œrlikon
leybold vacuum

TURBOVAC and MAG

Turbomolecular Pumps

35 - 3 200 l x s^{-1}

175.01.02
Excerpt from the Oerlikon Leybold Vacuum Full Line Catalog
Product Section C09
Edition May 2007

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General

The turbomolecular pumps from Oerlikon Leybold Vacuum generate a clean high and ultra-high vacuum, are easy to operate and are exceptionally reliable. In connection with a well rated backing pump, pressures below 10^{-10} mbar (0.75×10^{-10} Torr) can be attained.

Oerlikon Leybold Vacuum offers two product lines:

1. **TURBOVAC line**
   Turbomolecular pumps with mechanical rotor suspension
2. **TURBOVAC MAG line**
   Turbomolecular pumps with magnetic rotor suspension

Each of the two product lines contains **"classic" turbomolecular pumps** as well as **turbomolecular pumps with a compound stage**.

Oerlikon Leybold Vacuum is one of the world's leading manufacturer of turbomolecular pumps. Consequently, the TURBOVAC and the TURBOVAC MAG pumps are successfully used in many applications. A list of the most important ones is given in the table "Applications" in the section "General".

Principle of Operation

The turbomolecular pump is a turbine with blades. By the momentum transfer from the rapidly rotating rotor blades to the gas molecules their initially non-directed thermal motion is changed to a directed motion.

TURBOVAC TW 70 H turbomolecular pump with mechanical rotor suspension and dual compound stage

TURBOVAC TW 361 turbomolecular pump with mechanical rotor suspension

MAG W 1500 CT turbomolecular pump with magnetic rotor suspension and compound stage

Hence, the pumping process in a turbomolecular pump results from the directed motion of the gas molecules from the inlet flange to the fore-vacuum port.
In the **molecular flow range** - i.e. at pressures below 10^{-3} mbar (0.75×10^{-3} Torr) - the mean free path of the gas molecules is larger than the spacing between rotor and stator blades (typically some tenths of a millimeter). Consequently, the molecules collide primarily with the rotor blades with the result that the pumping process is highly efficient.

In the **range of laminar flow**, i.e. at pressures over 10^{-1} mbar (0.75×10^{-1} Torr) the situation is completely different. The effect of the rotor is impaired by the frequent collisions between the molecules. Therefore, a turbomolecular pump is not capable of pumping gases at atmospheric pressure thus necessitating the use of a suitably rated forevacuum pump.

To create the directed motion of the gas molecules, the tips of the rotor blades have to move at high speeds. Hence, a high rotational speed of the rotor is required. In the case of Oerlikon Leybold Vacuum turbomolecular pumps the rotor speeds vary from about 36,000 rpm for the larger rotor diameters (e.g. TURBOVAC 1000 about 20 cm (7.87 in.)) to 72,000 rpm. for small rotor diameters (e.g. TURBOVAC 50 about 6 cm (2.36 in.))

Characteristic Quantities

Pumping speed (volume flow rate), S, [l x s^{-1}]
The pumping speed for a given type of gas depends on the diameter of the rotor and the high vacuum flange, the rotor/stator design, the rotor speed and the molecular weight of the gas. The pumping speed S is a non-linear function of the inlet pressure p_1:
$S = S(p_1)$.

Gas throughput, Q, [mbar x l x s^{-1}]
Gas throughput Q is linked to the pumping speed S and the inlet pressure p_1 through the relationship
$Q = Q(p_1) = p_1 \cdot S(p_1)$.
The maximum permissible gas throughput Q_{max} is attained at the maximum permissible inlet pressure $p_{1,\,max}$:
$Q_{max} = Q(p_{1,\,max})$.

Compression, K
For a given type of gas, compression K is defined as the ratio between forevacuum pressure p_{VV} (= pressure on the forevacuum side of the turbomolecular pump) and the highvacuum pressure p_{HV} (= pressure on the highvacuum side of the turbomolecular pump):
$k = k(p_{VV}) = p_{VV} / p_{HV}$
$= p_{VV} / p_{HV}(p_{VV})$.

Compression depends very much on the gas throughput: at a given forevacuum pressure, compression increases when the gas throughput is reduced.

Idle compression, K_0
Idle compression K_0 of a turbomolecular pump is defined as the amount of compression of this pump at "Zero" gas throughput. What is problematic about this definition is the fact that the demanded "Zero" throughput can never be implemented in practice (finite leak rate, degassing of sealing components, desorption from wall surfaces). Data on idle compression need therefore to be gained from measurements run at extremely low throughputs.
Idle compression of a pump equipped with metal seals is significantly higher compared to the same pump sealed with O-rings.

Ultimate pressure (base pressure), p_{ult}, [mbar]
The ultimate pressure of a turbomolecular pump is defined as that pressure which is attained in the test chamber 48 hours after a 24 hour degassing period of the measurement system. The ultimate pressure will chiefly depend on the foreline pump used and the type of seal used at the highvacuum flange.

TURBOVAC Product Line

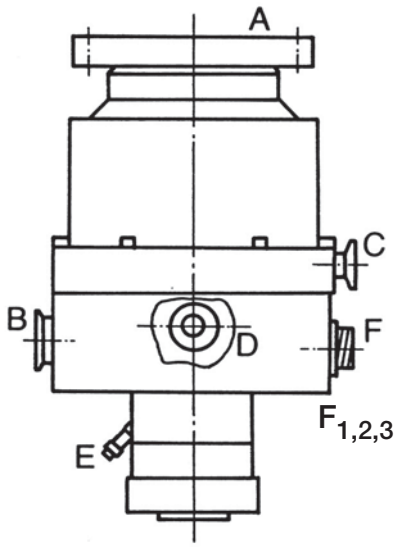
The **TURBOVAC pumps** are **turbomolecular pumps with mechanical rotor suspension** which are used in **the pressure range from 10^{-1} mbar (0.75 x 10^{-1} Torr) to 10^{-10} mbar (0.75 x 10^{-10} Torr). Pumping speeds for air vary from 35 l x s^{-1}** (inlet flange diameter = 40 mm (1.57 in.)) **to 1,600 l x s^{-1}** (inlet flange diameter = 250 mm (9.84 in.)).
Through the compact design, the most reliable ceramics ball bearings and the simplicity of operation, this line of pumps is used in all high-vacuum and ultrahigh vacuum areas of application.
In particular the TURBOVAC pumps are very successfully operated in mass spectroscopy applications, gas and liquid chromatographic analysis, CD, DVD and hard disk production, manufacturing of large-surface optical layers, and non-corrosive semiconductor fabrication processes.

The **most important advantages of the TURBOVAC product line** are:

- Oil-free pumps for the generation of clean high and ultra-high vacuum conditions
- Highly performance in any orientation
- Highly degree of operating reliability
- Easy to operate
- Compact design

Ceramic Ball Bearings Technology

All TURBOVAC pumps are fitted with **ceramic ball bearings**, i.e. **ceramic balls** are running in steel races. The bearings are **lubricated for life by grease**.
Ceramic balls are lighter, harder and smoother than balls made of steel. Therefore, with ceramic balls the wear on the races is significantly reduced. Consequently, the lifetime of the bearings, and hence the lifetime of the pump, is increased.
The **TURBOVAC pumps** fitted with grease-lubricated ceramic ball bearings **can be mounted in any orientation**. As the ball bearing is encapsulated, the grease can not enter the highvacuum space, even if the pump is mounted up-side-down.



A Highvacuum flange
B Forevacuum flange
C Venting flange
D Purge gas flange
E Water cooling connection
F Electrical connection
F_1 Connection for DC motor
F_2 Connection for regulator
F_3 Connection for axial sensor

Flange designations used in this product section

Components supplied with the Turbomolecular Pumps

Highvacuum Flange
KF, ISO-K and ISO-F models
- Accessories need to be ordered separately

ANSI Models
- O-ring included in the delivery

CF Models
- Without gaskets [1], but with screws [2]

Forevacuum Port
- Centering rings, O-rings and clamps for all KF type forevacuum flanges are included.

Purge / vent ports are blanked-off

[1] For CF gaskets, see Product Section C13
[2] Only for MAG pumps

TURBOVAC MAG Product Line

The **TURBOVAC MAG pumps** are **turbomolecular pumps with magnetic rotor suspension** which are used in the **pressure range from 10^{-1} mbar (0.75 x 10^{-1} Torr) to 10^{-10} mbar (0.75 x 10^{-10} Torr). Pumping speeds for air vary from 300 l x s^{-1}** (inlet flange diameter = 100 mm (3.94 in.)) **to 3,200 l x s^{-1}** (inlet flange diameter = 320 mm (12.6 in.)).
The TURBOVAC MAG pumps are mostly installed on semiconductor processing lines like etching, CVD, PVD and ion implantation, i.e. in applications where corrosive gases need to be pumped. Also electron beam microscopy is an important area of application for these pumps.

The **most important advantages of the TURBOVAC MAG product line** are:

- Hydrocarbon-free pumps for the generation of clean high and ultra-high vacuum conditions
- High performance in any orientation
- High degree of operating reliability
- Extremely low vibration
- Designed for pumping of corrosive gases

Use of Turbomolecular Pumps in Analytical Instruments

All modern analytical methods for gas, liquid and plasma analysis – like for example GC-MS, LC-MS and ICP-MS – rely on mass spectrometers and for this reason require adequate highvacuum conditions. Also in electron microscopes and many surface analysis instruments the production of a high-vacuum is essential.

In over 90 % of all highvacuum applications, the turbomolecular pump has been found to be ideal. Thanks to the hydrocarbon-free vacuum, most simple operation, compact design and almost maintenance-free operation it has in most cases displaced above all the diffusion pump.

On the basis of decades of experience and in cooperation with research facilities and the manufacturers of analytical instruments,

Oerlikon Leybold Vacuum has continually optimized its products.

Through the TURBOVAC wide range series, a further improvement has been attained, making available to users in the area of analytical engineering highly flexible and reliable products.

Owing to the modular concept the user may

- adapt his vacuum system precisely to his requirements
- perfectly integrate the components within his system and
- find the most cost-effective system configuration for his needs.

Moreover, in response to special customer requirements, though Oerlikon Leybold Vacuum has, through the introduction of the TURBOVAC multi inlet series, achieved a major step ahead for analytical instruments.

Up to three analysis chambers can be pumped down simultaneously by a single multi inlet pump. These pumps are fine tuned with regard to pumping speed and gas throughput so as to attain higher detection sensitivities for analytical systems, a smaller footprint and an increased sample throughput.

The benefits for the customers are the extreme compactness of the vacuum systems without sacrificing performance density, simple installation, stable vacuum connections and, compared to the use of discrete individual pumps, significantly lower investment costs for the entire system. The cartridge solution, moreover, allows for an innovative and cost-effective design of the customer's system and during servicing a simple replacement of the active unit without involved assembly work and leak searching.

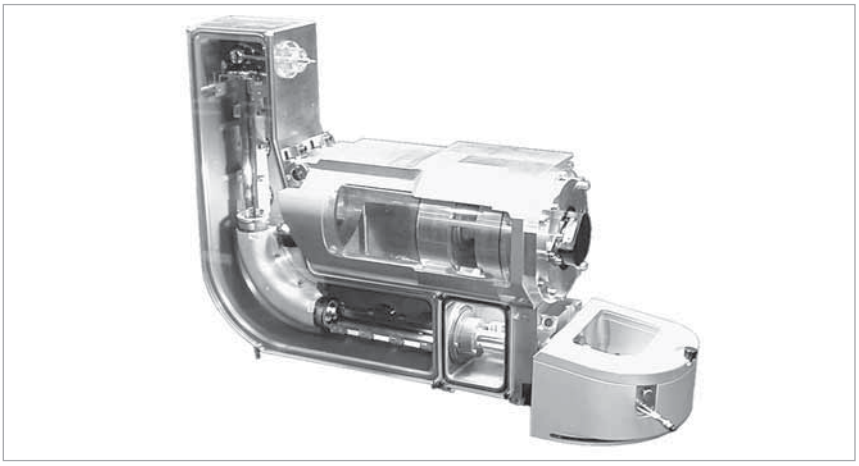
Cartridge benefits, which convince

- Higher effective pumping speed
- No losses in conductance
- Compact vacuum system
- Easy pump replacement without having to disassemble the highly sensitive mass spectrometer chambers

The benefits for the customers using Oerlikon Leybold Vacuum products are reflected by the efficiency of the analytical instruments:

- Increase in detection sensitivity
- Smaller analytical systems
- Increase in sample throughput
- Reduction of system costs
- Lower maintenance costs

In combination with backing pumps like the TRIVAC or Scroll pump, Oerlikon Leybold Vacuum is able to offer the best vacuum system optimized for all major applications in the area of analytical instrumentation.



TURBOVAC multi Inlet TW 220/150/15 fitted in an analytical instrument
(by courtesy of Thermo Fisher Scientific)

Use of Turbomolecular Pumps in the Area of Semiconductor Processes

In the semiconductor industry turbomolecular pumps are used on the following processes, among others:

- Etching
- Sputtering
- Ion implantation
- CVD
- Lithography.

In these applications pumping of aggressive gases is often required.

This may necessitate the use of pumps equipped with a purge gas facility or a magnetic suspension in order to avoid damaged bearings. Especially during metal etching, deposits may occur in the fore-vacuum space of the turbomolecular pump. In order to prevent this the pumps must be heated to a certain temperature. Such temperature controlled variants are optionally available for the MAG 1500 C, MAG 2000 C, MAG 2800 and MAG 3200. In contrast to turbomolecular pumps with mechanical bearings, magnetically levitated pumps provide the advantage that they prevent overheating of the bearings at high gas flows and effectively exclude any damage to the magnetic bearings by aggressive media.

In electron microscopes and in lithographic equipment, low vibration levels are exceptionally important. For this reason magnetically levitated turbomolecular pumps should be used here.

The recommended backing pumps are either dry compressing ECODRY pumps or rotary vane pumps from the TRIVAC range, possibly fitted with the BCS system.

Use of Turbomolecular Pumps in the Area of Coating Systems

Coating of optical and magnetic storage media, optical components as well as architectural glass requires highvacuum conditions. This is the only way to ensure that the formed layers will be uniform and adhere to the substrate.

The way in which the vacuum is generated has a significant impact on the quality of the coating. By pumping the vacuum chamber down to pressures in the range of 10^{-6} mbar (0.75×10^{-6} Torr), interfering gas and water molecules are removed from the processing chamber. In the case of sputtering the coating process is run in the pressure range between 10^{-3} and 10^{-2} mbar (0.75×10^{-3} and 0.75×10^{-2} Torr), and in the case of evaporation coating, pressures below 10^{-4} mbar (0.75×10^{-4} Torr) are utilized.

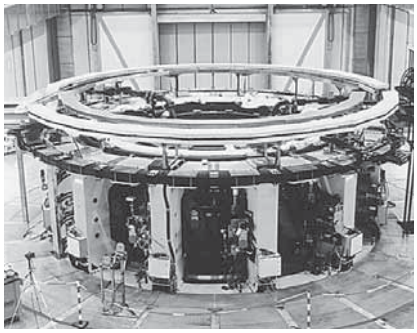
The turbomolecular pump meets all requirements of the customers as to a hydrocarbon-free vacuum, very simple operation, compact design and almost maintenance-free operation in an almost ideal manner. The range of pumps from Oerlikon Leybold Vacuum includes pumps with flange diameters ranging from 40 mm to 250 mm (1.57 in. to 9.84 in.) nominal width. Thus the right pump is available for each application, be it coating of data memories (CD, DVD, hard discs), coating of tools and coating of precision lenses in the area of optical components, displays or architectural glass.

Entire high vacuum equipment of a CD/DVD coating system with TURBOVAC TW 250 S pumps

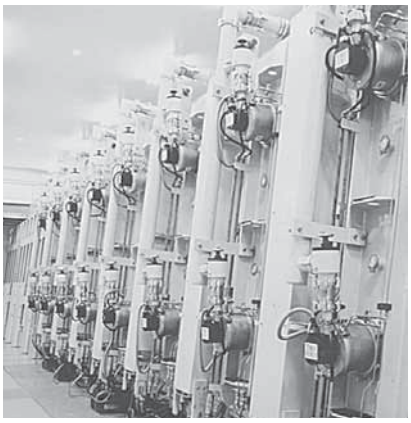
Research and Development

In the area of research, all types of turbomolecular pumps from Oerlikon Leybold Vacuum are being used.

In the case of particularly stringent requirements such as low vibration levels, a TURBOVAC with magnetic bearings should be selected; the same applies to those applications in which entirely hydrocarbon-free pump systems are required.

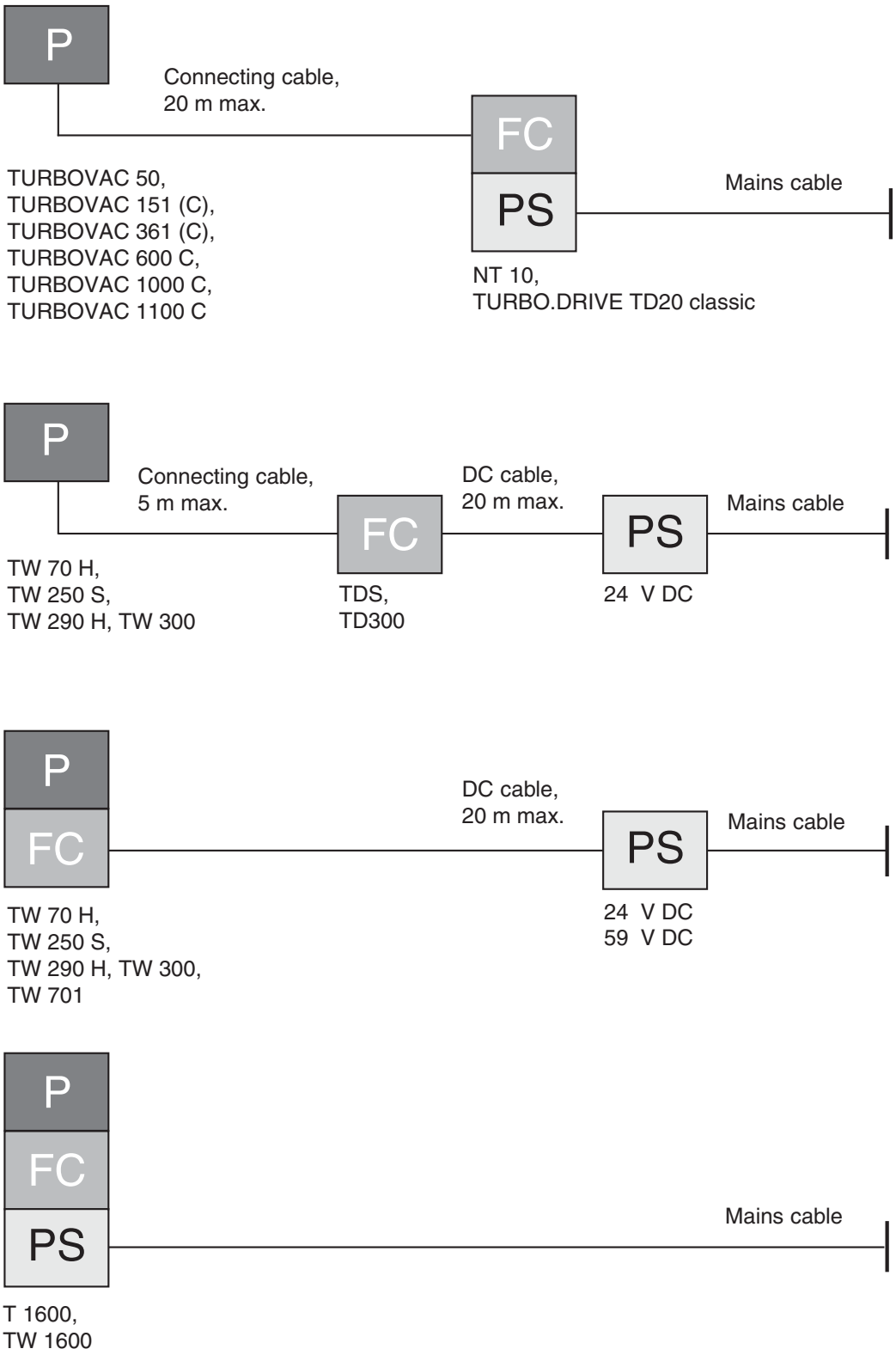


Nuclear fusion technology



High performance glass coating plant

Pump / Converter Configurations for TURBOVAC Product Line



P= Pump FC = Frequency Converter PS = Power Supply

Notes

MAG W 1300 C turbomolecular pump with magnetic rotor suspension and compound stage

Magnetic Bearings Technology

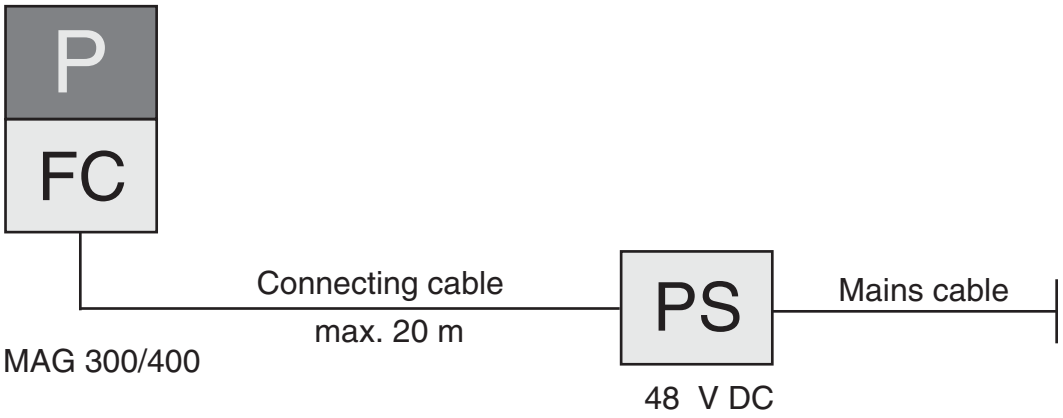
The world-wide success of the TURBOVAC MAG product line results from more than **30 years of experience** of Oerlikon Leybold Vacuum in the development and manufacturing of turbomolecular pumps with magnetically levitated rotors.

In 1976 Oerlikon Leybold Vacuum started the market introduction of the famous TURBOVAC 560 M. This was the first magnetically levitated turbomolecular pump which became commercially available. Today, Oerlikon Leybold Vacuum is employing the well-proven and reliable 5 axes active suspension design principle.

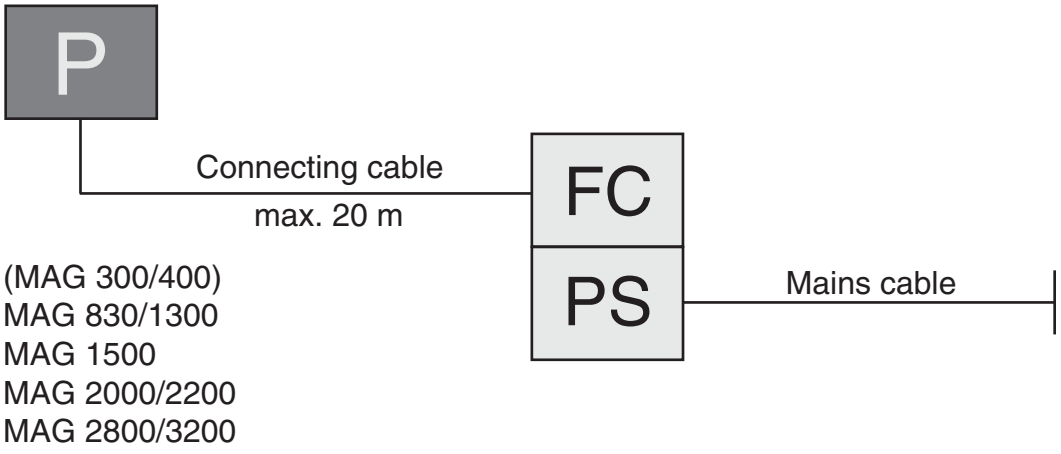
Five axes with active bearings
The rotor position is actively controlled by electromagnets in all 5 degrees of freedom. The TURBOVAC MAG 300/400, MAG 830/1300, MAG 1500, MAG 2000, MAG 2200 and MAG 2800/3200 are equipped with such a bearing system.

Pump / Converter Configurations for TURBOVAC MAG Product Line

With integrated Frequency Converter



With separate Frequency Converter



Application

Pumps / Applications	50	151, 361	600 C	1000 C	1100 C	T 1600	TW 70 H	TW 250 S	TW 290 H	TW 300	TW 701	TW 1600	MAG W 300/400 iP	MAG 1500 CT	MAG W 830/1300 C	MAG W 1500 CT	MAG W 2200 C	MAG W 2000 C/CT	MAG W 2800/3200 C/CT
Analytical Instruments																			
Leak detectors	■	■				■		■				■		■					
Mass spectrometers	■	■				■		■	■	■		■		■					
Gas chromatography (GC-MS)	■	■						■				■		■					
Liquid chromatography (LC-MS)	■	■					■	■				■		■					
Quadrupol time of flight (Q-TOF)								■		■		■		■					
Matrix assisted laser desorption time of flight (MALDI-TOF)	■							■		■		■		■					
Inductively coupled plasma mass spectrometry (ICP-MS)	■						■	■		■		■		■					
Electron beam microscopy	■					■					■	■		■					
Coating																			
Data storage / optical		■					■	■				■		■		■	■	■	
Data storage / magnetic			■	■	■	■		■			■	■		■		■	■	■	
Flat panel displays			■	■	■	■					■	■		■		■	■	■	
Optical coating		■	■	■	■	■		■	■		■	■		■		■	■	■	
Large area coating				■	■	■								■		■	■	■	
Decorative coating				■	■	■								■		■	■	■	
Metallization				■	■	■								■		■	■	■	
Wear protection			■	■	■	■								■		■	■	■	
Metallurgy				■	■	■								■		■	■	■	
TV tube manufacturing	■						■	■											
R & D (Research and Development)																			
Surface analysis				■			■					■	■	■	■	■	■	■	
UHV / XHV systems		■	■	■	■				■		■	■	■	■		■		■	
Particle accelerators		■		■	■	■		■	■	■	■		■		■		■	■	■
Fusion experiments			■	■	■	■						■	■	■	■	■	■	■	■
Space simulation			■	■	■							■	■	■	■	■	■	■	■
Semiconductor Processes																			
Load locks and transfer chambers	■	■	■	■	■			■	■		■		■	■	■				
Etch														■		■		■	■
PECVD													■	■	■	■	■	■	■
PVD													■	■	■	■	■	■	■
Ion implantation													■	■	■	■	■	■	■

Accessories

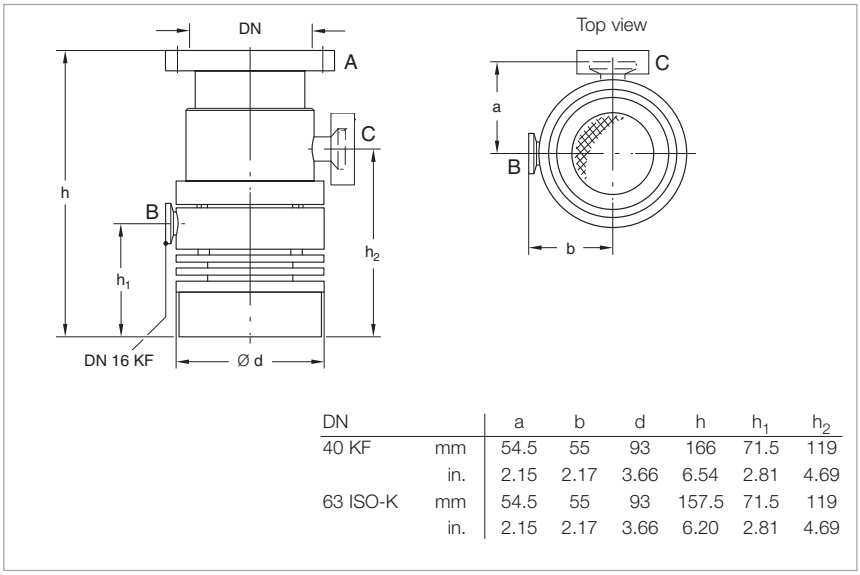
Accessories	Page	50	151, 361	600 C	1000 C	1100 C	T 1600	TW 70 H	TW 250 S	TW 290 H	TW 300	TW 701	TW 1600	MAG W 300/400 iP	MAG 1500 CT	MAG W 830/1300 C	MAG W 1500 CT	MAG W 2200 C	MAG W 2000 C/CT	MAG W 2800/3200 C/CT
Frequency converters																				
NT 10	C09.66	■																		
TURBO.DRIVE TD20 *classic*	C09.64		■	■	■	■														
TURBO.DRIVE S	C09.67		■				■	■	■	■										
Power supplies for TD S/TD 300, TW 700/701	C09.68						■	■	■	■	■									
Power supply PS 700	C09.69										■									
TURBO.DRIVE TD 300	C09.70						■	■	■	■										
Power supply TURBO.POWER 500	(C09.73)												■							
MAG.DRIVE digital	C09.98													■	■	■	■	■	■	■
Vibration absorber	C09.100	■	■	■	■	■	■	■	■	■		■	■							
Air cooling unit	C09.100	■	■	■	■								■							
Flange heaters für CF flanges	C09.101	■	■	■	■			■	■	■	■	■		■						
Fine filter	C09.101	■																		
Venting valves	C09.102	■	■	■	■	■			■	■	■	■		■		■		■		
Power failure venting valve	C09.102		■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■
Purge gas and venting valve	C09.102	■	■	■	■	■		■	■	■	■	■		■		■		■		
Water cooling	–	■											■							
Accessories for RS 232 C / RS 485 C-serial interfaces	C09.103	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Products and Accessories

Turbomolecular Pumps with Mechanical Rotor Suspension without Compound Stage TURBOVAC 50

Typical Applications

- Leak detectors
- Mass spectrometers
- Electron beam microscopy
- TV tube manufacturing
- Load locks and transfer chambers

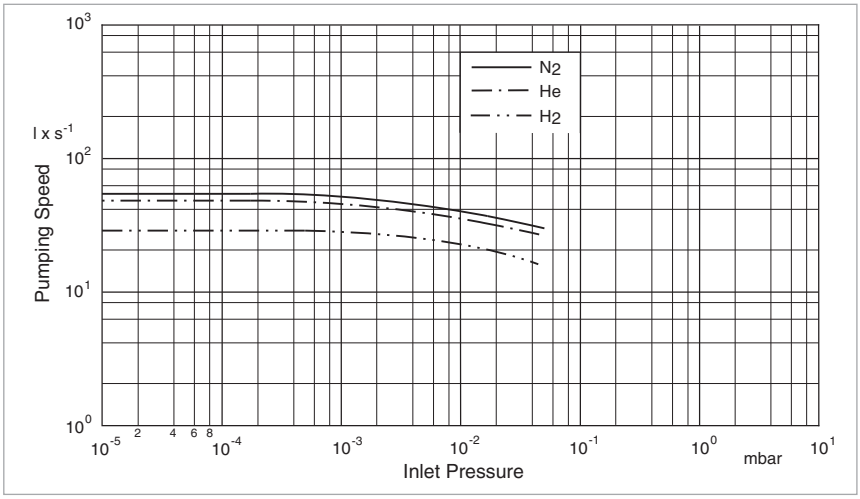


DN		a	b	d	h	h_1	h_2
40 KF	mm	54.5	55	93	166	71.5	119
	in.	2.15	2.17	3.66	6.54	2.81	4.69
63 ISO-K	mm	54.5	55	93	157.5	71.5	119
	in.	2.15	2.17	3.66	6.20	2.81	4.69

Dimensional drawing for the TURBOVAC 50

Technical Features

- Compact design
- Operation in any orientation
- Cooling by convection is sufficient for most applications
- Air and water cooling can be added easily
- Oil-free pump for generating clean high and ultrahigh vacuum conditions



Pumping speed as a function of the inlet pressure (TURBOVAC 50 with flange DN 63 ISO-K)

Advantages to the User

- Space-saving
- Easy to integrate into complex vacuum systems
- Low operating costs
- Highly reliable operation also in processes loaded with particles

Technical Data

TURBOVAC 50

Inlet flange	DN	O-ring sealed 40 KF	O-ring sealed 63 ISO-K
Pump housing		Aluminum	Aluminum
Pumping speed at 10^{-3} mbar			
N_2	l x s^{-1}	33	55
He	l x s^{-1}	36	48
H_2	l x s^{-1}	28	30
Max. gas throughput [1] at 10^{-2} mbar			
N_2	mbar x l x s^{-1}	0.30	0.40
He	mbar x l x s^{-1}	0.25	0.35
H_2	mbar x l x s^{-1}	0.20	0.25
Max. compression when idle			
N_2		$2 \cdot 10^6$	$2 \cdot 10^6$
Ultimate pressure with TRIVAC D 2,5 E	mbar (Torr)	$< 5 \times 10^{-8}$ ($< 3.75 \times 10^{-8}$)	$< 5 \times 10^{-8}$ ($< 3.75 \times 10^{-8}$)
Max. foreline pressure for N_2	mbar (Torr)	1×10^{-1} ($< 0.75 \times 10^{-1}$)	1×10^{-1} ($< 0.75 \times 10^{-1}$)
Recommended forevacuum pump		TRIVAC D 2,5 E	TRIVAC D 2,5 E
Run-up time to 95% of nominal speed	min	2	2
Cooling water connection (hose nozzles) (for Part No. 854 08)	mm (in.)	10	10
Weight, approx.	kg	2	2
Max. power consumption	VA	45	45

[1] for continuous operation when water-cooled

Ordering Information

TURBOVAC 50

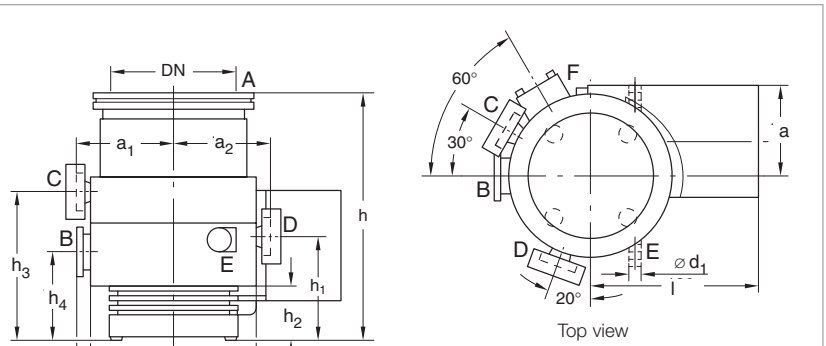
Inlet flange	Foreline flange	Cooling method	Interface	
DN 40 KF	DN 16 KF	Convection	–	**Part No. 854 00**
DN 63 ISO-K	DN 16 KF	Convection	–	**Part No. 854 01**
Accessories, necessary for all pumps				
Electronic frequency converter NT 10				
90 - 140 V				**Part No. 859 01**
180 - 260 V				**Part No. 859 00**
Connecting cable NT 10 - pump				
3 m (10.5 ft)				**Part No. 121 08**
5 m (17.5 ft)				**Part No. 121 09**
Accessories, optional				
Air cooling unit				
230 V AC				**Part No. 854 05**
110 V AC				**Part No. 854 06**
100 V AC				**Part No. 800152V0015**
Water cooling kit				**Part No. 854 08**
Flange heater				
63 CF, 230 V, 50 Hz				**Part No. 854 04**
63 CF, 110 V, 60 Hz				**Part No. 854 07**
Vibration absorber				
DN 63 ISO-K				**Part No. 800131V0063**
DN 63 CF				**Part No. 500 070**

Notes

TURBOVAC 151, 151 C
ClassicLine

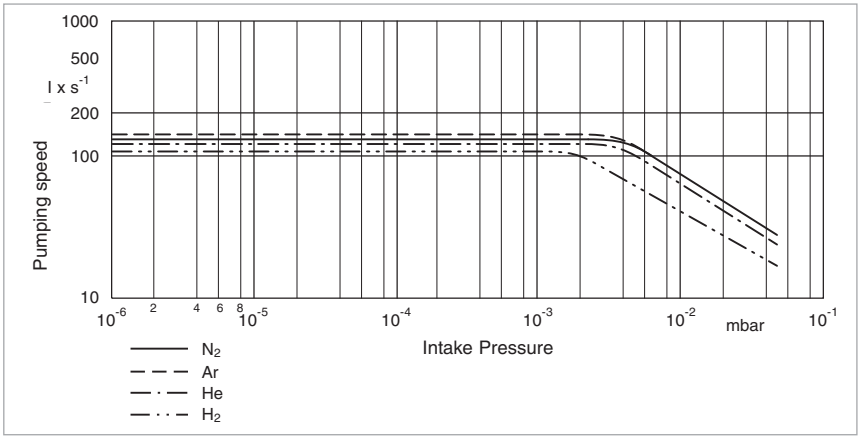
Turbomolecular pumps without a purge gas facility are only suited for pumping of air or inert gases.
They are not suited for pumping of aggressive or reactive gases.

TURBOVAC pumps with a "C" in the type designation are equipped with a purge gas facility.
The purge gas protects only the bearing area and the motor of the TURBOVAC.



DN		151 h	151 C h	151 C h_1	h_2	h_3	h_4	a	a_1	a_2	b	d	d_1	l
100 ISO-K	mm	207	207	88	47	126	73	76	79	78	76	132	10	136
	in.	8.14	8.14	3.46	1.85	4.96	2.87	2.99	3.11	3.07	2.99	5.20	0.39	5.35
100 CF	mm	224	–	–	47	126	73	76	79	78	76	132	10	136
	in.	8.82	–	–	1.85	4.96	2.87	2.99	3.11	3.07	2.99	5.20	0.39	5.35

Dimensional drawing for the TURBOVAC 151 and 151 C



Pumping speed as a function of the inlet pressure (TURBOVAC 151 with flange DN 100)

Typical Applications

- Leak detectors
- Mass spectrometers
- Data storage
- Optical coating
- R & D, e.g.
  - UHV systems
  - Particle accelerators
- Load locks and transfer chambers

Technical Features

- Compact design
- Operation in any orientation
- Oil-free pump for generating clean high and ultrahigh vacuum-conditions

Advantages to the User

- Space-saving
- Easy to integrate into complex vacuum systems
- Low operating costs
- Highly reliable operation also in processes loaded with particles

Technical Data

TURBOVAC 151

Inlet flange	**DN**	100 ISO-K	100 CF
Pumping speed			
N_2	**l x s^{-1}**	145	145
Ar	**l x s^{-1}**	150	150
He	**l x s^{-1}**	135	135
H_2	**l x s^{-1}**	115	115
Max. gas throughput			
N_2	**mbar x l x s^{-1}**	1.5	1.5
Ar	**mbar x l x s^{-1}**	1.3	1.3
H_2	**mbar x l x s^{-1}**	1.0	1.0
Compression ratio			
N_2		1×10^9	1×10^9
He		2×10^4	2×10^4
H_2		8×10^2	8×10^2
Ultimate pressure	**mbar (Torr)**	$< 1 \times 10^{-10}$ ($< 0.75 \times 10^{-10}$)	$< 1 \times 10^{-10}$ ($< 0.75 \times 10^{-10}$)
Max. continuous inlet pressure [1]	**mbar (Torr)**	5×10^{-2} (4×10^{-2})	5×10^{-2} (4×10^{-2})
Max. foreline pressure for N_2	**mbar (Torr)**	5×10^{-1} (4×10^{-1})	5×10^{-1} (4×10^{-1})
Recommended forevacuum pump		from TRIVAC D 4 B to D 16 B	from TRIVAC D 4 B to D 16 B
Run-up time to 95% speed	**min**	≈ 2	≈ 2
Purge / vent port	**DN**	10 KF	10 KF
Cooling water connection (hose nozzles)	**mm (in.)**	10 (0.39)	10 (0.39)
Weight, approx.	**kg (lbs)**	8 (17)	88 (17)
Max. power consumption	**VA**	680	680
at ultimate pressure	**VA**	480	480

[1] Water-cooled

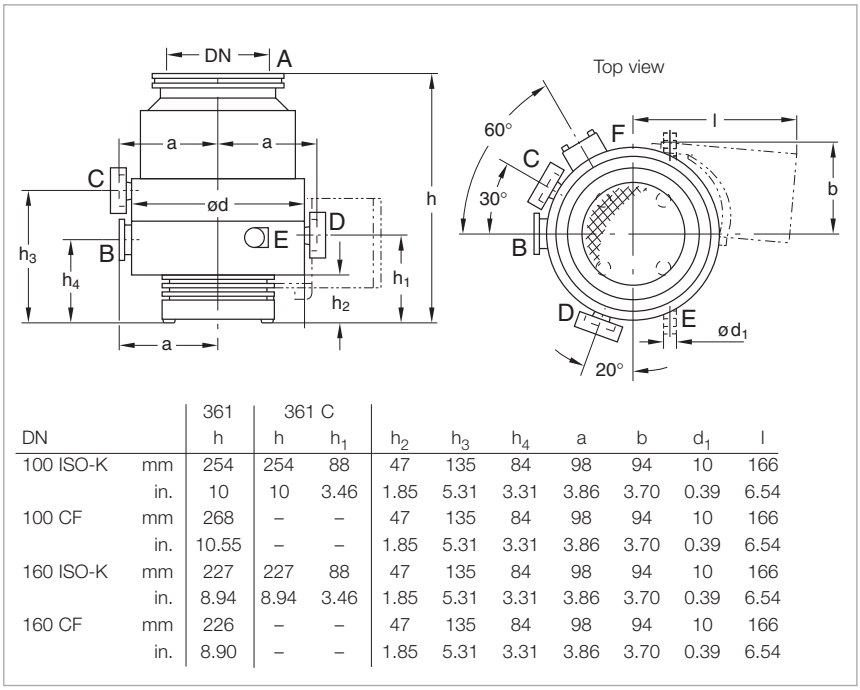
Inlet flange	Foreline flange	Cooling method	Item	
DN 100 ISO-K	DN 25 KF	Water-cooled	TURBOVAC 151	**Part No. 856 31**
DN 100 ISO-K	DN 25 KF	Water-cooled	TURBOVAC 151 C	**Part No. 856 35**
DN 100 CF	DN 25 KF	Water-cooled	TURBOVAC 151	**Part No. 856 32**
DN 100 CF	DN 25 KF	Water-cooled	TURBOVAC 151 C	**Part No. 103 41**
Accessories, necessary for all pumps				
Electronic frequency converter TURBO.DRIVE TD20 *classic*				
100 - 240 V AC (-15%/+10%)				
without interface				**Part No. 800075V0001**
with RS 232 C interface				**Part No. 800075V0002**
with RS 485 C interface				**Part No. 800075V0004**
with Profibus				**Part No. 800075V0003**
with 25 pol I/O				**Part No. 800075V0005**
with DeviceNet				**Part No. 800075V0006**
with Ethernet/IP				**Part No. 800075V0007**
Connecting cable TURBO.DRIVE TD20 *classic* - pump				
3 m (10.5 ft)				**Part No. 857 65**
5 m (17.5 ft)				**Part No. 857 66**
10 m (35.0 ft)				**Part No. 857 67**
20 m (70.0 ft)				**Part No. 857 68**
50 m (175.0 ft)				**Part No. 800152V0008**
60 m (210.0 ft)				**Part No. 800152V0007**
Accessories, optional				
Air cooling unit				
230 V AC				**Part No. 855 31**
110 V AC				**Part No. 894 08**
100 V AC				**Part No. 800152V0016**
Flange heater 100 CF				
230 V AC				**Part No. 854 27**
110 V AC				**Part No. 854 28**

Notes

TURBOVAC 361, 361 C
ClassicLine

Turbomolecular pumps without a purge gas facility are only suited for pumping of air or inert gases.
They are not suited for pumping of aggressive or reactive gases.

TURBOVAC pumps with a "C" in the type designation are equipped with a purge gas facility.
The purge gas protects only the bearing area and the motor of the TURBOVAC.



DN		361 h	361 C h	361 C h_1	h_2	h_3	h_4	a	b	d_1	l
100 ISO-K	mm	254	254	88	47	135	84	98	94	10	166
	in.	10	10	3.46	1.85	5.31	3.31	3.86	3.70	0.39	6.54
100 CF	mm	268	–	–	47	135	84	98	94	10	166
	in.	10.55	–	–	1.85	5.31	3.31	3.86	3.70	0.39	6.54
160 ISO-K	mm	227	227	88	47	135	84	98	94	10	166
	in.	8.94	8.94	3.46	1.85	5.31	3.31	3.86	3.70	0.39	6.54
160 CF	mm	226	–	–	47	135	84	98	94	10	166
	in.	8.90	–	–	1.85	5.31	3.31	3.86	3.70	0.39	6.54

Dimensional drawing for the TURBOVAC 361 and 361 C

Typical Applications

- Leak detectors
- Mass spectrometers
- Data storage
- Optical coating
- R & D, e.g.
  - UHV systems
  - Particle accelerators
- Load locks and transfer chambers

Technical Features

- Compact design
- Operation in any orientation
- Oil-free pump for generating clean high and ultrahigh vacuum conditions

Advantages to the User

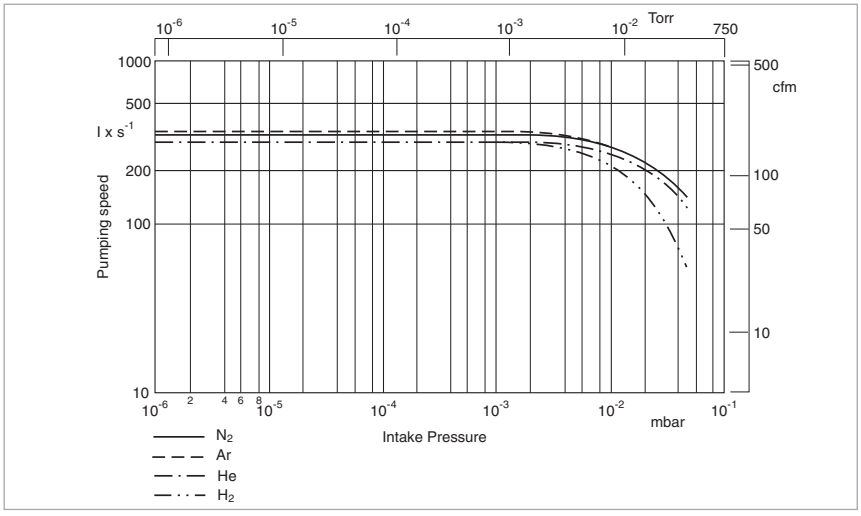
- Space-saving
- Easy to integrate into complex vacuum systems
- Low operating costs
- Highly reliable operation also in processes loaded with particles

Technical Data

TURBOVAC 361

Inlet flange	DN	100 ISO-K • 100 CF	160 ISO-K • 160 CF
Pumping speed			
N_2	l x s^{-1}	345	400
Ar	l x s^{-1}	350	–
He	l x s^{-1}	340	380
H_2	l x s^{-1}	340	370
Max. gas throughput			
N_2	mbar x l x s^{-1}	3.0	3.0
Ar	mbar x l x s^{-1}	2.5	2.5
Compression ratio			
N_2		1×10^9	1×10^9
He		6×10^4	6×10^4
H_2		3×10^3	3×10^3
Ultimate pressure	mbar (Torr)	$< 1 \times 10^{-10}$ ($< 0.75 \times 10^{-10}$)	$< 1 \times 10^{-10}$ ($< 0.75 \times 10^{-10}$)
Max. continuous inlet pressure [1]	mbar (Torr)	5×10^{-2} (3.75×10^{-2})	5×10^{-2} (3.75×10^{-2})
Max. foreline pressure for N_2	mbar (Torr)	5×10^{-1} (3.75×10^{-1})	5×10^{-1} (3.75×10^{-1})
Recommended forevacuum pump		from TRIVAC D 16 B to D 25 B	from TRIVAC D 16 B to D 25 B
Run-up time to 95% speed	min	≈ 2	≈ 2
Purge / vent port	DN	10 KF	10 KF
Cooling water connection (hose nozzle)	mm (in.)	10 (0.39)	10 (0.39)
Weight, approx.	kg (lbs)	12 (26)	12 (26)
Max. power consumption	VA	680	680
at ultimate pressure	VA	480	480

[1] Water-cooled



Pumping speed as a function of the inlet pressure (TURBOVAC 361 with flange DN 100)

Inlet flange	Foreline flange	Cooling method	Item	
DN 100 ISO-K	DN 25 KF	Water-cooled	TURBOVAC 361	**Part No. 856 70**
DN 100 ISO-K	DN 25 KF	Water-cooled	TURBOVAC 361 C	**Part No. 856 75**
DN 100 CF	DN 25 KF	Water-cooled	TURBOVAC 361	**Part No. 856 71**
DN 160 ISO-K	DN 25 KF	Water-cooled	TURBOVAC 361	**Part No. 856 72**
DN 160 ISO-K	DN 25 KF	Water-cooled	TURBOVAC 361 C	**Part No. 856 77**
DN 160 CF	DN 25 KF	Water-cooled	TURBOVAC 361	**Part No. 856 73**

Accessories, necessary for all pumps

Electronic frequency converter TURBO.DRIVE TD20 *classic*	
100 - 240 V AC (-15%/+10%)	
without interface	**Part No. 800075V0001**
with RS 232 C interface	**Part No. 800075V0002**
with RS 485 C interface	**Part No. 800075V0004**
with Profibus	**Part No. 800075V0003**
with 25 pol I/O	**Part No. 800075V0005**
with DeviceNet	**Part No. 800075V0006**
with Ethernet/IP	**Part No. 800075V0007**
Connecting cable TURBO.DRIVE TD20 *classic* - pump	
3 m (10.5 ft)	**Part No. 857 65**
5 m (17.5 ft)	**Part No. 857 66**
10 m (35.0 ft)	**Part No. 857 67**
20 m (70.0 ft)	**Part No. 857 68**
50 m (175.0 ft)	**Part No. 800152V0008**
60 m (210.0 ft)	**Part No. 800152V0007**

Accessories, optional

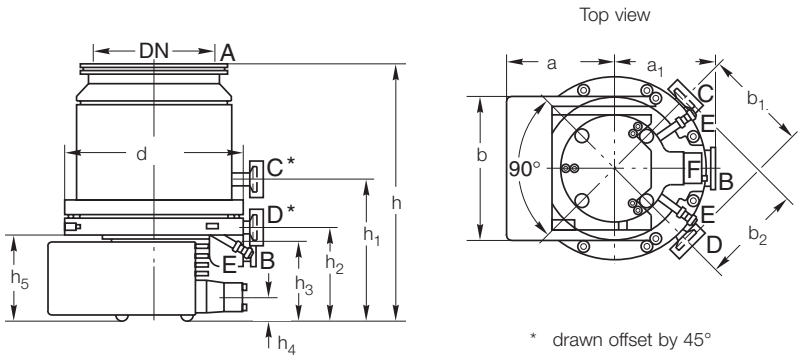
Air cooling unit	
230 V AC	**Part No. 855 31**
110 V AC	**Part No. 894 08**
100 V AC	**Part No. 800152V0016**
Flange heater 100 CF	
230 V AC	**Part No. 854 27**
110 V AC	**Part No. 854 28**
Flange heater 160 CF	
230 V AC	**Part No. 854 37**
110 V AC	**Part No. 854 38**

Notes

TURBOVAC 600 C
ClassicLine

Typical Applications

- Load locks and transfer chambers
- Optical coating
- Flat panel displays
- R & D

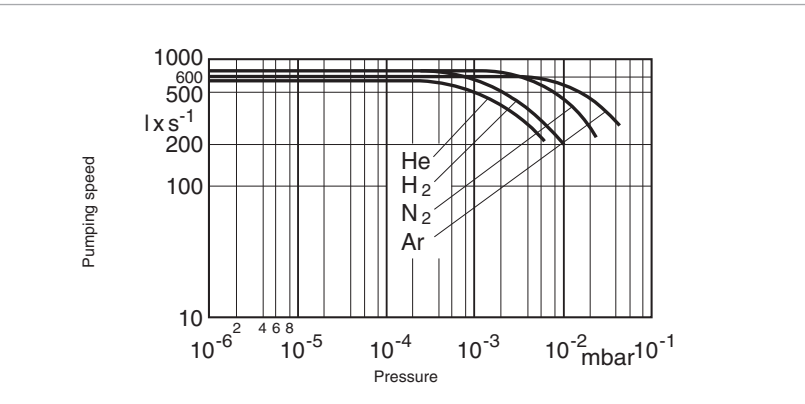


DN		h	h_1	h_2	h_3	h_4	h_5	a	a_1	b	b_1	b_2	ø d
160 ISO-K	mm	317	175	116	97	28	105	134	124.5	178	124.7	124.5	225
	in.	12.48	6.89	4.57	3.82	1.10	4.13	5.28	4.90	7.01	4.91	4.90	8.86
160 CF	mm	323	175	116	97	28	105	134	124.5	178	124.7	124.5	225
	in.	12.72	6.89	4.57	3.82	1.10	4.13	5.28	4.90	7.01	4.91	4.90	8.86

Dimensional drawing for the TURBOVAC 600 C

Technical Features

- Compact design
- Operation in any orientation
- Oil-free pump for generating clean high and ultrahigh vacuum conditions



Pumping speed for different gases as a function of intake pressure
(TURBOVAC 600 C with flange DN 160 ISO-K)

Advantages to the User

- Installation in any orientation
- Highly reliable due to hybrid ceramic ball bearings
- Life time lubrication and maintenance-free
- Option: Purge gas facility

Technical Data

TURBOVAC 600 C

Inlet flange	DN	160 ISO-K • 160 CF
Pumping speed		
N_2	l x s^{-1}	560
He	l x s^{-1}	600
H_2	l x s^{-1}	570
Max. gas throughput		
N_2	mbar x l x s^{-1}	< 4
Ar	mbar x l x s^{-1}	< 4
Compression ratio		
N_2		> 10^9
He		2 x 10^4
H_2		1.1 x 10^3
Ultimate pressure	mbar (Torr)	< 10^{-10} (< 10^{-10})
Speed	min^{-1}	36 000
Run-up time (frequency converter), approx.	min	4
Max. continuous inlet pressure [1] (continuous)	mbar (Torr)	1 x 10^{-2} (0.75 x 10^{-2})
Max. foreline pressure for N_2	mbar (Torr)	1 x 10^{-1} (0.75 x 10^{-1})
Recommended forevacuum pump		
for standard operation		TRIVAC D 25 B / 40 B
for purge gas operation		TRIVAC 40 B
Run-up time to 95% speed	min	3
Purge / vent port	DN	10 KF
Cooling water connection (hose nozzles)	mm (in.)	10 (0.39)
Weight, approx.	kg (lbs)	17 (37.5)
Max. power consumption	VA	680
at ultimate pressure	VA	480

[1] Water-cooled

Ordering Information

TURBOVAC 600 C

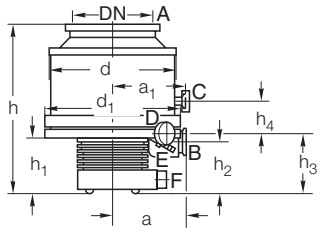
Inlet flange	Foreline flange	Cooling method	Item	
DN 160 ISO-K	DN 40 KF	Water-cooled	TURBOVAC 600 C	**Part No. 800150V0015**
DN 160 CF	DN 40 KF	Water-cooled	TURBOVAC 600 C	**Part No. 800150V0017**
Accessories, necessary for all pumps				
Electronic frequency converter TURBO.DRIVE TD20 *classic*				
100 - 240 V AC (-15%/+10%)				
without interface				**Part No. 800075V0001**
with RS 232 C interface				**Part No. 800075V0002**
with RS 485 C interface				**Part No. 800075V0004**
with Profibus				**Part No. 800075V0003**
with 25 pol I/O				**Part No. 800075V0005**
with DeviceNet				**Part No. 800075V0006**
with Ethernet/IP				**Part No. 800075V0007**
Connecting cable TURBO.DRIVE TD20 *classic* - pump				
3 m (10.5 ft)				**Part No. 857 65**
5 m (17.5 ft)				**Part No. 857 66**
10 m (35.0 ft)				**Part No. 857 67**
20 m (70.0 ft)				**Part No. 857 68**
50 m (175.0 ft)				**Part No. 800152V0008**
60 m (210.0 ft)				**Part No. 800152V0007**
Accessories, optional				
Air cooling unit				
230 V AC				**Part No. 855 41**
115 V AC				**Part No. 170 016**
100 V AC				**Part No. 800152V0017**
Flange heater 160 CF				
230 V AC				**Part No. 854 37**
110 V AC				**Part No. 854 38**

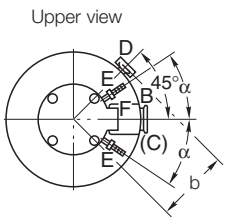
Notes

TURBOVAC 1000 C
ClassicLine

Typical Applications

- Evaporation and sputtering systems
- Metallurgy
- Research systems

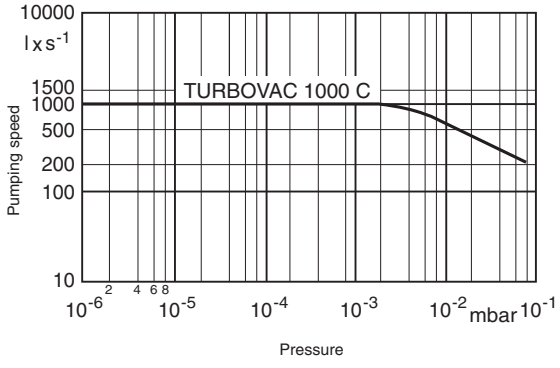




1) DN 40 KF, cast base flange
2) DN 63 KF, screwed in

DN		h	h_1	h_2	h_3	h_4	a	a_1	b	ø d	ø d_1
160 ISO-K/40 KF 1)	mm	338	111	102	123	62	140	133	141	241	258
	in.	13.31	4.37	4.02	4.84	2.44	5.51	5.24	5.55	9.49	10.16
160 ISO-K/63 KF 2)	mm	341	111	94	123	62	153	133	152	241	258
	in.	13.43	4.37	3.7	4.84	2.44	6.02	5.24	5.98	9.49	10.16
160 CF/40 KF 1)	mm	348	108	99	121	83	140	133	141	241	258
	in.	13.70	4.25	3.90	4.76	3.27	5.51	5.24	5.55	9.49	10.16
200 ISO-K/40 KF 1)	mm	351	111	102	123	62	140	133	141	241	258
	in.	13.82	4.37	4.02	4.84	2.44	5.51	5.24	5.55	9.49	10.16
200 CF/40 KF 1)	mm	336	108	99	121	83	140	133	141	241	258
	in.	13.23	4.25	3.90	4.76	3.27	5.51	5.24	5.55	9.49	10.16
250 ISO-K/40 KF 1)	mm	307	108	99	121	83	140	133	141	241	258
	in.	12.09	4.25	3.90	4.76	3.27	5.51	5.24	5.55	9.49	10.16
250 ISO-K/63 KF 2)	mm	310	111	94	121	91	153	133	141	241	258
	in.	12.20	4.37	3.70	4.76	3.58	6.02	5.24	5.55	9.49	10.16

Dimensional drawing for the TURBOVAC 1000 C



Pumping speed for air as a function of intake pressure (TURBOVAC 1000 C with DN 250 flange)

Technical Features

- Robust rotor design
- Operation in any orientation
- Highest pumping speed and throughput

Advantages to the User

- Installation in any orientation
- Highly reliable due to hybrid ceramic ballbearings
- Standard model:
  Venting flange, water cooling
- Options:
  Air cooling, purge gas facility

Technical Data

TURBOVAC 1000 C

Inlet flange	**DN**	160 ISO-K • 160 CF	200 ISO-K • 200 CF	250 ISO-K
Pumping speed				
N_2	**l x s^{-1}**	850	1100	1150
He	**l x s^{-1}**	880	975	1000
H_2	**l x s^{-1}**	900	970	1000
Max. gas throughput				
N_2	**mbar · l x s^{-1}**	6.5	6.5	6.5
Compression ratio				
N_2		> 10^9	> 10^9	> 10^9
He		5 x 10^4	5 x· 10^4	5 x 10^4
H_2		2 x 10^3	2 x 10^3	2 x 10^3
Ultimate pressure	**mbar**	< 10^{-10}	< 10^{-10}	< 10^{-10}
	(Torr)	(< 0.75 x 10^{-10})	(< 0.75 x 10^{-10})	(< 0.75 x 10^{-10})
Run-up time	**min^{-1}**	36 000	36 000	36 000
Run-up time				
to 95% speed, approx.	**min**	9	9	9
Max. continuous inlet pressure [1)]	**mbar**	1 x 10^{-2}	1 x 10^{-2}	1 x 10^{-2}
(continuous)	**(Torr)**	(0.75 x 10^{-2})	(0.75 x 10^{-2})	(0.75 x 10^{-2})
Type of bearing		Hybrid ceramic ball bearings	Hybrid ceramic ball bearings	Hybrid ceramic ball bearings
Type of lubrication		Fett	Fett	Fett
Installation orientation		Any	Any	Any
Cooling		Water (air)	Water (air)	Water (air)
Weight, approx.	**kg (lbs)**	25 (55.1)	25 (55.1)	25 (55.1)
Recommended backing pump				
for standard operation	**TRIVAC**	D 25 B / D 40 B	D 25 B / D 40 B	D 25 B / D 40 B
for purge gas operation	**TRIVAC**	D 40 B / D 65 B	D 40 B / D 65 B	D 40 B / D 65 B

[1)] Water-cooled

Inlet flange	Foreline flange	Cooling method	Interface	
DN 160 ISO-K	DN 40 KF	Water-cooled	–	**Part No. 855 35**
DN 160 ISO-K	DN 63 ISO-K	Water-cooled	–	**Part No. 855 38**
DN 200 ISO-K	DN 40 KF	Water-cooled	–	**Part No. 153 00**
DN 160 CF	DN 40 KF	Water-cooled	–	**Part No. 854 91**
DN 200 CF	DN 40 KF	Water-cooled	–	**Part No. 117 64**
DN 250 ISO-K	DN 40 KF	Water-cooled	–	**Part No. 855 36**
DN 250 ISO-K	DN 63 ISO-K	Water-cooled	–	**Part No. 855 39**

Accessories, necessary for all pumps

Electronic frequency converter TURBO.DRIVE TD20 *classic*	
100 - 240 V AC (-15%/+10%)	
without interface	**Part No. 800075V0001**
with RS 232 C interface	**Part No. 800075V0002**
with RS 485 C interface	**Part No. 800075V0004**
with Profibus	**Part No. 800075V0003**
with 25 pol I/O	**Part No. 800075V0005**
with DeviceNet	**Part No. 800075V0006**
with Ethernet/IP	**Part No. 800075V0007**
Connecting cable TURBO.DRIVE TD20 *classic* - pump	
3 m (10.5 ft)	**Part No. 857 65**
5 m (17.5 ft)	**Part No. 857 66**
10 m (35.0 ft)	**Part No. 857 67**
20 m (70.0 ft)	**Part No. 857 68**
50 m (175.0 ft)	**Part No. 800152V0008**
60 m (210.0 ft)	**Part No. 800152V0007**

Accessories, optional

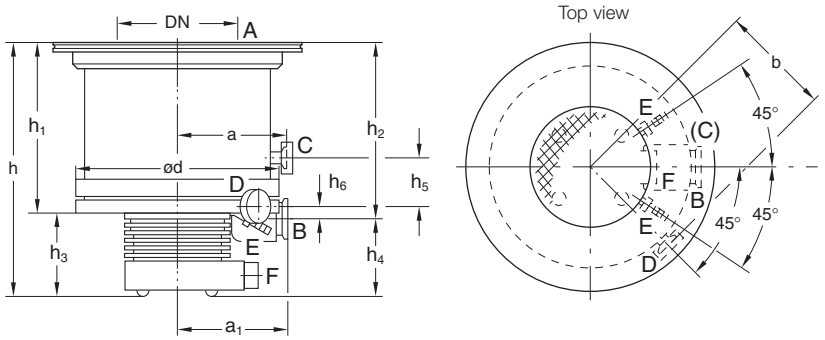
Air cooling unit	
230 V AC	**Part No. 855 41**
115 V AC	**Part No. 894 09**
100 V AC	**Part No. 800152V0017**
Purge / vent valve, DN 16 KF	
24 V DC; 0.6 mbar x l x s^{-1} = 36 sccm	**Part No. 121 33**

Notes

TURBOVAC 1100 C
ClassicLine

Typical Applications

- Data storage
- Flat panel displays
- Optical coating
- Large area coating
- R & D, e.g.
  - Fusion experiments
  - Space simulation
- Load locks and transfer chambers

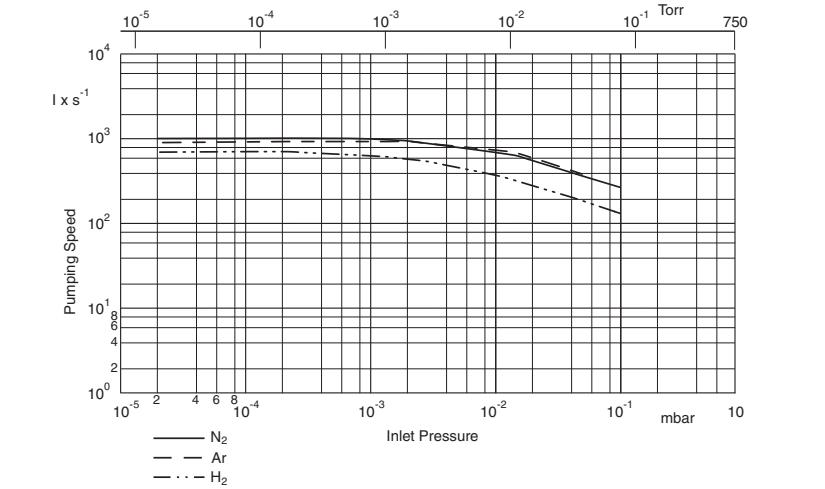


DN		h	h_1	h_2	h_3	h_4	h_5	h_6	a	a_1	b	d
160 ISO-K	mm	341	230	247	111	94	63	28.5	133	153	141	258
	in.	13.43	9.06	9.72	4.37	3.70	2.48	1.12	5.24	6.02	5.55	10.16
200 ISO-K	mm	325	214	231	111	94	63	28.5	133	153	141	258
	in.	12.80	8.43	9.09	4.37	3.70	2.48	1.12	5.24	6.02	5.55	10.16
250 ISO-K	mm	310	200	217	111	94	63	28.5	133	153	141	258
	in.	12.20	7.87	8.54	4.37	3.70	2.48	1.12	5.24	6.02	5.55	10.16

Dimensional drawing for the TURBOVAC 1100 C

Technical Features

- Robust rotor design
- Operation in any orientation
- Highest pumping speed and throughput
- Bearing temperature measurement through the TURBO.DRIVE TD20 *classic*
- Oil-free pump for generating clean high and ultrahigh vacuum conditions



Pumping speed as a function of the inlet pressure (TURBOVAC 1100 C with flange DN 250)

Advantages to the User

- Space-saving
- Easy to integrate into complex vacuum systems
- High productivity
- Low operating costs
- Highly reliable operation also in processes loaded with particles

Technical Data

TURBOVAC 1100 C

Inlet flange	**DN**	160 ISO-K	200 ISO-K	250 ISO-K
Pumping speed				
N_2	**l x s^{-1}**	710	830	1050
Ar	**l x s^{-1}**	–	760	980
He	**l x s^{-1}**	–	750	850
H_2	**l x s^{-1}**	–	600	630
Max. gas throughput				
N_2	**mbar x l x s^{-1}**	6.5	6.5	6.5
Ar	**mbar x l x s^{-1}**	6.5	6.5	6.5
Compression ratio				
N_2		1×10^5	1×10^5	1×10^5
Ar		1×10^5	1×10^5	1×10^5
H_2		1×10^4	1×10^4	1×10^4
Ultimate pressure	**mbar (Torr)**	$< 3 \times 10^{-10}$ ($< 2.2 \times 10^{-10}$)	$< 3 \times 10^{-10}$ ($< 2.2 \times 10^{-10}$)	$< 3 \times 10^{-10}$ ($< 2.2 \times 10^{-10}$)
Max. foreline pressure for N_2	**mbar (Torr)**	0.1 (0.075)	0.1 (0.075)	0.1 (0.075)
Recommended forevacuum pump		TRIVAC D 65 B / SCROLLVAC SC 15/30 D	TRIVAC D 65 B / SCROLLVAC SC 15/30 D	TRIVAC D 65 B / SCROLLVAC SC 15/30 D
Run-up time to 95% speed	**min**	9	9	9
Purge / vent port	**DN**	10 KF	10 KF	10 KF
Cooling water connection (hose nozzles)	**mm (in.)**	10 (0.39)	10 (0.39)	10 (0.39)
Weight, approx.	**kg (lbs)**	22 (48)	22 (48)	22 (48)
Supply voltage	**V AC**	42	42	42
Max. power consumption	**VA**	400	400	400

Ordering Information

TURBOVAC 1100 C

Inlet flange	Foreline flange	Cooling method	Interface	
DN 160 ISO-K	DN 63 ISO-K	Water-cooled	–	**Part No. 800150V0030**
DN 200 ISO-K	DN 63 ISO-K	Water-cooled	–	**Part No. 800150V0031**
DN 250 ISO-K	DN 63 ISO-K	Water-cooled	–	**Part No. 800150V0032**
Accessories, necessary for all pumps				
Electronic frequency converter TURBO.DRIVE TD20 *classic*				
100 - 240 V AC (-15%/+10%)				
without interface				**Part No. 800075V0001**
with RS 232 C interface				**Part No. 800075V0002**
with RS 485 C interface				**Part No. 800075V0004**
with Profibus				**Part No. 800075V0003**
with 25 pol I/O				**Part No. 800075V0005**
with DeviceNet				**Part No. 800075V0006**
with Ethernet/IP				**Part No. 800075V0007**
Connecting cable TURBO.DRIVE TD20 *classic* - pump				
3 m (10.5 ft)				**Part No. 857 65**
5 m (17.5 ft)				**Part No. 857 66**
10 m (35.0 ft)				**Part No. 857 67**
20 m (70.0 ft)				**Part No. 857 68**
50 m (175.0 ft)				**Part No. 800152V0008**
60 m (210.0 ft)				**Part No. 800152V0007**
Accessories, optional				
Purge / vent valve, DN 16 KF				
24 V DC; 0.6 mbar x l x s^{-1} = 36 sccm				**Part No. 121 33**

Note: The TURBO.GUARD 3 system is no longer available for these part numbers and is not supported by the TURBO.DRIVE TD20 classic.

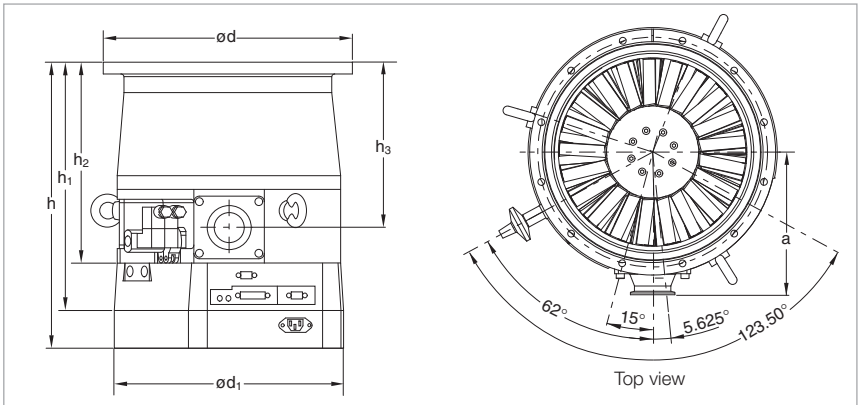
Note for the North and South American Continents: For special application we recommend the TURBOVAC 1000 C. Please contact your sale office

Notes

TURBOVAC T 1600 / T 1601

Typical Applications

- Data storage
- Flat panel displays
- Optical coating
- Large area coating
- R & D, e.g.
  - Fusion experiments
  - Space simulation

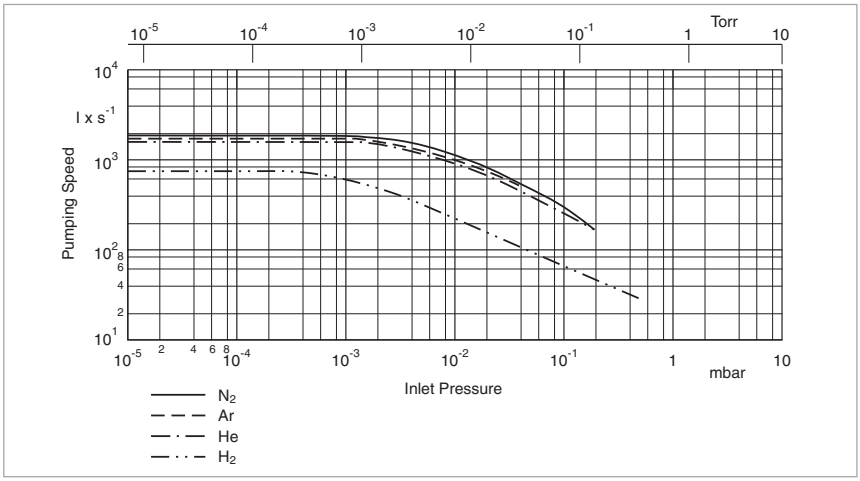


DN		a	d	d_1	h	h_1	h_2	h_3
200 ISO-F (T 1600)	mm	178	285	308	425	369	304	255
	in.	7.01	11.22	12.13	16.73	14.53	11.97	10.04
250 ISO-F (T 1600)	mm	178	335	308	398	342	277	228
	in.	7.01	13.19	12.13	15.67	13.86	10.91	8.98
250 ISO-F (T 1601)	mm	178	335	313	408	–	277	228
	in.	7.01	13.19	12.32	16.06	–	10.91	8.98
250 CF (T 1600)	mm	178	304	308	413	357	292	243
	in.	7.01	11.97	12.13	16.26	14.06	11.50	9.57

Dimensional drawing for the TURBOVAC T 1600

Technical Features

- Frequency converter and power supply integrated
- Robust rotor design
- Operation in any orientation
- Highest pumping speed and throughput
- Oil-free pump for generating clean high and ultrahigh vacuum conditions
- Purge gas and venting valve integrated
- For special outside influences (only T 1601)



Pumping speed as a function of the inlet pressure (TURBOVAC T 1600 with flange DN 250)

Advantages to the User

- Space-saving
- Easy to integrate into complex vacuum systems
- High productivity
- Low operating costs
- Highly reliable operation also in processes loaded with particles

Technical Data

TURBOVAC T 1600 / T 1601

Inlet flange	DN	200 ISO-F	250 ISO-F • 250 CF
Pumping speed			
N_2	l x s^{-1}	1100	1550
Ar	l x s^{-1}	960	1410
He	l x s^{-1}	1150	1300
H_2	l x s^{-1}	690	720
Max. gas throughput			
N_2	mbar x l x s^{-1}	30	30
Ar	mbar x l x s^{-1}	20	20
He	mbar x l x s^{-1}	30	30
H_2	mbar x l x s^{-1}	20	20
Compression ratio			
N_2		5×10^5	5×10^5
Ar		1×10^6	1×10^6
He		1×10^4	1×10^4
H_2		2×10^2	2×10^2
Ultimate pressure	mbar (Torr)	$< 3 \times 10^{-10}$ ($< 2.2 \times 10^{-10}$)	$< 3 \times 10^{-10}$ ($< 2.2 \times 10^{-10}$)
Max. foreline pressure for N_2	mbar (Torr)	0.5 (0.375)	0.5 (0.375)
Recommended forevacuum pump (alternatively)		TRIVAC D 65 B + RUVAC WA 501 TRIVAC D 65 B SCROLLVAC SC 15/30 D	TRIVAC D 65 B + RUVAC WA 501 TRIVAC D 65 B SCROLLVAC SC 15/30 D
Run-up time to 95% speed	min	< 10	< 10
Purge / vent port	DN	G 1/4"	G 1/4"
Cooling water connection		G 3/8"	G 3/8"
Weight, approx.	kg (lbs)	40 (88)	40 (88)
Supply voltage	V	100 - 240	100 - 240
Max. power consumption	VA	700	700

Ordering Information

TURBOVAC T 1600

Inlet flange	Foreline flange	Cooling method	Interface	
DN 200 ISO-F	DN 40 KF	Water-cooled	–	**Part No. 800040V1144**
DN 200 ISO-F	DN 40 KF	Water-cooled	Profibus	**Part No. 800040V2144**
DN 250 ISO-F	DN 40 KF	Water-cooled	–	**Part No. 800040V1444**
DN 250 ISO-F	DN 40 KF	Water-cooled	Profibus	**Part No. 800040V2444**
DN 250 ISO-F	DN 63 ISO-K	Water-cooled	–	**Part No. 800040V1544**
DN 250 CF	DN 40 KF	Water-cooled	–	**Part No. 800040V1844**
DN 250 CF	DN 40 KF	Water-cooled	Profibus	**Part No. 800040V2844**
Purge filter				**Part No. 200 18 515**
Accessories for RS 232 C and RS 485 C interfaces				**see chapter "Turbomolecular Pumps", para. "Accessories"**

Ordering Information

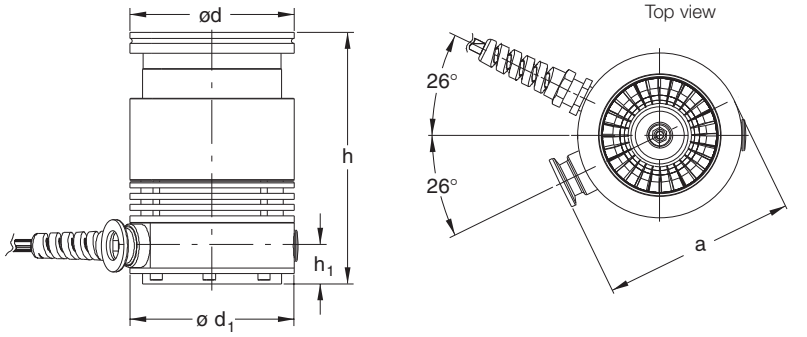
TURBOVAC T 1601

Inlet flange	Foreline flange	Cooling method	Interface	
DN 250 ISO-F	DN 40 KF	Water-cooled	Profibus	**Part No. 800040V4444**
Accessories for RS 232 C and RS 485 C interfaces				**see chapter "Turbomolecular Pumps", para. "Accessories"**

Mechanical Rotor Suspension with Compound Stage TURBOVAC TW 70 H

Typical Applications

- Mass spectrometers
- Electron beam microscopy
- Leak detectors
- R & D, e.g.
  - UHV systems
- Load locks and transfer chambers

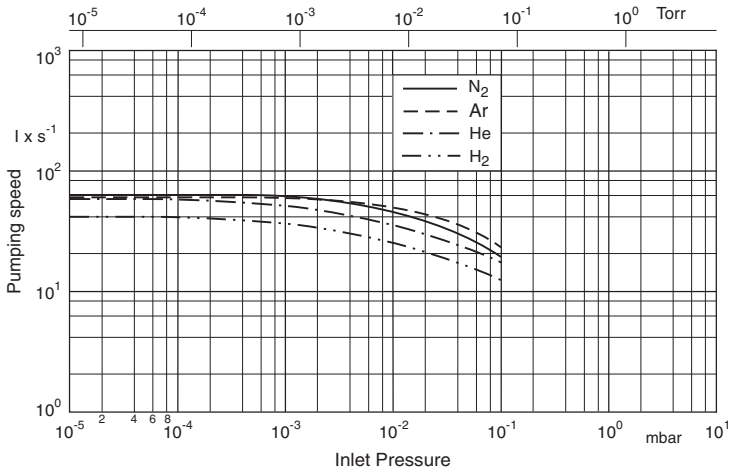


DN		a	h	h_1	d	d_1
63 ISO-K	mm	111	145	22	95	95
	in.	4.37	5.71	0.87	3.74	3.74
63 CF	mm	111	169	22	113.5	95
	in.	4.37	6.65	0.87	4.47	3.74

Dimensional drawing for the TURBOVAC TW 70 H

Technical Features

- Integrated or external frequency converter
- Compact design
- Operation in any orientation
- High foreline tolerance
- Oil-free pump for generating clean high and ultrahigh vacuum conditions



Pumping speed as a function of the inlet pressure

Advantages to the User

- Space-saving
- Easy to integrate into complex vacuum systems
- Allows the use of down-sized forevacuum pumps
- Low operating costs
- Highly reliable operation

Technical Data

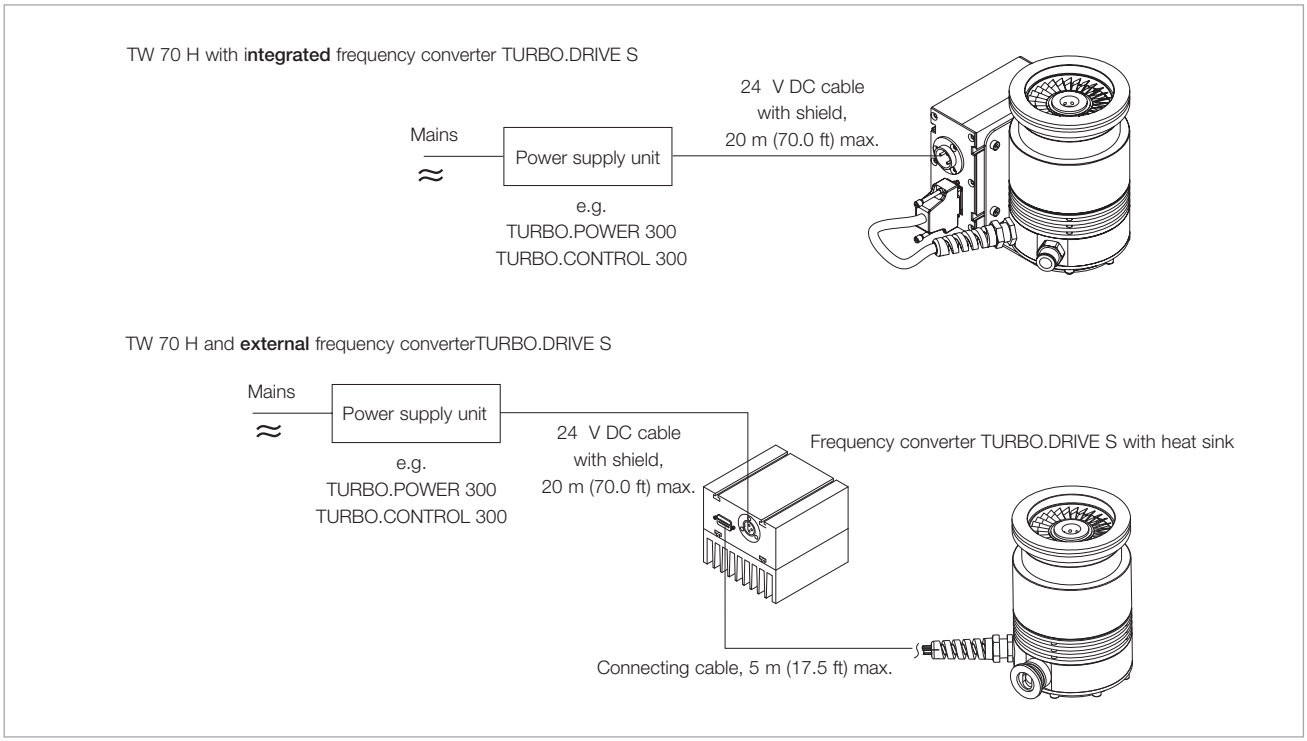
TURBOVAC TW 70 H

Inlet flange	**DN**	O-ring sealed 63 ISO-K	Metal sealed 63 CF
Pump housing		Aluminum	Stainless steel
Pumping speed at 10^{-5} / 10^{-3} mbar			
N_2	**l x s^{-1}**	60 / 56	60 / 56
Ar	**l x s^{-1}**	56 / 54	56 / 54
H_2	**l x s^{-1}**	40 / 38	40 / 38
He	**l x s^{-1}**	52 / 50	52 / 50
Max. gas throughput [1] at 10^{-1} mbar			
N_2	**mbar x l x s^{-1}**	1.9	1.9
Ar	**mbar x l x s^{-1}**	2.4	2.4
H_2	**mbar x l x s^{-1}**	1.3	1.3
He	**mbar x l x s^{-1}**	1.9	1.9
Max. compression when idle			
N_2		1×10^8 at 14 mbar	1×10^{10} at 10 mbar
Ar		1×10^7 at 14 mbar	
H_2		4×10^3 at 0.2 mbar	
He		2×10^5 at 2 mbar	
Ultimate pressure			
with two-stage oil-sealed rotary vane vacuum pump TRIVAC D 2,5 E	**mbar (Torr)**	$< 5 \times 10^{-8}$ ($< 3.75 \times 10^{-8}$)	$< 2 \times 10^{-10}$ ($< 1.5 \times 10^{-10}$)
with dry compressing scroll vacuum pump SCROLLVAC SC 5 D	**mbar (Torr)**		$< 1 \times 10^{-9}$ ($< 0.75 \times 10^{-9}$)
with diaphragm pump DIVAC 0.8 T	**mbar (Torr)**		$< 5 \times 10^{-9}$ ($< 3.75 \times 10^{-9}$)
Max. foreline pressure for N_2	**mbar (Torr)**	20 (15)	20 (15)
Recommended forevacuum pump			
two-stage oil-sealed rotary vane vacuum pump		TRIVAC D 2,5 E	TRIVAC D 2,5 E
diaphragm pump		DIVAC 0,8 T	DIVAC 0,8 T
oil-free scroll vacuum pump		SC 5 D	SC 5 D
Run-up time to 95% of nominal speed	**min**	1.5	1.5
Cooling water connection (option)		2 x G 1/8"	2 x G 1/8"
Weight, approx. with / without frequency converter	**kg (lbs)**	3.0 (6.62) / 2.3 (5.08)	3.0 (6.62) / 2.3 (5.08)
Supply voltage	**V DC**	24	24
Max. power consumption			
Run up / ultimate pressure	**W**	150 / 30	150 / 30

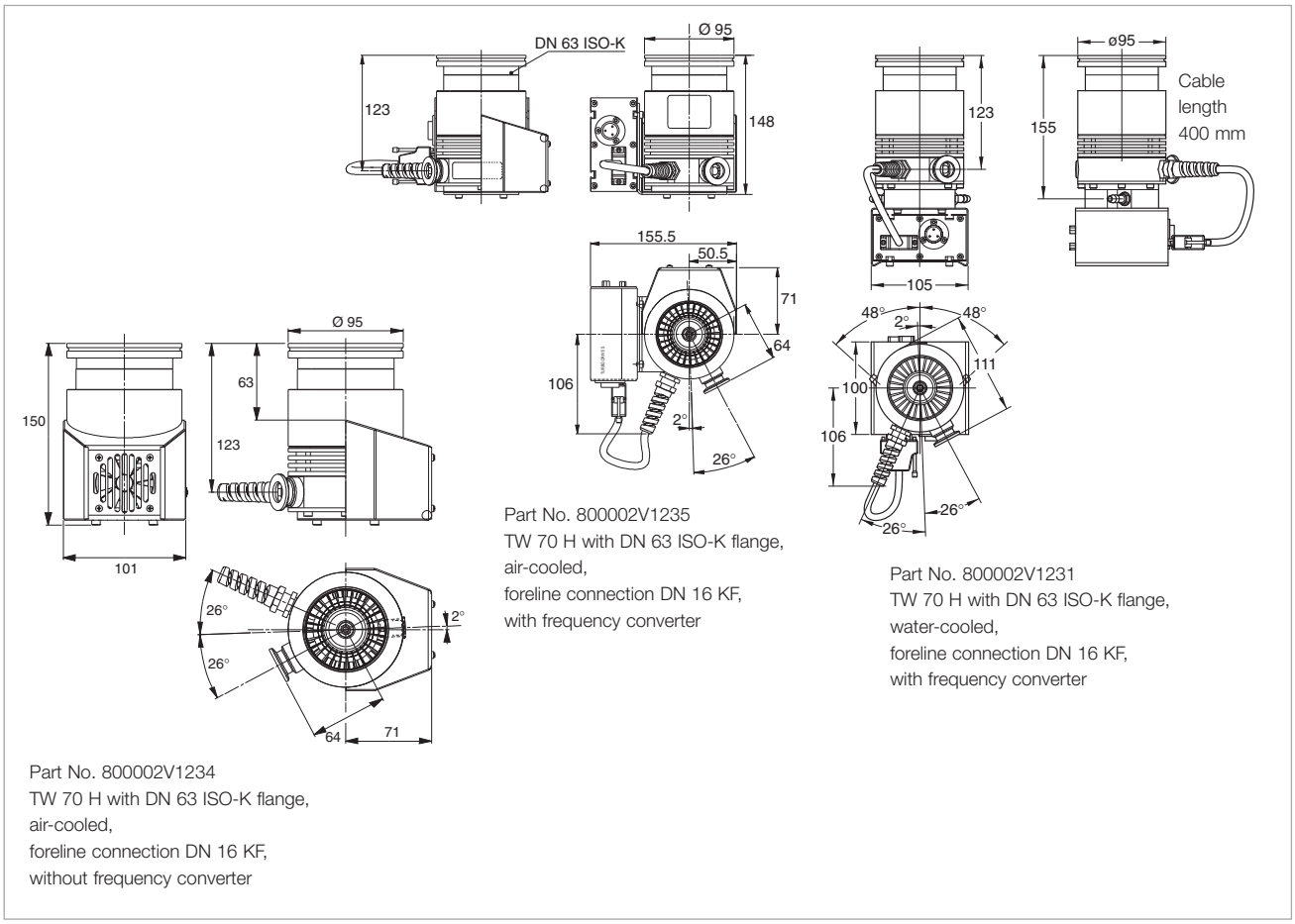
[1] for continuous operation when water-cooled

TW 70 H with integrated frequency converter TURBO.DRIVE S				
Inlet flange	Foreline flange	Cooling method	Interface	
DN 63 ISO-K	DN 16 KF	Air-cooled	RS 485 C	**Part No. 800002V1235**
DN 63 ISO-K	DN 16 KF	Air-cooled	RS 232 C	**Part No. 800002V1236**
DN 63 ISO-K	DN 16 KF	Water-cooled	RS 485 C	**Part No. 800002V1435**
DN 63 ISO-K	Camozzi coupling [1]	Air-cooled	RS 485 C	**Part No. 800002V1215**
DN 63 ISO-K	Camozzi coupling [1]	Water-cooled	RS 485 C	**Part No. 800002V1415**
DN 63 CF	DN 16 KF	Air-cooled	RS 232 C	**Part No. 800002V2236**
DN 63 CF	DN 16 KF	Water-cooled	RS 485 C	**Part No. 800002V2435**
TW 70 H without frequency converter TURBO.DRIVE S				
Inlet flange	Foreline flange	Cooling method	Interface	
DN 63 ISO-K	DN 16 KF	Convection	–	**Part No. 800002V1934**
DN 63 ISO-K	DN 16 KF	Air-cooled	–	**Part No. 800002V1234**
DN 63 ISO-K	Camozzi coupling [1]	Convection	–	**Part No. 800002V1914**
DN 63 CF	DN 16 KF	Convection	–	**Part No. 800002V2934**
For operation, one frequency converter TURBO.DRIVE S is necessary				
Electronic frequency converter TURBO.DRIVE S with heat sink				
RS 485 C interface				**Part No. 800070V0006**
RS 232 C interface				**Part No. 800070V0005**
Connecting cable (TURBO.DRIVE S - pump)				
1 m (3.5 ft)				**Part No. 152 47**
3 m (10.5 ft)				**Part No. 864 40**
5 m (17.5 ft)				**Part No. 864 50**
Accessories, necessary for all pumps				
START/STOP switch for manual operation of the turbomolecular pump				**Part No. 152 48**
Power supplies				see chapter
TURBO.POWER 300				"Turbomolecular Pumps
TURBO.CONTROL 300				with Mechanical Rotor Suspension",
				para. "Electronic Frequency Converters"
Accessories, optional				
Water cooling unit with 2 x G 1/8" connection				
including 2 hose nozzles G 1/8", OD 8 mm for water hose,				
2 gaskets (copper) 10 x 14 x 1				**Part No. 800135V0001**
Air cooling unit (uses V DC from pump connection)				**Part No. 800136V0001**
Flange heater 63 CF				
230 V, 50 Hz				**Part No. 854 04**
110 V, 60 Hz				**Part No. 854 07**
Splinter guard				
DN 63 ISO-K (course)				**Part No. 200 17 170**
DN 63 CF (course)				**Part No. 200 17 171**
DN 63 CF (fine)				**Part No. 887 20**
Vibration absorber				
DN 63 ISO-K				**Part No. 800131V0063**
DN 63 CF				**Part No. 500 070**
Accessories for serial interfaces RS 232 C and RS 485 C				see chapter "Turbomolecular Pumps", para. "Accessories"

[1] Quick coupling for plastic vacuum hoses with an OD of 10 mm. We recommend polyamide hoses



The modular concept



Part No. 800002V1235
TW 70 H with DN 63 ISO-K flange,
air-cooled,
foreline connection DN 16 KF,
with frequency converter

Part No. 800002V1231
TW 70 H with DN 63 ISO-K flange,
water-cooled,
foreline connection DN 16 KF,
with frequency converter

Part No. 800002V1234
TW 70 H with DN 63 ISO-K flange,
air-cooled,
foreline connection DN 16 KF,
without frequency converter

Selected dimensional drawings for the TURBOVAC TW 70 H versions

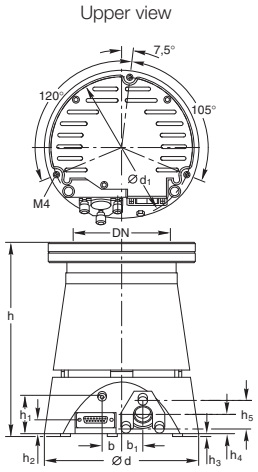
TURBOVAC TW 250 S

Typical Applications

- Analytical instruments
- Coating
- R & D

		b	b_1	d	d_1	h
DN 100 ISO-K	mm	20	22	160	146.6	175
	in.	0.79	0.87	6.29	5.77	6.89
DN 100 CF	mm	20	22	160	146.6	175
	in.	0.79	0.87	6.29	5.77	6.89

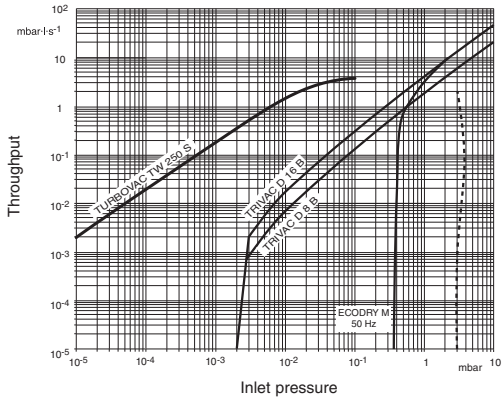
		h_1	h_2	h_3	h_4	h_5
DN 100 ISO-K	mm	37	14	4	20	40
	in.	1.46	0.55	0.16	0.79	1.57
DN 100 CF	mm	37	14	4	20	40
	in.	1.46	0.55	0.16	0.79	1.57



Dimensional drawing for the TURBOVAC TW 250 S without frequency converter

Technical Features

- Integrated or external frequency converter
- Compact design
- Efficient air-cooling system integrated



Operation diagram for nitrogen for TURBOVAC TW 250 S

Advantages to the User

- Highest pumping speed and throughput for N_2 and Ar
- Highest reliability in operation

Technical Data

TURBOVAC TW 250 S

Inlet flange	DN	100 ISO-K / 100 CF
Pumping speed at 10^{-5} mbar		
N_2	l x s^{-1}	230
Ar	l x s^{-1}	210
H_2	l x s^{-1}	80
He	l x s^{-1}	150
Max. gas throughput, max.		
N_2		3.7 mbar x l x s^{-1} at 10^{-1} mbar
Ar		1.6 mbar x l x s^{-1} at 10^{-2} mbar
H_2		1.1 mbar x l x s^{-1} at 10^{-1} mbar
He		2.4 mbar x l x s^{-1} at 10^{-1} mbar
Compression ratio		
N_2		3.0×10^7 at 3 mbar
Ar		1.0×10^7 at 6 mbar
H_2		5.0×10^2 at 0.2 mbar
He		3.2×10^3 at 0.7 mbar
Ultimate pressure with two-stage oil-sealed rotary vane pump	mbar (Torr)	< 2×10^{-8} (< 1.5×10^{-2})
Max. permissible backing pressure for N_2	mbar (Torr)	3 (2.25)
Operating speed	min^{-1} (rpm)	51.600
Run-up time, approx.	min	3
Forevacuum connection		DN 16 KF
Venting connection		Thread M 5
Weight		
without frequency converter	kg (lbs)	5.0 (11.0)
with frequency converter	kg (lbs)	5.8 (12.6)
Recommended forevacuum pumps		
TRIVAC		D 2.5 E
Diaphragm pump		
with an ultimate pressure < 3 mbar and a pumping speed at 3 mbar		upon request
TRIVAC (at purge gas operation)		D 8 B

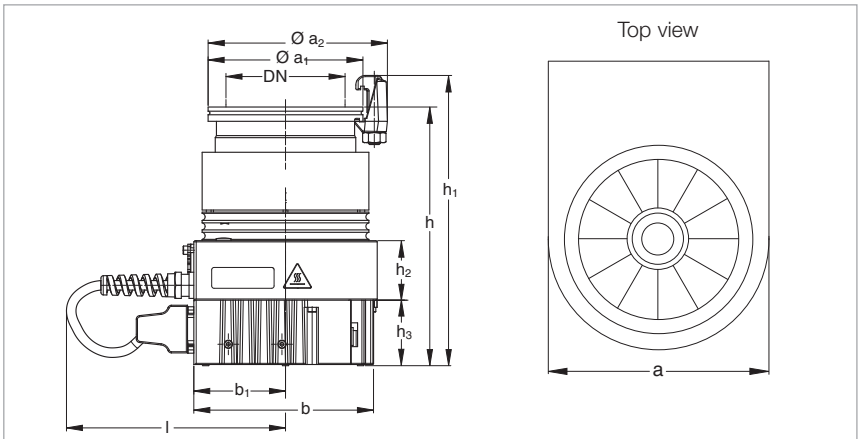
TURBOVAC TW 250 S with integrated frequency converter TDS				
Inlet flange	Cooling method	Splinter guard	Frequency converter	
DN 100 ISO-K	Water-cooled	–	TDS / PB	**Part No. 114 37**
DN 100 ISO-K	Water-cooled	Course	TDS / PB	**Part No. 800150V0016**
DN 100 ISO-K	Air-cooled	Course	TDS / PB	**Part No. 800150V0009**
DN 100 ISO-K	Air-cooled	–	TDS / RS 232 C	**Part No. 800150V0011**
DN 100 ISO-K	Air-cooled	–	TDS / RS 485 C	**Part No. 800150V0013**
DN 100 CF	Air-cooled	–	TDS / RS 232 C	**Part No. 800150V0012**
DN 100 CF	Air-cooled	–	TDS / RS 485 C	**Part No. 800150V0014**
TURBOVAC TW 250 S without integrated frequency converter TDS				
Inlet flange	Cooling method	Splinter guard	Frequency converter	
DN 100 ISO-K	Air-cooled	Course	–	**Part No. 113 52**
DN 100 ISO-K	Air-cooled	Course	–	**Part No. 800150V0007**
For operation, one frequency converter TDS is necessary				
Electronic frequency converter TDS without heat sink				
with RS 485 C interface				**Part No. 800070V0003**
with RS 232 C interface				**Part No. 800070V0002**
Connecting cable TDS – pump				
1 m (3.5 ft)				**Part No. 152 47**
Power supplies				see chapter
TURBO.POWER 300				“Turbomolecular Pumps
TURBO.CONTROL 300				with Mechanical Rotor Suspension”,
				para. “Electronic Frequency Converters”
Accessories, necessary for all pumps				
Venting valve mounting kit				**Part No. 863 20**
Power failure venting valve				
220/240 V AC				**Part No. 280 71**
24 V AC				**Part No. 280 85**
Venting valve				
220/240 V AC				**Part No. 280 70**
110/120 V AC				**Part No. 280 72**
24 V AC				**Part No. 280 73**
24 V DC				**Part No. 280 74**
Accessories, optional				
Water cooling unit with 2x G 1/8" connection				**Part No. 800135V0002**
including 2 hose nozzles G 1/8", OD 10 mm for water hose,				
4 gaskets, 2 blank-off plugs				
Air cooling unit (uses V DC from pump connection)				**Part No. 800 000 249**
Flange heater				
100 CF, 230 V, 50 Hz				**Part No. 854 27**
100 CF, 110 V, 60 Hz				**Part No. 854 28**
Splinter guard				
DN 100 ISO-K/CF				
coarse (3.2 x 3.2 mm (0.13 x 0.13 in.))				**Part No. 800132V0101**
fine (1.6 x 1.6 mm (0.06 x 0.06 in.))				**Part No. 800132V0102**
DN 160 ISO-K				**Part No. 200 00 307**
DN 160 CF				**Part No. 200 17 247**
Vibration absorber				
DN 100 ISO-K				**Part No. 800131V0100**
DN 100 CF				**Part No. 500 071**
DN 160 ISO-K				**Part No. 500 073**
DN 160 CF				**Part No. 500 072**
Accessories for serial interfaces RS 232 C and RS 485 C				see chapter “Turbomolecular Pumps”, para. “Accessories”

Notes

TURBOVAC TW 290 H

Typical Applications

- Mass spectrometers
- R & D, e.g.
  - UHV systems
  - Particle accelerators
- Load locks and transfer chambers

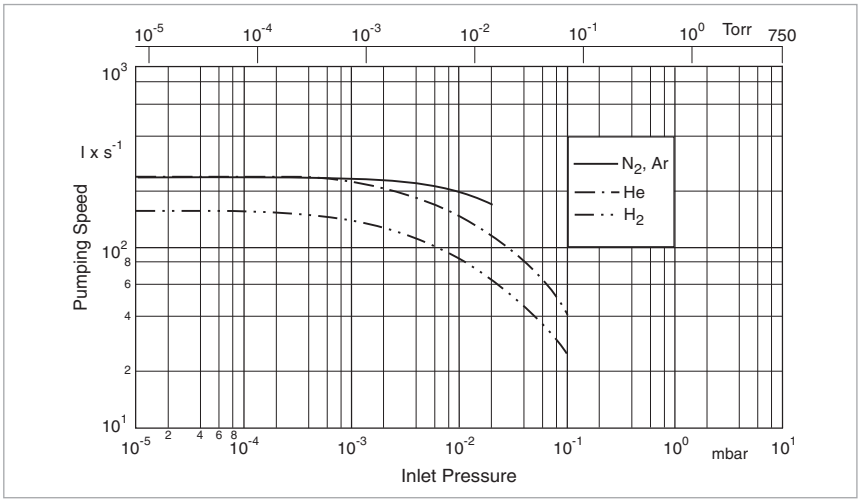


DN		a	a_1	a_2	h	h_1	h_2	h_3	b	b_1	l
100 ISO-K	mm	160	130	171	217	243	50	55	154	77	186
	in.	6.30	5.12	6.73	8.54	9.57	1.97	2.17	6.06	3.03	7.32
100 CF	mm	160	151.5	–	219.4	–	50	55	154	77	186
	in.	6.30	5.96	–	8.64	–	1.97	2.17	6.06	3.03	7.32

Dimensional drawing for the TURBOVAC TW 290 H

Technical Features

- Integrated frequency converter
- Compact design
- Operation in any orientation
- High pumping speed and compression for light gases
- Highly effective air-cooling unit
- Oil-free pump for generating clean high and ultrahigh vacuum conditions



Pumping speed as a function of the inlet pressure

Advantages to the User

- Space-saving
- Easy to integrate into complex vacuum systems
- High foreline tolerance allows the use of down-sized forevacuum pumps
- Low operating costs

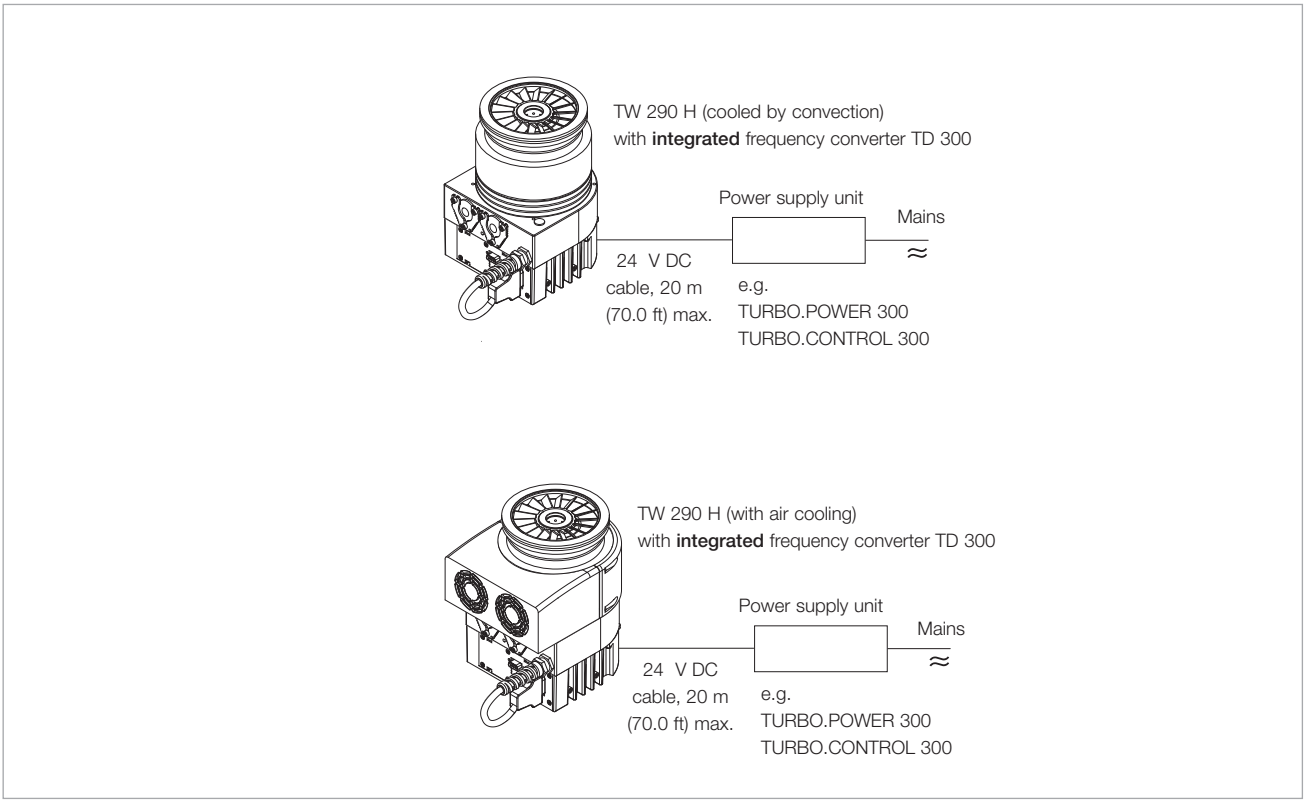
Technical Data

TURBOVAC TW 290 H

Inlet flange	DN	O-ring sealed 100 ISO-K	Metal sealed 100 CF
Pump housing		Aluminum	Stainless steel
Pumping speed at 10^{-5} / 10^{-3} mbar			
N_2	l x s^{-1}	240 / 240	240 / 240
Ar	l x s^{-1}	240 / 240	240 / 240
H_2	l x s^{-1}	160 / 140	160 / 140
He	l x s^{-1}	240 / 230	240 / 230
Ultimate pressure (for CF pumps)			
with two-stage oil-sealed rotary vane vacuum pump TRIVAC D 2,5 E	mbar (Torr)	< 1 x 10^{-8} (< 0.75 x 10^{-8})	< 1 x 10^{-10} (< 0.75 x 10^{-10})
with dry compressing scroll vacuum pump SCROLLVAC SC 15 D	mbar (Torr)		< 1 x 10^{-9} (< 0.75 x 10^{-9})
with diaphragm pump DIVAC 2.5 VT	mbar (Torr)		< 1 x 10^{-9} (< 0.75 x 10^{-9})
Max. foreline pressure for N_2 [1]	mbar (Torr)	< 6	< 6
Recommended forevacuum pump			
two-stage oil-sealed rotary vane vacuum pump dry compressing scroll vacuum pump		TRIVAC D 2,5 E SCROLLVAC SC 15 D	TRIVAC D 2,5 E SCROLLVAC SC 15 D
Run-up time to 95% of nominal speed	min	4	4
Purge / vent port	DN	16 KF	16 KF
Cooling water connection (option)		2x G 1/8"	2x G 1/8"
Weight, approx. with / without frequency converter	kg (lbs)	6.8 (15.0) / 6.0 (13.2)	6.8 (15.0) / 6.0 (13.2)
Supply voltage	V DC	24	24
Max. power consumption			
Run up / ultimate pressure	W	150 / 30	150 / 30

[1] water-cooled

TW 290 H with integrated frequency converter TD 300				
Inlet flange	Foreline flange	Cooling method	Interface	
DN 100 ISO-K	DN 16 KF	Convection	RS 485 C	**Part No. 800170V3003**
DN 100 CF	DN 16 KF	Convection	RS 485 C	**Part No. 800170V3004**
TW 290 H without frequency converter TD 300				
Inlet flange	Foreline flange	Cooling method	Interface	
DN 100 ISO-K	DN 16 KF	Convection	–	**Part No. 800170V3001**
DN 100 CF	DN 16 KF	Convection	–	**Part No. 800170V3002**
Accessories, necessary for all pumps				
START/STOP switch for manual operation of the turbomolecular pump				**Part No. 152 48**
Power supplies TURBO.POWER 300 TURBO.CONTROL 300				**see chapter "Turbo-molecular Pumps with Mechanical Rotor Suspension", para. "Electronic Frequency Converters"**
Accessories, optional				
Water cooling unit with G 1/8" connection including 2 hose nozzles G 1/8", OD 10 mm for water hose, 4 gaskets, 2 blank-off plugs				**Part No. 800135V0002**
Air cooling unit (uses V DC from pump connection)				**Part No. 800 000 249**
Flange heater 100 CF, 230 V, 50 Hz 100 CF, 110 V, 60 Hz				**Part No. 854 27** **Part No. 854 28**
Splinter guard DN 100 ISO-K/CF coarse (3.2 x 3.2 mm (0.13 x 0.13 in.)) fine (1.6 x 1.6 mm (0.06 x 0.06 in.))				**Part No. 800132V0101** **Part No. 800132V0102**
Vibration absorber DN 100 ISO-K DN 100 CF				**Part No. 800131V0100** **Part No. 500 071**
Accessories for serial interfaces RS 232 C and RS 485 C				**see chapter "Turbomolecular Pumps", para. "Accessories"**

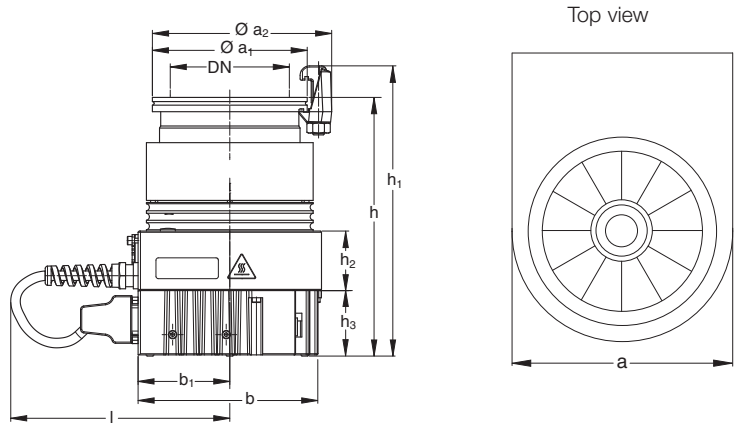


The modular concept

TURBOVAC TW 300

Typical Applications

- Mass spectrometers
- Production of thin films
- CD and DVD coating
- R & D, e.g.
  - UHV systems
  - Particle accelerators
- Load locks and transfer chambers

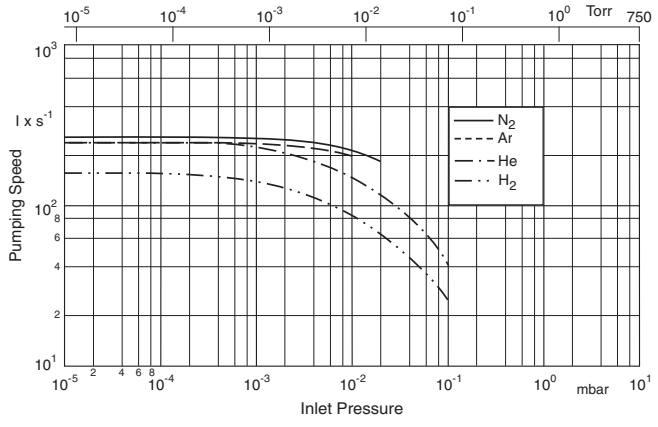


DN		a	a_1	a_2	h	h_1	h_2	h_3	b	b_1	l
100 ISO-K	mm	160	130	171	217	243	50	55	154	77	186
	in.	6.30	5.12	6.73	8.54	9.57	1.97	2.17	6.06	3.03	7.32
160 ISO-K	mm	160	180	202	221	247.5	50	55	154	77	186
	in.	6.30	7.09	7.95	8.70	9.74	1.97	2.17	6.06	3.03	7.32
100 CF	mm	160	151.5	–	219.4	–	50	55	154	77	186
	in.	6.30	5.96	–	8.64	–	1.97	2.17	6.06	3.03	7.32

Dimensional drawing for the TURBOVAC TW 300

Technical Features

- Integrated or external frequency converter
- Compact design
- Operation in any orientation
- Highest pumping speed for Nitrogen and Argon
- Highly effective air-cooling unit
- Oil-free pump for generating clean high and ultrahigh vacuum conditions



Pumping speed as a function of the inlet pressure

Advantages to the User

- Space-saving
- Easy to integrate into complex vacuum systems
- High foreline tolerance allows the use of down-sized forevacuum pumps
- High productivity
- Low operating costs

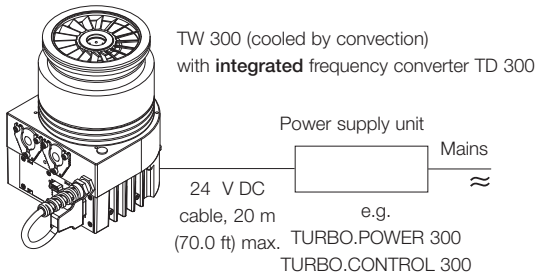
Technical Data

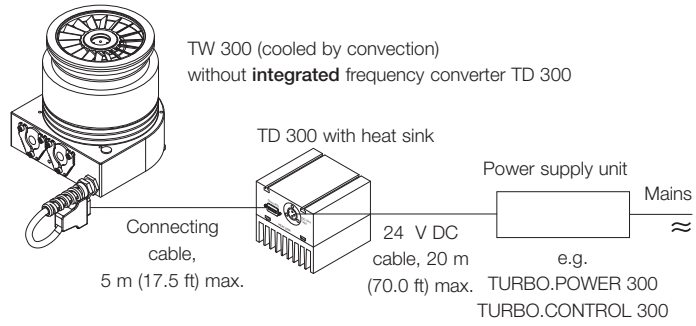
TURBOVAC TW 300

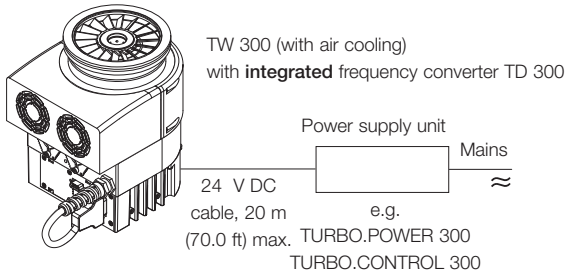
Inlet flange	**DN**	O-ring sealed 100 ISO-K	O-ring sealed 160 ISO-K	Metal sealed 100 CF
Pump housing		Aluminum	Aluminum	Stainless steel
Pumping speed [1] at 10^{-5} / 10^{-3} mbar				
N_2	**l x s^{-1}**	240 / 240	240 / 240	240 / 240
Ar	**l x s^{-1}**	230 / 230	230 / 230	230 / 230
H_2	**l x s^{-1}**	140 / 125	140 / 125	140 / 125
He	**l x s^{-1}**	230 / 220	230 / 220	230 / 220
Ultimate pressure (for CF pumps)				
with two-stage oil-sealed rotary vane vacuum pump TRIVAC D 2,5 E	**mbar (Torr)**	< 2 x 10^{-8} (< 1.5 x 10^{-8})	< 2 x 10^{-8} (< 1.5 x 10^{-8})	< 2 x 10^{-10} (< 1.5 x 10^{-10})
with dry compressing scroll vacuum pump SCROLLVAC SC 15 D	**mbar (Torr)**			< 1 x 10^{-9} (< 0.75 x 10^{-9})
with diaphragm pump DIVAC 2.5 VT	**mbar (Torr)**			< 4 x 10^{-9} (< 3 x 10^{-9})
Max. foreline pressure for N_2	**mbar (Torr)**	< 10 (water-cooled)	< 10 (water-cooled)	< 5 (air-cooled)
Recommended forevacuum pump two-stage oil-sealed rotary vane vacuum pump dry compressing scroll vacuum pump		TRIVAC D 2,5 E SCROLLVAC SC 15 D	TRIVAC D 2,5 E SCROLLVAC SC 15 D	TRIVAC D 2,5 E SCROLLVAC SC 15 D
Run-up time to 95% of nominal speed	**min**	4	4	4
Purge / vent port	**DN**	16 KF	16 KF	16 KF
Cooling water connection (option)		2x G 1/8"	2x G 1/8"	2x G 1/8"
Weight, approx. with / without frequency converter	**kg (lbs)**	6.8 (15.0) / 6.0 (13.2)	6.8 (15.0) / 6.0 (13.2)	6.8 (15.0) / 6.0 (13.2)
Supply voltage	**V DC**	24	24	24
Max. power consumption Run up / ultimate pressure	**W**	150 / 30	150 / 30	150 / 30

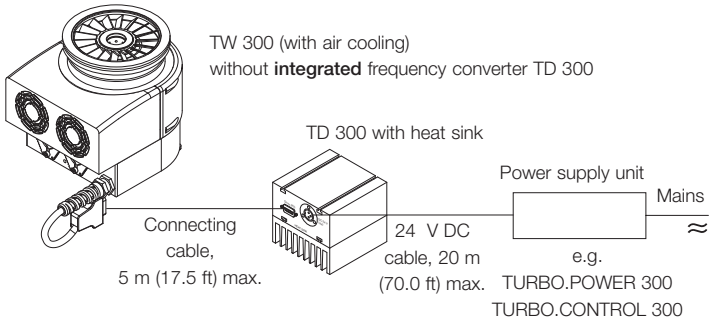
[1] for continuous operation when water-cooled

TW 300 with integrated frequency converter TD 300				
Inlet flange DN 100 ISO-K	Foreline flange DN 16 KF	Cooling method Water-cooled	Interface RS 232/422 C	**Part No. 800170V2106**
TW 300 without frequency converter TD 300				
Inlet flange DN 100 ISO-K DN 100 ISO-K	Foreline flange DN 16 KF DN 16 KF	Cooling method Convection Air-cooled	Interface – –	**Part No. 800170V2101** **Part No. 800011V0003**
For operation, one frequency converter TD 300 is necessary Electronic frequency converter TD 300 without heat sink with Profibus with RS 485 C interface with RS 232/422 C interface				**Part No. 800072V0004** **Part No. 800072V0003** **Part No. 800072V0001**
Connecting cable TD 300 – pump 1 m (3.5 ft) 3 m (10.5 ft) 5 m (17.5 ft)				**Part No. 152 47** **Part No. 864 40** **Part No. 864 50**
Accessories, necessary for all pumps				
START/STOP switch for manual operation of the turbomolecular pump				**Part No. 152 48**
Power supplies TURBO.POWER 300 TURBO.CONTROL 300				see chapter “Turbomolecular Pumps with Mechanical Rotor Suspension”, para. “Electronic Frequency Converters”
Accessories, optional				
Water cooling unit with 2x G 1/8" connection including 2 hose nozzles G 1/8", OD 10 mm for water hose, 4 gaskets, 2 blank-off plugs				**Part No. 800135V0002**
Air cooling unit (uses V DC from pump connection)				**Part No. 800 000 249**
Flange heater 100 CF, 230 V, 50 Hz 100 CF, 110 V, 60 Hz				**Part No. 854 27** **Part No. 854 28**
Splinter guard DN 100 ISO-K/CF coarse (3.2 x 3.2 mm (0.13 x 0.13 in.)) fine (1.6 x 1.6 mm (0.06 x 0.06 in.)) DN 160 ISO-K DN 160 CF				**Part No. 800132V0101** **Part No. 800132V0102** **Part No. 200 00 307** **Part No. 200 17 247**
Vibration absorber DN 100 ISO-K DN 100 CF DN 160 ISO-K DN 160 CF				**Part No. 800131V0100** **Part No. 500 071** **Part No. 500 073** **Part No. 500 072**
Accessories for serial interfaces RS 232 C and RS 485 C				see chapter “Turbomolecular Pumps”, para. “Accessories”







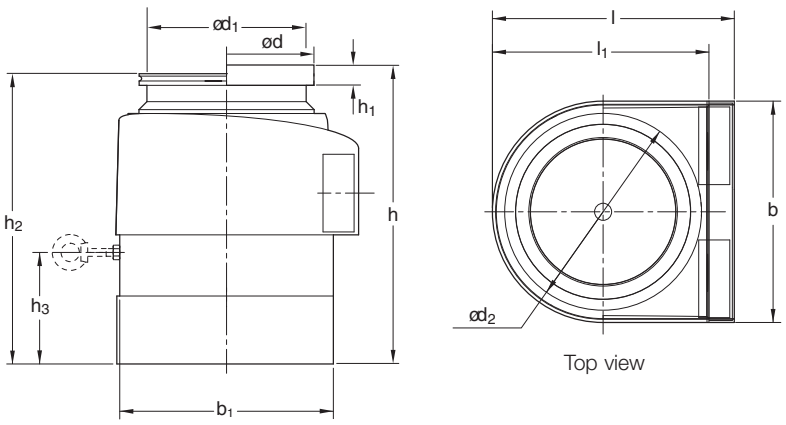


The modular concept

TURBOVAC TW 701

Typical Applications

- Mass spectrometers
- Data storage
- Flat panel displays
- R & D, e.g.
  - UHV systems
  - Particle accelerators
- Load locks and transfer chambers

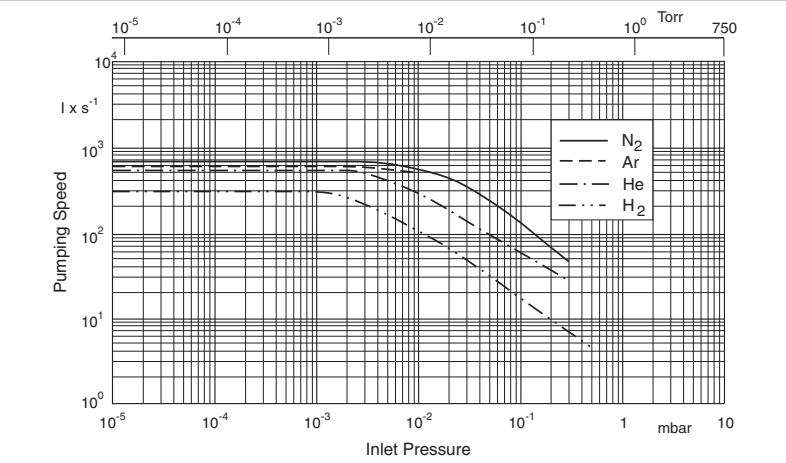


		b	b_1	d	d_1	d_2	h	h_1	h_2	h_3	l	l_1
DN160 ISO-K	mm	228	219	180	150	180	–	–	285	115	264	223
	in.	8.98	8.82	7.09	5.91	7.09	–	–	11.22	4.53	10.39	8.78
DN 160 CF	mm	228	219	–	150	180	295	12	–	115	264	223
	in.	8.98	8.82	–	5.91	7.09	11.61	0.47	–	4.53	10.39	8.78

Dimensional drawing for the TURBOVAC TW 701

Technical Features

- Integrated frequency converter
- Operation in any orientation
- Highest pumping speed and throughput für Nitrogen und Argon
- High foreline tolerance allows the use of down-sized forevacuum pumps
- Highly effective air-cooling unit
- Oil-free pump for generating clean high and ultrahigh vacuum conditions



Pumping speed as a function of the inlet pressure

Advantages to the User

- Space-saving
- Easy to integrate into complex vacuum systems
- High productivity
- Low operating costs
- Highly reliable operation

Technical Data

TURBOVAC TW 701

Inlet flange	**DN**	160 ISO-K	160 CF
Pumping speed			
N_2	**l x s^{-1}**	680	680
Ar	**l x s^{-1}**	600	600
He	**l x s^{-1}**	530	530
H_2	**l x s^{-1}**	330	330
Max. gas throughput			
N_2	**mbar x l x s^{-1}**	12	12
Ar	**mbar x l x s^{-1}**	5 (water-cooled)	5 (water-cooled)
He	**mbar x l x s^{-1}**	7	7
H_2	**mbar x l x s^{-1}**	2.5	2.5
Compression ratio			
N_2		8×10^8	8×10^8
Ar		1×10^8	1×10^8
He		1×10^6	1×10^6
H_2		2×10^4	2×10^4
Ultimate pressure	**mbar (Torr)**	$< 5.0 \times 10^{-9}$ ($< 3.75 \times 10^{-9}$)	$< 1.5 \times 10^{-10}$ ($< 1.1 \times 10^{-10}$)
Max. foreline pressure for N_2	**mbar (Torr)**	14 (10.5)	14 (10.5)
Recommended forevacuum pump		TRIVAC D 65 B SCROLLVAC SC 30 D	TRIVAC D 65 B SCROLLVAC SC 30 D
Run-up time to 95% speed	**min**	≈ 5	≈ 5
Purge port	**DN**	16 KF	16 KF
Cooling water connection		2x G 1/8" (internal threads)	2x G 1/8" (internal threads)
Weight, approx.	**kg (lbs)**	19 (42)	19 (42)
Supply voltage, nominal	**V DC**	59	59
Max. power consumption	**W**	500	500

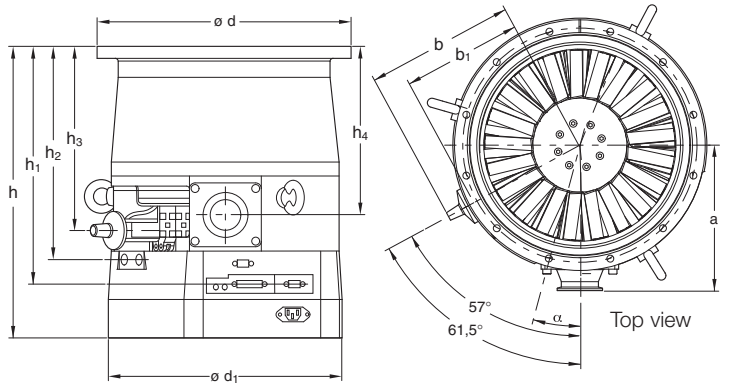
TW 701 with integrated frequency converter				
Inlet flange	Foreline flange	Cooling method	Interface	
DN 160 ISO-K	DN 25 KF	Air-cooled	RS 232 C	**Part No. 800051V0121**
DN 160 ISO-K	DN 25 KF	Water-cooled	RS 232 C	**Part No. 800051V0025**
DN 160 ISO-K	DN 25 KF	Air-cooled	RS 485 C	**Part No. 800051V0024**
DN 160 ISO-K	DN 25 KF	Water-cooled	RS 485 C	**Part No. 800051V0023**
DN 160 ISO-K	DN 25 KF	Water-cooled	Profibus	**Part No. 800051V0122**
DN 160 CF	DN 25 KF	Air-cooled	RS 485 C	**Part No. 800051V0027**
DN 160 CF	DN 25 KF	Water-cooled	RS 485 C	**Part No. 800051V0026**
DN 200 CF (incl. splinter guard)	DN 25 KF	Water-cooled	RS 232 C	**Part No. 800051V0022**
Power supply unit TURBO.CONTROL 700				see chapter "Turbomolecular Pumps with Mechanical Rotor Suspension", para. "Electronic Frequency Converters"
Accessories, optional				
Splinter guard				
DN 160 ISO-K				**Part No. 200 00 307**
DN 160 CF				**Part No. 200 17 247**
Flange heater 160 CF				
230 V AC				**Part No. 854 37**
110 V AC				**Part No. 854 38**
Vibration absorber				
DN 160 ISO-K				**Part No. 500 073**
DN 160 CF				**Part No. 500 072**
OEM power supply, 59 V DC				**Part No. 864 45**
59 V DC cable				
3 m (10.5 ft)				**Part No. 200 12 729**
5 m (17.5 ft)				**Part No. 200 12 730**
10 m (35.0 ft)				**Part No. 200 12 731**
20 m (70.0 ft)				**Part No. 200 15 064**
Plug with integrated START/STOP switch				**Part No. 152 48**
Purge gas and venting valve, 24 V DC; 0.6 mbar x l x s^{-1} = 36 sccm (purge gas pressure, abs.; 1.5 to 6 bar)				**Part No. 121 33**
Accessories for serial interfaces RS 232 C and RS 485 C				see chapter "Turbomolecular Pumps", para. "Accessories"
Accessories, for the water connection				
Adaptor G (BPS) 1/8" – G (BPS) 1/4" pipe				**Part No. 200 91 671 (2x required)**
Gasket				**Part No. 224 01 207 (2x required)**
Adaptor G (BPS) 1/8" – 10 mm (0.39 in.) hose nozzle				**Part No. 200 18 366 (2x required)**
Gasket				**Part No. 230 02 106 (2x required)**
Adaptor G (BPS) 1/8" – NPT 1/8"				**Part No. 200 12 742 (2x required)**
Gasket				**Part No. 238 20 110 (2x required)**

Notes

TURBOVAC TW 1600

Typical Applications

- Data storage
- Flat panel displays
- Optical coating
- Large area coating
- R & D, e.g.
  - Fusions-Experimente
  - Space simulation
  - UHV applications

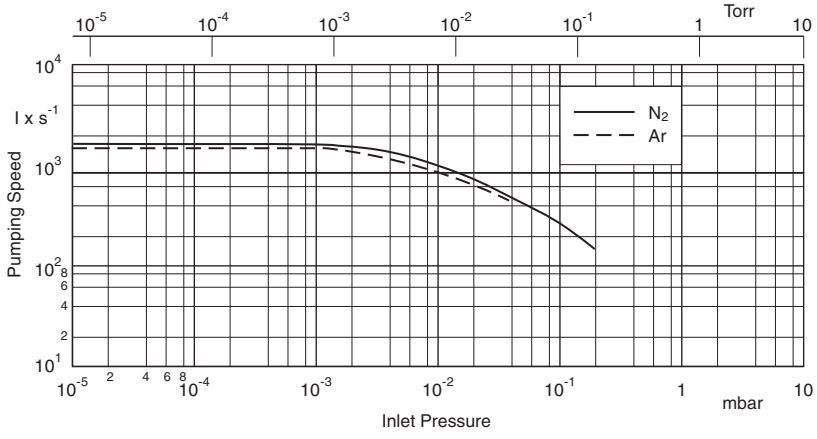


DN		α	a	b	b_1	d	d_1	h	h_1	h_2	h_3	h_4
200 ISO-F	mm	15°	178	190	156	285	308	425	349	315	277	256
	inch	15°	7.01	7.48	6.14	11.22	12.13	16.73	13.74	12.40	10.91	10.08
250 ISO-F	mm	15°	178	190	156	335	308	398	322	288	249	228
	inch	15°	7.01	7.48	6.14	13.19	12.13	15.67	12.68	11.34	9.80	8.98
250 CF	mm	5.6°	178	190	156	304	308	413	337	303	264	243
	inch	5.6°	7.01	7.48	6.14	11.97	12.13	16.26	13.27	11.93	10.39	9.57

Dimensional drawing for the TURBOVAC TW 1600

Technical Features

- Frequency converter and power supply integrated
- Robust rotor design
- Operation in any orientation
- Highest pumping speed and throughput
- Oil-free pump for generating clean high and ultrahigh vacuum conditions
- Purge gas and venting valve integrated
- High foreline tolerance



Pumping speed as a function of the inlet pressure

Advantages to the User

- Space-saving
- Easy to integrate into complex vacuum systems
- High productivity
- Low operating costs
- Operation with dry backing pumps

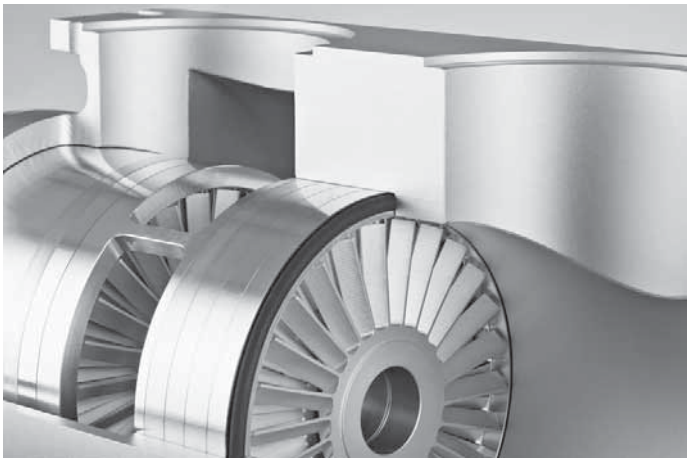
Technical Data — TURBOVAC TW 1600

Inlet flange	DN	200 ISO-F	250 ISO-F • 250 CF
Pumping speed			
N_2	l x s^{-1}	1000	1420
Ar	l x s^{-1}	820	1200
Max. gas throughput			
N_2	mbar x l x s^{-1}	7.4	7.4
Ar	mbar x l x s^{-1}	6.8	6.8
Compression ratio k_0 for O-ring sealed pumps			
N_2		1×10^7	1×10^7
Ar		3×10^8	3×10^8
Ultimate pressure	mbar (Torr)	$< 3 \times 10^{-10}$ ($< 2.25 \times 10^{-10}$)	$< 3 \times 10^{-10}$ ($< 2.25 \times 10^{-10}$)
Max. foreline pressure for N_2	mbar (Torr)	8 (6)	8 (6)
Recommended forevacuum pump (alternatively)		TRIVAC D 65 B + RUVAC WA 501 DIVAC 4.8 VT SOGEVAC SV 25 SCROLLVAC SC 30 D	TRIVAC D 65 B + RUVAC WA 501 DIVAC 4.8 VT SOGEVAC SV 25 SCROLLVAC SC 30 D
Run-up time to 95% speed	min	< 10	< 10
Purge / vent port	DN	G 1/4"	G 1/4"
Cooling water connection		G 3/8"	G 3/8"
Weight, approx.	kg (lbs)	40 (88.3)	40 (88.3)
Supply voltage	V AC	100 - 240	100 - 240
Max. power consumption	W	700	700

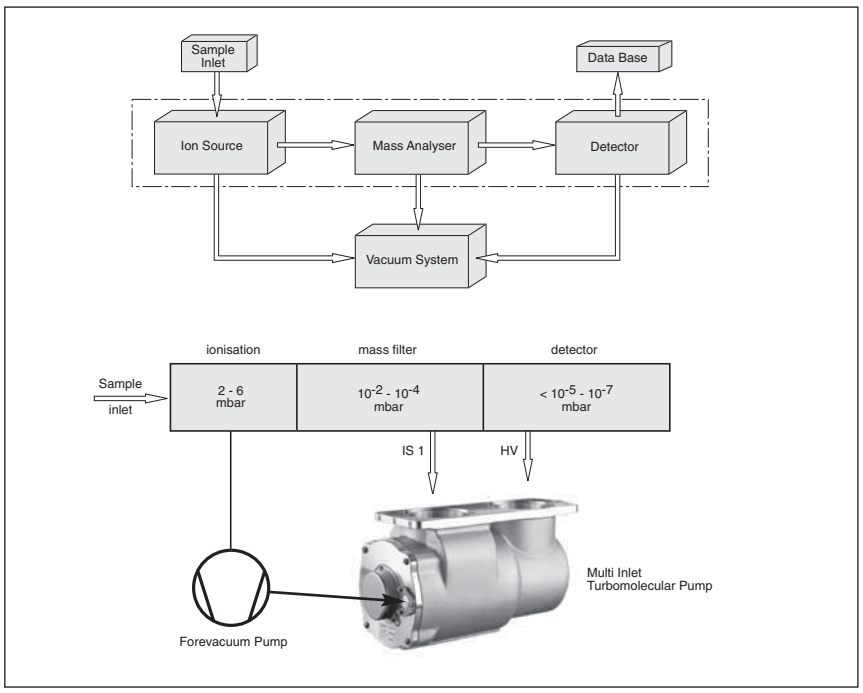
Ordering Information — TURBOVAC TW 1600

Inlet flange	Foreline flange	Cooling method	Interface	
DN 200 ISO-F	DN 40 KF	Water-cooled	Profibus	**Part No. 800041V2144**
DN 250 ISO-F	DN 40 KF	Water-cooled	Profibus	**Part No. 800041V2444**
DN 250 CF	DN 40 KF	Water-cooled	Profibus	**Part No. 800041V2844**
Purge filter				**Part No. 200 18 515**
Accessories for serial interfaces RS 232 C and RS 485 C				see chapter “Turbomolecular Pumps“, para. “Accessories“

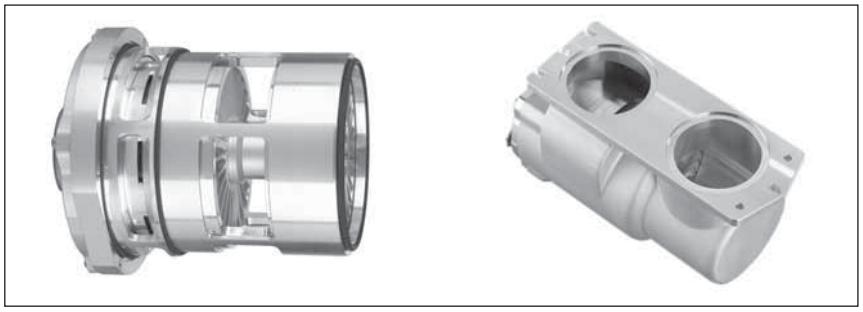
Special Turbomolecular Pumps



TURBOVAC Multi Inlet



Application example: GC-MS



Multi inlet product examples
Left: cartridge, right: dual inlet

Advantages to the User

- Reduction of system costs
- Smaller size of the analysis system
- Reduction in the number of individual vacuum components
- Choice between cartridge or customised pump housing

Typical Applications

For example

- LC-MS (linking of a liquid chromatograph to a mass spectrometer)
- GC/MS (linking of a gas chromatograph to a mass spectrometer)
- TOF-MS (time-of-flight mass spectrometer)
- ICP-MS (inductively coupled plasma mass spectrometry)
- Helium leak detectors

Technical Characteristics

- Dual inlet (pumping down of two analysis chambers)
- Triple inlet (pumping down of three analysis chambers)
- High effective pumping speed

HV stage S = 60 to 400 l/s

Interstage IS1 S = 30 to 300 l/s

Interstage IS2 S = 5 to 30 l/s

- Cartridge solutions (without pump housing) are available
- Compact vacuum system

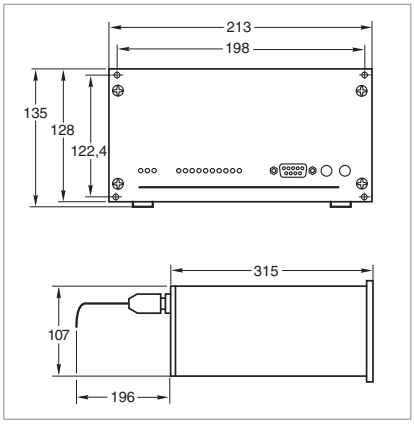
Customised versions are available upon request

Notes

Electronic Frequency Converters TURBO.DRIVE TD20 *classic*

Technical Features

- For operating the TURBOVAC 151 (C), 361 (C), 600 C, 1000 C and 1100 (C) turbomolecular pump
- Front panel with LED
  - Status, Power, Error, pump run-up, pumping power
- Wide voltage range mains input
- Current interfaces like Profibus, DeviceNet, Ethernet/IP, RS 232 C, RS 485 C and 25-way terminal strip, available as options



Dimensional drawing for the frequency converter Turbo.Drive TD20 *classic*

Advantages to the User

- Easy integration within a vacuum system owing to the large variety of different modern interfaces as well as for modernising older systems
- Start/stop function through keys on the front panel
- Remote control and process control through analog and PLC compatible inputs and outputs
- Compatible to frequency converter NT 20, NT 151/361, NT 361 and NT 1000/1500

Technical Data

		TURBO.DRIVE TD20 *classic*
Mains connection, 50 - 60 Hz; selectable	V	100 to 240 (-15% / +10%)
Max. output voltage	V	3 x 47
Overload current limit	A	5
Permissible ambient temperature	°C (°F)	0 to +45 (+32 to +113)
Protection class	IP	20
Dimensions (W x H x D)	mm (in.)	213 x 128 x 315 (1/2 19", 3 HU) 8.39 x 5.04 x 12.40 (1/2 19", 3 HU)
Weight, approx.	kg (lbs)	4 (8.8)

Ordering Information

	TURBO.DRIVE TD20 *classic*
TURBO.DRIVE TD20 *classic*	
without interface	**Part No. 800075V0001**
with RS 232 C interface	**Part No. 800075V0002**
with RS 485 C interface	**Part No. 800075V0004**
with Profibus	**Part No. 800075V0003**
with 25 pol I/O	**Part No. 800075V0005**
with DeviceNet	**Part No. 800075V0006**
with Ethernet/IP	**Part No. 800075V0007**
Mains cable	
3 m (10.5 ft)	
Euro plug	**Part No. 800102V0002**
UK plug	**Part No. 800102V0003**
US plug 6-15 P	**Part No. 800102V1002**
Connection cable TURBOVAC - converter	
3 m (10.5 ft)	**Part No. 857 65**
5 m (17.5 ft)	**Part No. 857 66**
10 m (35.0 ft)	**Part No. 857 67**
20 m (70.0 ft)	**Part No. 857 68**
50 m (175.0 ft)	**Part No. 800152V008**
60 m (210.0 ft)0	**Part No. 800152V007**
19” in. rack mounting frame 3 HU	**Part No. 161 00**
Pump adapter cable (required when replacing a NT 151/361, NT 361 or NT 1000/1500)	**Part No. 800 000 006**
Adapter cable, 0.2 m long 25-way PLC interface to 2x Phoenix plugs (required when a NT 20 with connected PLC interface needs to be replaced)	**Part No. 800152V0020**
PC software TURBO.DRIVE Server [1)]	**Part No. 800110V0102** **(see Section „Accessories” at the end of the chapter)**

Electronic Frequency Converters TURBOTRONIK NT 10

Technical Features

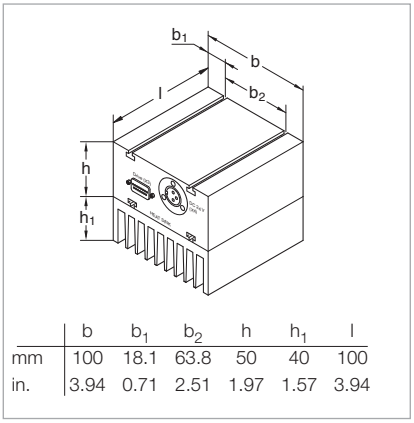
- For operating the TURBOVAC 50 turbomolecular pump
- Bench top unit
- Also for rack mounting (1/4 19", 3 HU)
- Controls and indicators on the front panel
- Inputs for remote control and process controller
- Freely assignable relays (e.g. to control the backing pumps)

Technical Data		TURBOTRONIK NT 10
Mains connection, 50 - 60 Hz	V	90 - 140/180 - 260
Max. output voltage	V	3 x 150
Overload current limit	A	0.22
Permissible ambient temperature	°C (°F)	0 to +40 (+32 to +104)
Dimensions (W x H x D)	mm (in.)	106 x 128 x 233 (4.17 x 5.04 x 9.17)
Weight, approx.	kg (lbs)	1.5 (3.3)

Ordering Information	TURBOTRONIK NT 10
90 - 140 V (with US plug)	**Part No. 859 01**
180 - 260 V (with EURO plug)	**Part No. 859 00**
Connecting cable pump - converter 3 m (10.5 ft) 5 m (17.5 ft)	 **Part No. 121 08** **Part No. 121 09**

TURBO.DRIVE S (TDS) for TW 70 H and TW 250 S

TURBO.DRIVE S (front side)



	b	b_1	b_2	h	h_1	l
mm	100	18.1	63.8	50	40	100
in.	3.94	0.71	2.51	1.97	1.57	3.94

Dimensional drawing for the TURBO.DRIVE S (rear side)

Technical Features

- Compact size
- RS 232 C, RS 485 C or Profibus interface
- Configurations
  - as a separate frequency converter
  - integrated within turbomolecular pump
- Remote control via remote control interface
- Flexible mounting
- Cost-effective supply of 24 V DC power

Technical Data

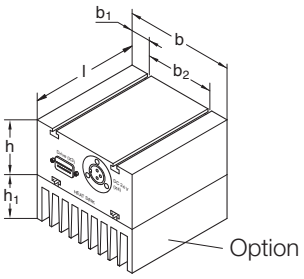
	TURBO.DRIVE S
Input	
Voltage V DC	24 ± 5%
Max. continuos current A	7
Max. continuos power consumption W	170
Ambient temperature °C (°F)	+10 to +45 (+50 to +113)
Dimensions (W x H x D), including heat sink mm (in.)	100 x 90 x 100 (3.94 x 3.54 x 3.94)
Weight kg (lbs)	0.7 (1.55)
Serial interface	RS 232 C, RS 485 C or Profibus

Ordering Information

	TURBO.DRIVE S
TURBO.DRIVE S	
with RS 232 C interface	**Part No. 800070V0002**
with RS 485 C interface	**Part No. 800070V0003**
with Profibus	**Part No. 800070V0004**
with RS 232 C interface and heat sink	**Part No. 800070V0005**
with RS 485 C interface and heat sink	**Part No. 800070V0006**
Connecting cable TDS - pump	
1 m (3.5 ft)	**Part No. 152 47**
3 m (10.5 ft)	**Part No. 864 40**
5 m (17.5 ft)	**Part No. 864 50**
START/STOP switch (for manual operation)	**Part No. 152 48**
Hat rail adaptor as mounting aid	**Part No. 800110V0003**
Accessories for RS 232 C and RS 485 C interfaces	**see chapter "Turbomolecular Pumps", para. "Accessories"**

TURBO.DRIVE 300 (TD 300) for TW 70, TW 250 S, TW 300 and TW 300 H

TURBO.DRIVE 300 (front side)



	b	b_1	b_2	h	h_1	l
mm	100	18.1	63.8	50	40	100
in.	3.94	0.71	2.51	1.97	1.57	3.94

Dimensional drawing for the TURBO.DRIVE 300 (rear side)

Technical Features

- Compact size
- RS 232/422 C or RS 485 C interface
- Configurations
  - as a separate frequency converter
  - integrated within turbomolecular pump
- Remote control via remote control interface
- Flexible mounting
- Cost-effective supply of 24 V DC power

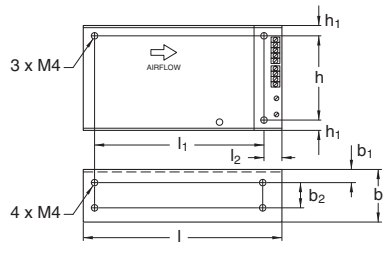
Technical Data

		TURBO.DRIVE 300
Input		
Voltage	V DC	24 ± 5%
Max. continuos current	A	7
Max. continuos power consumption	W	170
Ambient temperature	°C (°F)	+5 to +45 (+41 to +113)
Dimensions (W x H x D)	mm (in.)	100 x 90 x 100 (3.94 x 3.54 x 3.94)
Weight	kg (lbs)	0.7 (1.55)
Serial interface		RS 232/422 C or RS 485 C

Ordering Information

	TURBO.DRIVE 300
TURBO.DRIVE 300	
with RS 232/422 C interface	**Part No. 800072V0001**
with RS 485 C interface	**Part No. 800072V0003**
with Profibus	**Part No. 800072V0004**
Connecting cable TD 300 - pump	
1 m (3.5 ft)	**Part No. 152 47**
3 m (10.5 ft)	**Part No. 864 40**
5 m (17.5 ft)	**Part No. 864 50**
START/STOP switch (for manual operation)	**Part No. 152 48**
Hat rail adaptor as mounting aid	**Part No. 800110V0003**
Accessories for RS 232 C and RS 485 C interfaces	**see chapter "Turbomolecular Pumps", para. "Accessories"**

Power Supply PS 700 for TW 701 Turbomolecular Pumps



	b	b_1	b_2	h	h_1	l	l_1	l_2
mm	63	15	30	105	11	227	197	18
in.	2.48	0.59	1.18	4.13	0.43	8.94	7.76	0.71

Dimensional drawing for the power supply PS 700

Technical Features

- 59 V DC OEM power supply for screw fixing in electrical cabinets

Technical Data

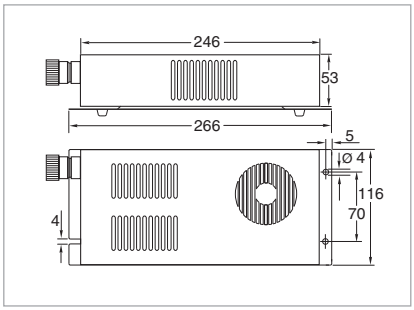
Technical Data		Power Supply PS 700
Input		
Mains voltage	V DC	85-265
Max. continuos power consumption	W	850
Output		
Voltage, nominal	V DC	59
Max. continuos current	A	13
Max. continuos power consumption	W	750
Ambient temperature	°C (°F)	0 to +70 (+32 to +158)
Dimensions (W x H x D)	mm (in.)	227 x 63 x 127 (8.94 x 2.48 x 5.0)
Weight	kg (lbs)	2 (4.4)

Ordering Information

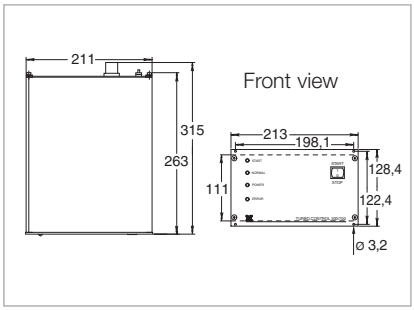
Ordering Information	Power Supply PS 700
OEM power supply 59 V DC	**Part No. 864 45**
59 V DC cable TW 700 – power supply	
3 m (10.5 ft)	**Part No. 200 12 729**
5 m (17.5 ft)	**Part No. 200 12 730**
10 m (35.0 ft)	**Part No. 200 12 731**
20 m (70.0 ft)	**Part No. 200 15 064**
Mains cable for OEM power supply, 2 m (7 ft)	
with EURO plug	**Part No. 800102V0001**
with US plug, 220 V AC	**Part No. 800102V1001**
with US plug, 115 V AC (7.5 ft)	**Part No. 992 76 513**
START/STOP switch for TURBO.DRIVE S (for manual operation)	**Part No. 152 48**

Note:
See the TPC and TSC controllers in the Product Section C10 “Turbomolecular Pump Systems” for additinal controllers for the TURBOVAC TW 300 and TW 700

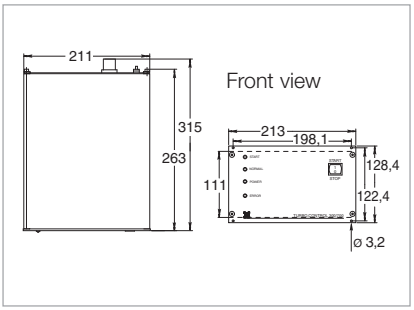
Power Supply Units for TURBO.DRIVE S, TURBO.DRIVE 300 and TW 700/701



Dimensional drawing for the power supply TURBO.POWER 300



Dimensional drawing for the power supply TURBO.CONTROL 300



Dimensional drawing for the power supply TURBO.CONTROL 700

Technical Features

- Cost-effective supply of 24 V DC power for TURBO.DRIVE S and TURBO.DRIVE 300
- Plug & play
- Bench top unit or for cabinet mounting

Technical Features

- For supplying 24 V DC power to the TURBO.DRIVE S and TURBO.DRIVE 300
- Plug & play
- Bench top unit or for cabinet mounting
- Mains switch
- START/STOP switch for the turbo-molecular pump
- Remote control via remote interface
- Status indicating LEDs and status relays

Technical Features

- For supplying 59 V DC power to the TW 700/701
- Plug & play
- Bench top unit or for cabinet mounting
- Mains switch
- START/STOP switch for the turbo-molecular pump
- Remote control via remote interface
- Status indicating LEDs and status relays

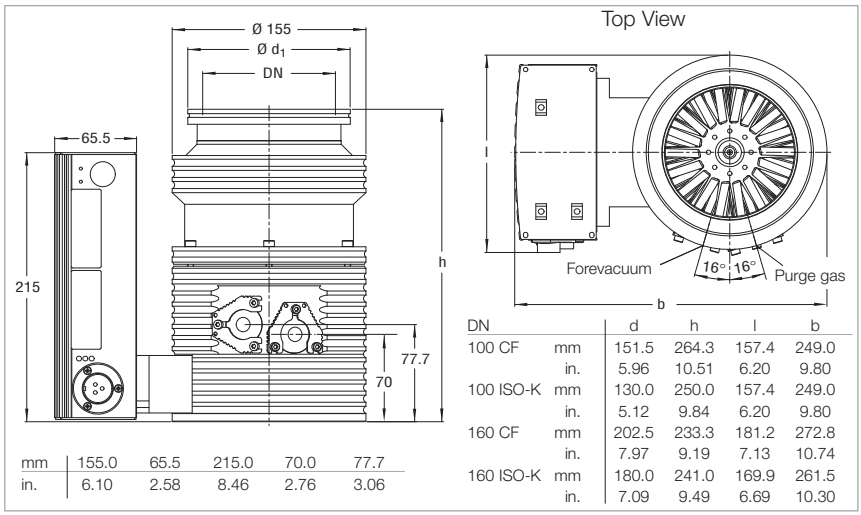
Technical Data

		Power Supply		
		TURBO.POWER 300	**TURBO.CONTROL 300**	**TURBO.CONTROL 700**
Input				
Mains voltage		85-264 V / 50/60 Hz	85-264 V / 50/60 Hz	85-264 V / 50/60 Hz
Max. power consumption	V A	300	300	805
Output				
Voltage, nominal	V DC	24	24	59
Max. continuos current	A	8.4	8.4	8.5
Ambient temperature	°C (°F)	0 to +40 (+32 to +104)	0 to +40 (+32 to +104)	0 to +40 (+32 to +104)
Dimensions (W x H x D)	mm (in.)	116 x 53 x 260 (4.57 x 2.09 x 10.24)	213 x 129 x 320 (8.39 x 5.08 x 12.6)	213 x 129 x 320 (8.39 x 5.08 x 12.6)
Weight	kg (lbs)	1.5 (3.3)	1.5 (3.3)	2.5 (5.52)

Ordering Information

	Power Supply		
	TURBO.POWER 300	**TURBO.CONTROL 300**	**TURBO.CONTROL 700**
Power supply			
TURBO.POWER 300	**Part No. 800100V0002**	**–**	**–**
TURBO.CONTROL 300	**–**	**Part No. 800100V0001**	**–**
TURBO.CONTROL 700	**–**	**–**	**Part No. 800101V0001**
DC cable			
frequency converter - power supply unit	24 V DC power cable	24 V DC control cable	59 V DC control cable
1 m (3.5 ft)	**Part No. 800094V0100**	**Part No. 800091V0100**	**Part No. 800093V0100**
3 m (10.5 ft)	**Part No. 800094V0300**	**Part No. 800091V0300**	**Part No. 800093V0300**
5 m (17.5 ft)	**Part No. 800094V0500**	**Part No. 800091V0500**	**Part No. 800093V0500**
10 m (35.0 ft)	**Part No. 800094V1000**	**Part No. 800091V1000**	**Part No. 800093V1000**
20 m (70.0 ft)	**Part No. 800094V2000**	**Part No. 800091V2000**	**Part No. 800093V2000**
Mains cable, 3 m (10.5 ft)			
with EURO plug	**Part No. 800102V0002**	**Part No. 800102V0002**	**Part No. 800102V0002**
UK plug	**Part No. 800102V0003**	**Part No. 800102V0003**	**Part No. 800102V0003**
with US plug 6-15 P, 220 V AC	**Part No. 800102V1002**	**Part No. 800102V1002**	**Part No. 800102V1002**
with US plug, 115 V AC (7.5 ft)	**Part No. 992 76 513**	**Part No. 992 76 513**	**Part No. 992 76 513**
Hat rail adaptor as mounting aid	**Part No. 800110V0003**	**–**	**–**

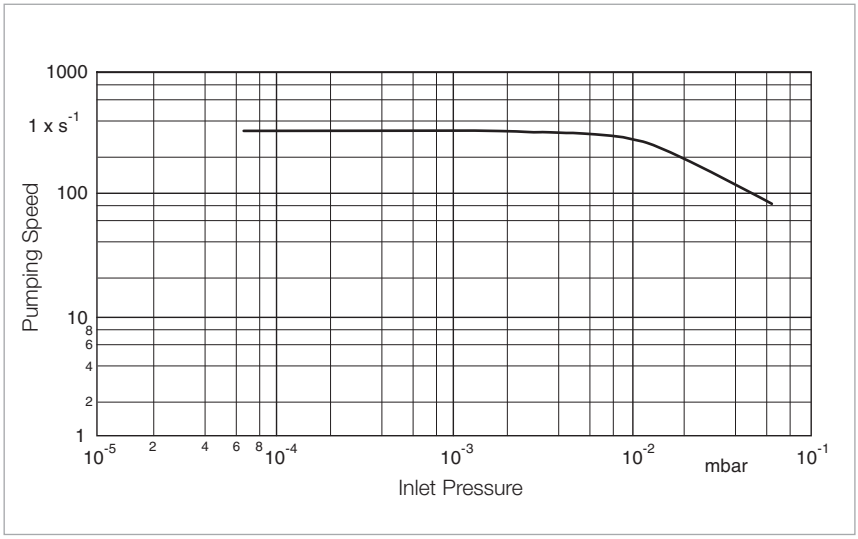
Magnetic Rotor Suspension with Integrated Frequency Converter, with Compound Stage TURBOVAC MAG W 300/400



mm	155.0	65.5	215.0	70.0	77.7
in.	6.10	2.58	8.46	2.76	3.06

DN		d	h	l	b
100 CF	mm	151.5	264.3	157.4	249.0
	in.	5.96	10.51	6.20	9.80
100 ISO-K	mm	130.0	250.0	157.4	249.0
	in.	5.12	9.84	6.20	9.80
160 CF	mm	202.5	233.3	181.2	272.8
	in.	7.97	9.19	7.13	10.74
160 ISO-K	mm	180.0	241.0	169.9	261.5
	in.	7.09	9.49	6.69	10.30

Dimensional drawing for the TURBOVAC MAG W 300/400



Pumping speed of the TURBOVAC MAG W 300/400 as a function of the inlet pressure

Typical Applications

- Gas analysis systems
- Particle accelerators
- Electron microscopes
- Research

Technical Characteristics

- Installation in any orientation
- DN 100 or 160 ISO-K and/or CF high vacuum connection
- DN 16 KF with clamped forevacuum connection
- Purge gas/venting connection DN 16 KF with clamped connection (purge/vent)
- Water or air cooling optional
- CE and RoHS compliant; fulfilment of UL requirements
- 2 slots for industrial communicati-ons modules
- standard 9 pin 24 V PLC I/O
- further interfaces can be fitted: Ethernet, ProfiBus, DeviceNet, RS 232/RS 485

Advantages to the User

- Highest pumping speed from the smallest possible size.
- New standard regarding maintenan-ce free systems.
- Suitability for vibration sensitive applications in the area of analytical engineering, thin-film technology, electron microscopes, research, development among others.
- Flexibility due to the modular con-cept; the converter is optionally also available by way of a bench top unit.

Technical Data

TURBOVAC MAG W

		300 iP		400 iP	
High vacuum connection	DN	100 ISO-K	100 CF	160 ISO-K	160 CF
Pumping speed					
N_2	l x s^{-1}	300	300	365	365
H_2	l x s^{-1}	190	190	200	200
He	l x s^{-1}	260	260	290	290
Rotational speed	min^{-1} (rpm)	58 800 (58 800)	58 800 (58 800)	58 800 (58 800)	58 800 (58 800)
Compression					
N_2		2.0×10^9	2.0×10^9	2.0×10^9	2.0×10^9
H_2		$3.2 \times \cdot 10^3$	3.2×10^3	3.2×10^3	3.2×10^3
He		9.2×10^4	9.2×10^4	9.2×10^4	9.2×10^4
Ultimate pressure	mbar (Torr)	$< 10^{-8}$ ($< 0.75 \times 10^{-8}$)	$< 10^{-10}$ ($< 0.75 \times 10^{-10}$)	$< 10^{-8}$ ($< 0.75 \times 10^{-8}$)	$< 10^{-10}$ ($< 0.75 \times 10^{-10}$)
Max. degassing temperature	°C (°F)	–	80 (176)	–	80 (176)
Max. forevacuum pressure for N_2	mbar (Torr)	8 (6)	8 (6)	8 (6)	8 (6)
Recommended backing pump		TRIVAC D 2,5 E TRIVAC D 8 B	TRIVAC D 2,5 E TRIVAC D 8 B	TRIVAC D 2,5 E TRIVAC D 8 B	TRIVAC D 2,5 E TRIVAC D 8 B
Run-up time	min	< 3	< 3	< 3	< 3
Forevacuum connection (clamped)	DN	16 ISO-KF	16 ISO-KF	16ISO- KF	16 ISO-KF
Seal gas / venting connection (clamped)	DN	16 ISO-KF	16 ISO-KF	16 ISO-KF	16 ISO-KF
Water cooling connection (optional)	G	1/8”	1/8”	1/8”	1/8”
Weight, approx.	kg (lbs)	12 (26.49)	12 (26.49)	12 (26.49)	12 (26.49)
Accessories for all Pumps					
Integrated frequency converter TURBO.DRIVE iS					
Power supply	V	48	48	48	48
Residual ripple	%	< 2	< 2	< 2	< 2
Power rating					
maximum	W	400	400	400	400
at ultimate pressure	W	259	259	259	259
DC current consumption, max.	A	7.5 to 9.3	7.5 to 9.3	7.5 to 9.3	7.5 bis 9.3
DC power supply voltage range	V	43 to 53	43 to 53	43 to 53	43 bis 53
Length of the DC connection cable, max.					
for 3 x 1,5 mm^2	m	5	5	5	5
for 3 x 2,5 mm^2	m	20	20	20	20
Contact rating for the relays, max.		32 V; 0.5 A	32 V; 0.5 A	32 V; 0.5 A	32 V; 0.5 A
Permissible ambient temperature					
during operation	°C (°F)	10 to 40 (50 to 104)	10 to 40 (50 to 104)	10 to 40 (50 to 104)	10 to 40 (50 to 104)
during storage	°C (°F)	0 to 60 (0 to 140)	0 to 60 (0 to 140)	0 to 60 (0 to 140)	0 to 60 (0 to 140)
Relative humidity of the air, non-condensing	%	5 to 85	5 to 85	5 to 85	5 to 85
Protection class	IP	30	30	30	30
Overvoltage category		II	II	II	II
Pollution category		2	2	2	2

Ordering Information — TURBOVAC MAG W

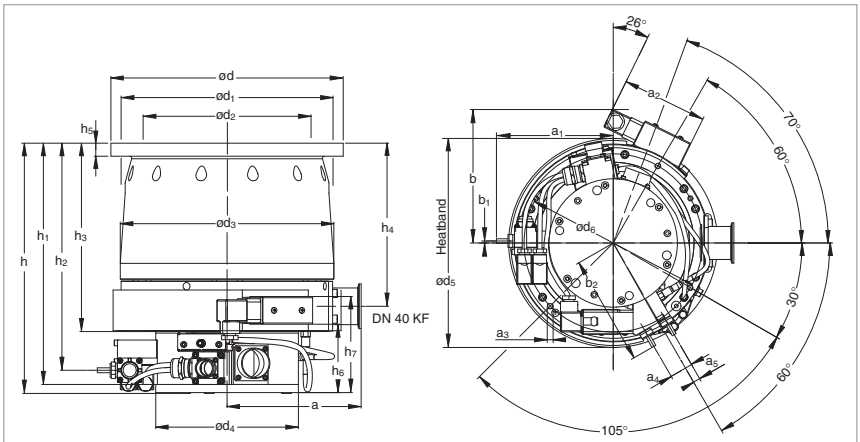
	300 iP	400 iP
Turbomolecular pump TURBOVAC MAG W with integrated frequency converter and seal gas connection		
DN 100 ISO-K	**Part No. 410300V0505**	**–**
DN 100 CF	**Part No. 410300V0506**	**–**
DN 160 ISO-K	**–**	**Part No. 410400V0505**
DN 160 CF	**–**	**Part No. 410400V0506**
Splitter guard		
DN 100 ISO-K		
coarse (3.2 x 3.2 mm)	**Part No. 800132V0101**	**Part No. 800132V0101**
fine (1.6 x 1.6 mm)	**Part No. 800132V0102**	**Part No. 800132V0102**
DN 100 CF		
coarse (3.2 x 3.2 mm)	**Part No. 200 91 514**	**Part No. 200 91 514**
fine (1.6 x 1.6 mm)	**Part No. E 200 17 195**	**Part No. E 200 17 195**
DN 160 ISO-K	**Part No. 200 00 307**	**Part No. 200 00 307**
DN 160 CF	**Part No. 200 17 247**	**Part No. 200 17 247**
Seal gas and venting valve	**upon request**	**upon request**
Flange heater		
100 CF, 230 V, 50 Hz	**Part No. 854 27**	**Part No. 854 27**
100 CF, 110 V, 60 Hz	**Part No. 854 28**	**Part No. 854 28**
160 CF, 230 V, 50 Hz	**Part No. 854 37**	**Part No. 854 37**
160 CF, 110 V, 60 Hz	**Part No. 854 38**	**Part No. 854 38**
Water cooling	**Part No. 410300V0101**	**Part No. 410300V0101**
Air cooling	**Part No. 410300V0102**	**Part No. 410300V0102**

Ordering Information — TURBO.POWER 500

TURBO.POWER 500	**Part No. 410300V0221**
DC cable (connection between TURBO.POWER 500 and pump)	
1 m	**Part No. 410300V2001**
3 m	**Part No. 410300V2003**
5 m	**Part No. 410300V2005**
10 m	**Part No. 410300V2010**
20 m	**Part No. 410300V2020**
Mains cord	
3 m (EU)	**Part No. 800102V0002**
3 m (US)	**Part No. 800102V1002**

Notes

Magnetic Rotor Suspension with Separate Frequency Converter, without Compound Stage TURBOVAC MAG 1500 CT



Top view

		a	a_1	a_2	a_3	a_4	a_5	b	b_1	b_2	d	d_1	d_2
200 ISO-F	mm	164.5	159	116.5	M8 x 15	32	9	182	3	150	285	260	213
	in.	6.48	6.26	4.59	M8 x 0.6	1.26	0.35	7.17	0.12	5.91	11.22	10.24	8.39
250 ISO-F	mm	164.5	159	116.5	M8 x 15	32	9	182	3	150	335	310	213
	in.	6.48	6.26	4.59	M8 x 0.6	1.26	0.35	7.17	0.12	5.91	11.22	12.20	10.28

		d_3	d_4	d_5	d^6	h	h_1	h_2	h_3	h_4	h_5	h_6	h_7
200 ISO-F	mm	262	175	285	243	307	296	279	231	200	16	84	16
	in.	10.31	6.89	11.22	9.57	12.09	11.65	10.98	9.09	7.87	0.63	3.31	0.63
250 ISO-F	mm	262	175	285	243	307	296	279	231	200	16	84	16
	in.	10.31	6.89	11.22	9.57	12.09	11.65	10.98	9.09	7.87	0.63	3.31	0.63

Dimensional drawing for the TURBOVAC MAG 1500 CT

Typical Applications

- All major semiconductor processes such as Etch, CVD, PVD and Ion Implantation
- Load locks and transfer chambers

Technical Features

- Active 5-axis magnetic bearing system
- Patented KEPLA-COAT® for rotor and stator to prevent corrosion
- Low noise and vibration levels
- Operation in any orientation
- Advanced rotor design for high throughput
- Integrated purge gas system
- CT versions: Integrated temperature management system
- Bearing and temperature system are controlled digitally
- Intelligent power control system

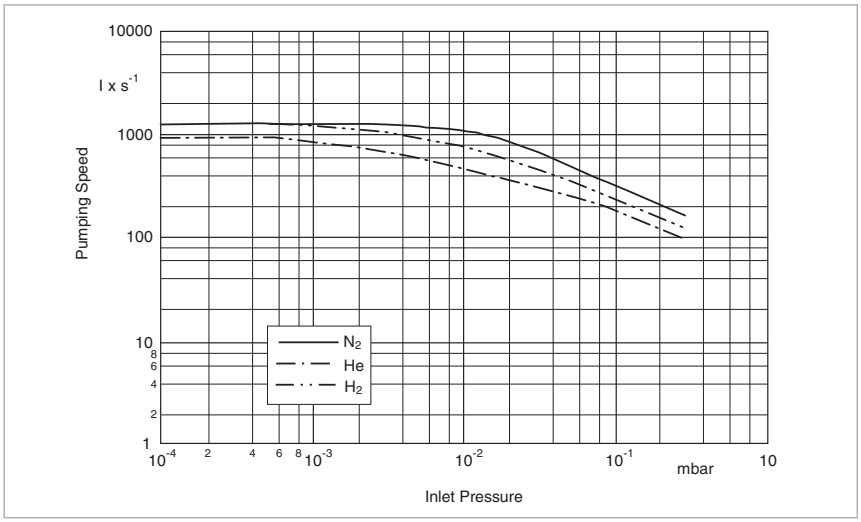
Advantages to the User

- Maintenance-free
- High throughput for all process gases
- High pumping speed at low pressure
- High foreline pressure tolerance: up to 1.7 mbar (1.13 Torr)
- High resistance against corrosive gases
- Robust against particles and deposits
- Temperature control up to 90 °C (194 °F) to avoid condensation
- Lowest weight and size in its class
- Application specific design

Technical Data

TURBOVAC MAG 1500 CT

Inlet flange	**DN**	200 ISO-F	250 ISO-F
Pumping speed according to PNEUROP			
N_2	**l x s^{-1}**	1100	1220
He	**l x s^{-1}**	1000	1180
H_2	**l x s^{-1}**	980	1020
Speed	**min^{-1}**	36 000	36 000
Compression ratio			
N_2		> 10^8	> 10^8
Ultimate pressure according to DIN 28 400	**mbar (Torr)**	< 10^{-8} (< 0.75 x 10^{-8})	< 10^{-8} (< 0.75 x 10^{-8})
Max. foreline pressure for N_2	**mbar (Torr)**	1.7 (1.2)	1.7 (1.2)
Recommended forevacuum pump			
Rotary vane pump		TRIVAC D 65 BCS	TRIVAC D 65 BCS
or dry compressing pump			
offering a pumping speed of 100 m^3/h			
Run-up time	**min**	< 6	< 6
forevacuum flange	**DN**	40 KF	40 KF
Purge / vent port	**VCR nut**	1/4"	1/4"
Cooling water connection			
(OD of tube)	**mm (in.)**	6.4 (0.25)	6.4 (0.25)
Weight, approx.	**kg (lbs)**	32 (70)	32 (70)



Pumping speed of the TURBOVAC MAG 1500 C/CT as a function of the inlet pressure

Ordering Information

TURBOVAC MAG 1500 CT

TURBOVAC MAG turbomolecular pump	**Part No. 400020V0002**	**Part No. 400021V0002**
Electronic frequency converter		
MAG.DRIVE digital	**Part No. 400035V0011**	**Part No. 400035V0011**
with Profibus interface	**Part No. 400035V0013**	**Part No. 400035V0013**
with RS 232 Cinterface	**Part No. 400035V0014**	**Part No. 400035V0014**
with Ethernetinterface	**Part No. 400035V0015**	**Part No. 400035V0015**
with DeviceNetinterface	**Part No. 400035V0016**	**Part No. 400035V0016**
Plug-in control	**Part No. 121 36**	**Part No. 121 36**
Connecting cables converter – pump [1)]		
1.5 m (5.25 ft) DRIVE/BEARING	**Part No. 400036V0001**	**Part No. 400036V0001**
1.5 m (5.25 ft) TMS	**Part No. 400037V0001**	**Part No. 400037V0001**
03.0 m (10.5 ft) DRIVE/BEARING	**Part No. 400036V0008**	**Part No. 400036V0008**
03.0 m (10.5 ft) TMS	**Part No. 400037V0008**	**Part No. 400037V0008**
05.0 m (17.5 ft) DRIVE/BEARING	**Part No. 400036V0004**	**Part No. 400036V0004**
5.0 m (17.5 ft) TMS	**Part No. 400037V0004**	**Part No. 400037V0004**
10.0 m (35.0 ft) DRIVE/BEARING	**Part No. 400036V0002**	**Part No. 400036V0002**
10.0 m (35.0 ft) TMS	**Part No. 400037V0002**	**Part No. 400037V0002**
20.0 m (70.0 ft) DRIVE/BEARING	**Part No. 400036V0003**	**Part No. 400036V0003**
20.0 m (70.0 ft) TMS	**Part No. 400037V0003**	**Part No. 400037V0003**
Seal kit		
DN 250 metal	**Part No. 200 07 901**	**Part No. 200 07 901**

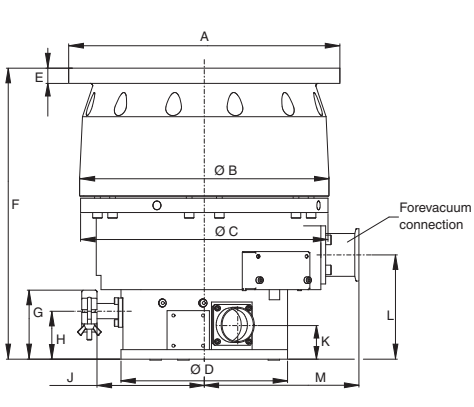
[1)] further connecting cables can be found under MAG.DRIVE digital in the section “Turbomolecular Pumps with Magnetic Rotor Suspension”, para. “Electronic Frequency Converters”

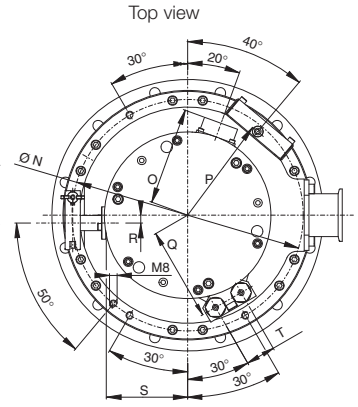
Notes

Magnetic Rotor Suspension with Separate Frequency Converter, with Compound Stage TURBOVAC MAG W 830/1300 C

Typical Applications

- Semiconductor processes, like PVD and ion implantation
- Transfer chambers
- Particle accelerators
- Research instruments and systems
- Coaters





	Forevacuum flange	Inlet flange		A	B	C	D	E
MAG W 830 C	DN 40 KF	160 ISO-F	mm	225	262	260	175	16
	DN 40 KF	160 ISO-F	in.	8.86	10.31	10.24	6.89	0.63
MAG W 1300 C	DN 40 KF / DN 25 KF	200 ISO-F	mm	285	262	260	175	16
	DN 40 KF / DN 25 KF	250 ISO-F	in.	11.22	10.31	10.24	6.89	0.63
MAG W 1300 C	DN 40 KF	250 ISO-F	mm	335	262	260	175	16
	DN 40 KF	250 ISO-F	in.	13.19	10.31	10.24	6.89	0.63

		F	G	H	J	K	L	M	N
MAG W 830 C	mm	353	72	50	113	35	109.5	163	243
	in.	13.9	2.83	1.97	4.45	1.38	4.31	6.42	9.57
MAG W 1300 C	mm	306	72	50	113	35	109.5	163	243
	in.	12.05	2.83	1.97	4.45	1.38	4.31	6.42	9.57
MAG W 1300 C	mm	306	72	50	113	35	109.5	163	243
MAG W 1300 C	mm	12.05	2.83	1.97	4.45	1.38	4.31	6.42	9.57

		O	P	Q	R	S	T
MAG W 830 C	mm	103	114.7	98	8.3	85	31
	in.	4.06	4.52	3.86	0.33	3.35	1.22
MAG W 1300 C	mm	103	114.7	98	8.3	85	31
	in.	4.06	4.52	3.86	0.33	3.35	1.22
MAG W 1300 C	mm	103	114.7	98	8.3	85	31
	in.	4.06	4.52	3.86	0.33	3.35	1.22

Dimensional drawing for the TURBOVAC MAG W 830/1300 C

Technical Features

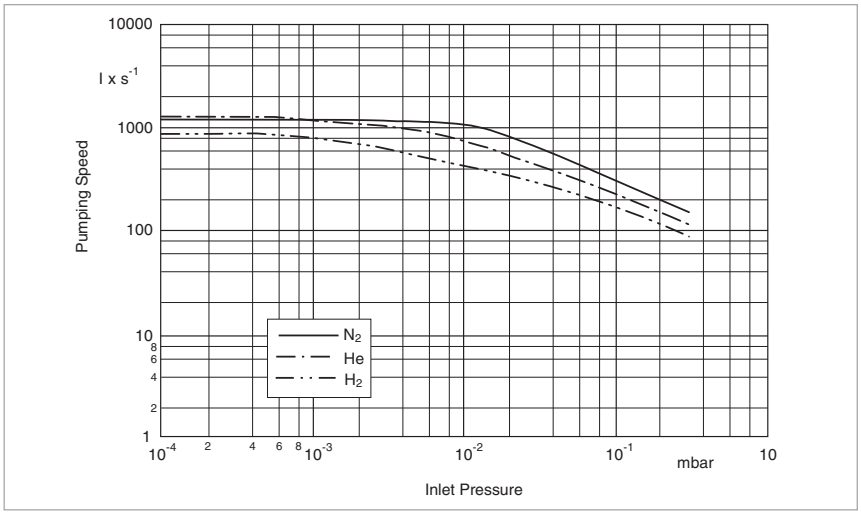
- Active 5-axis magnetic bearing system
- Digital monitoring of the bearing system
- Low noise and vibration levels
- Operation in any orientation
- Advanced rotor design for high throughput
- purge gas connection
- Intelligent power control system

Advantages to the User

- Maintenance-free
- High throughput for all process gases
- High pumping speed at low pressure
- High foreline pressure tolerance: up to 2 mbar (1.5 Torr)
- Lowest weight and size in its class
- Application specific design

Technical Data

		TURBOVAC MAG				
		W 830	W 830 C	W 1300	W 1300 C	
Inlet flange	DN	160 CF	160 ISO-F	200 CF	200 ISO-F	250 ISO-F
Pumping speed according to PNEUROP						
N_2	l x s^{-1}	900	700	1170	1100	1220
He	l x s^{-1}	900	650	1200	1050	1180
H_2	l x s^{-1}	740	300	920	920	1020
Speed	min^{-1}	36000	24000	36000	36000	36000
Compression ratio						
N_2		1.5 x 10^8	> 5 x 10^7	1.5 x 10^8	> 10^8	> 10^8
Ultimate pressure according to DIN 28 400						
	mbar (Torr)	< 1 x 10^{-10} (< 0.75 x 10^{-10})	< 10^{-8} (< 0.75 x 10^{-8})	< 1 x 10^{-10} (< 0.75 x 10^{-10})	< 10^{-8} (< 0.75 x 10^{-8})	< 10^{-8} (< 0.75 x 10^{-8})
Max. foreline pressure for N_2						
with convection cooling	mbar (Torr)	0.2 (0.15)	–	0.2 (0.15)	–	–
with water cooling	mbar (Torr)	2.0 (1.5)	2.0 (1.5)	2.0 (1.5)	2.0 (1.5)	2.0 (1.5)
Recommended forevacuum pump						
Rotary vane pump		TRIVAC D 65 BCS	TRIVAC D 65 BCS	TRIVAC D 65 BCS	TRIVAC D 65 BCS	TRIVAC D 65 BCS
or dry compressing pump offering a pumping speed of 100 m^3/h						
Run-up time	min	< 6.0	< 4.0	< 6.0	< 6.0	< 6.0
forevacuum flange	DN	40 KF	40 KF	40 KF	40 KF	40 KF
Purge / vent port	DN	10 KF / 16 KF	10 KF / 16 KF	10 KF / 16 KF	10 KF / 16 KF	10 KF / 16 KF
Cooling water connection (OD tube)	mm (in.)	1/4"	1/4"	1/4"	6 (0.24)	6 (0.24)
Weight, approx.	kg (lbs)	35 (77.3)	32 (70.6)	35 (77.3)	32 (70.6)	32 (70.6)



Pumping speed of the TURBOVAC MAG W 1300 C (DN 250) as a function of the inlet pressure

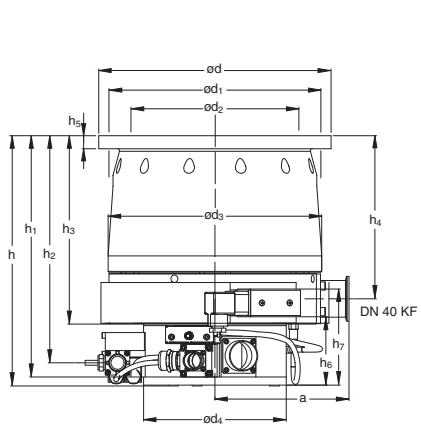
Ordering Information

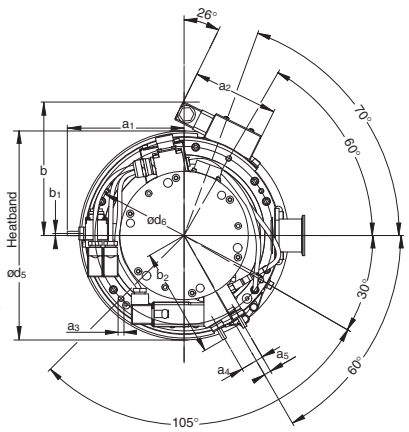
	TURBOVAC MAG				
	W 830	W 830 C	W 1300	W 1300 C	
Inlet flange DN	160 CF	160 ISO-F	200 CF	200 ISO-F	250 ISO-F
TURBOVAC MAG turbomolecular pump	Part No. 400100V0041	Part No. 400100V0005	Part No. 400110V0051	Part No. 400110V0011	Part No. 400110V0021
Electronic frequency converter MAG.DRIVE digital	Part No. 400035V0011	Part No. 400035V0011	Part No. 400035V0011	Part No. 400035V0011	Part No. 400035V0011
with Profibus interface	Part No. 400035V0013	Part No. 400035V0013	Part No. 400035V0013	Part No. 400035V0013	Part No. 400035V0013
with RS 232 C interface	Part No. 400035V0014	Part No. 400035V0014	Part No. 400035V0014	Part No. 400035V0014	Part No. 400035V0014
with Ethernet interface	Part No. 400035V0015	Part No. 400035V0015	Part No. 400035V0015	Part No. 400035V0015	Part No. 400035V0015
with DeviceNet interface	Part No. 400035V0016	Part No. 400035V0016	Part No. 400035V0016	Part No. 400035V0016	Part No. 400035V0016
Plug-in control	Part No. 121 36	Part No. 121 36	Part No. 121 36	Part No. 121 36	Part No. 121 36
Pure gas valve	Part No. 121 33	Part No. 121 33	Part No. 121 33	Part No. 121 33	Part No. 121 33
Connecting cable converter – pump [1]					
1.5 m (5.25 ft) DRIVE/BEARING	Part No. 400036V0001	Part No. 400036V0001	Part No. 400036V0001	Part No. 400036V0001	Part No. 400036V0001
3.0 m (10.5 ft) DRIVE/BEARING	Part No. 400036V0008	Part No. 400036V0008	Part No. 400036V0008	Part No. 400036V0008	Part No. 400036V0008
10.0 m (35.0 ft) DRIVE/BEARING	Part No. 400036V0002	Part No. 400036V0002	Part No. 400036V0002	Part No. 400036V0002	Part No. 400036V0002
20.0 m (70.0 ft) DRIVE/BEARING	Part No. 400036V0003	Part No. 400036V0003	Part No. 400036V0003	Part No. 400036V0003	Part No. 400036V0003
Connecting cable for optional purge gas valve					
1.5 m (5.25 ft) pump/coverter	Part No. 400038V0007	Part No. 400038V0007	Part No. 400038V0007	Part No. 400038V0007	Part No. 400038V0007
3.0 m (10.5 ft) pump/coverter	Part No. 400038V0006	Part No. 400038V0006	Part No. 400038V0006	Part No. 400038V0006	Part No. 400038V0006
10.0 m (35.0 ft) pump/coverter	Part No. 400038V0002	Part No. 400038V0002	Part No. 400038V0002	Part No. 400038V0002	Part No. 400038V0002
20.0 m (XX.X ft) pump/coverter	Part No. 400038V0009	Part No. 400038V0009	Part No. 400038V0009	Part No. 400038V0009	Part No. 400038V0009

[1] further connecting cables can be found under MAG.DRIVE digital in the section “Turbomolecular Pumps with Magnetic Rotor Suspension”, para. “Electronic Frequency Converters”

Notes

TURBOVAC MAG W 1500 CT





Top view

		a	a_1	a_2	a_3	a_4	a_5	b	b_1	b_2	d	d_1	d_2
200 ISO-F	mm	164.5	159	116.5	M8 x 15	32	9	182	3	150	285	260	213
	in.	6.48	6.26	4.59	M8 x 0.6	1.26	0.35	7.17	0.12	5.91	11.22	10.24	8.39
250 ISO-F	mm	164.5	159	116.5	M8 x 15	32	9	182	3	150	335	310	261
	in.	6.48	6.26	4.59	M8 x 0.6	1.26	0.35	7.17	0.12	5.91	11.22	12.20	10.28

		d_3	d_4	d_5	d_6	h	h_1	h_2	h_3	h_4	h_5	h_6	h_7
200 ISO-F	mm	262	175	285	243	307	296	279	231	200	16	84	118
	in.	10.31	6.89	11.22	9.57	12.09	11.65	10.98	9.09	7.87	0.63	3.31	4.65
250 ISO-F	mm	262	175	285	243	307	296	279	231	200	16	84	118
	in.	10.31	6.89	11.22	9.57	12.09	11.65	10.98	9.09	7.87	0.63	3.31	4.65

Dimensional drawing for the TURBOVAC MAG W 1500 CT

Typical Applications

- All major semiconductor processes such as Etch, CVD, PVD and Ion Implantation

Technical Features

- Active 5-axis magnetic bearing system
- Bearing and temperature system are controlled digitally
- Corrosion resistant
- Low noise and vibration levels
- Operation in any orientation
- Compound rotor design for high pumping speed and foreline pressure
- Integrated purge gas system
- CT versions: Integrated temperature management system
- Intelligent power control system

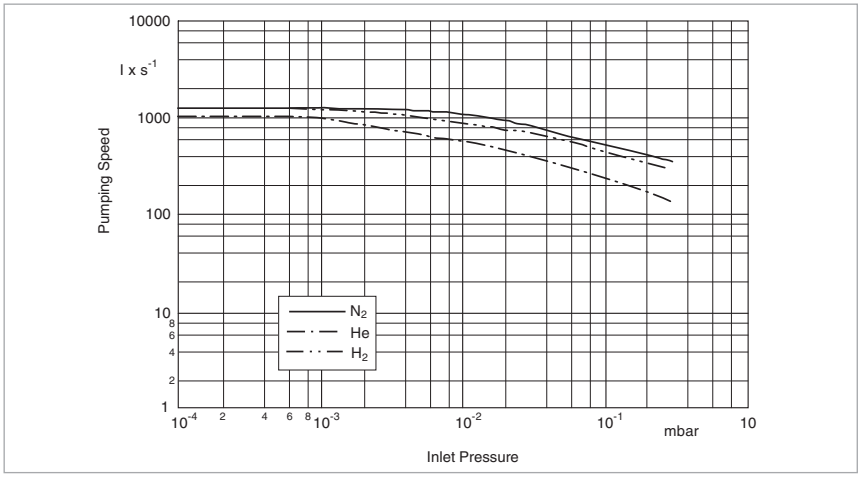
Advantages to the User

- Maintenance-free
- High throughput for all process gases
- High pumping speed at low pressure
- High foreline pressure tolerance: up to 2.6 mbar (1.95 Torr)
- High resistance against corrosive gases
- Robust against particles and deposits
- Temperature control up to 90 °C (194 °F) to avoid condensation
- Lowest weight and size in its class
- Application specific design

Technical Data

TURBOVAC MAG W 1500 CT

Inlet flange DN	200 ISO-F	250 ISO-F	200 CF
Pumping speed according to PNEUROP			
N_2 l x s^{-1}	1100	1220	1100
He l x s^{-1}	1000	1180	1000
H_2 l x s^{-1}	800	850	800
Speed min^{-1}	36 000	36 000	36 000
Compression ratio			
N_2	> 10^8	> 10^8	> 10^8
Ultimate pressure according to DIN 28 400 mbar (Torr)	< 10^{-8} (< 0.7 x 10^{-8})	< 10^{-8} (< 0.7 x 10^{-8})	< 10^{-10} (< 0.7 x 10^{-8})
Max. foreline pressure for N_2 mbar (Torr)	2.6 (1.95)	2.6 (1.95)	2.6 (1.95)
Recommended forevacuum pump Rotary vane pump or dry compressing pump offering a pumping speed of 100 m^3/h	TRIVAC D 65 BCS	TRIVAC D 65 BCS	TRIVAC D 65 BCS
Run-up time to 95% speed min	< 6	< 6	< 6
forevacuum flange DN	40 KF	40 KF	40 KF
Purge / vent port VCR nut	1/4"	1/4"	1/4"
Cooling water connection, hose nipple (OD tube) mm (in.)	6.4 (0.25)	6.4 (0.25)	6.4 (0.25)
Weight, approx. kg (lbs)	32 (70.6)	32 (70.6)	32 (70.6)



Pumping speed of the TURBOVAC MAG W 1500 CT (DN 250) as a function of the inlet pressure

Ordering Information

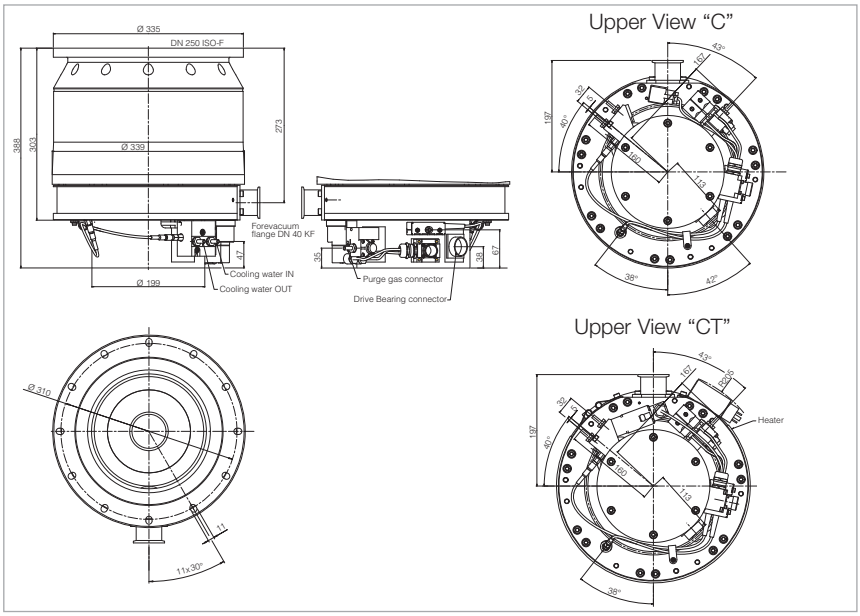
TURBOVAC MAG W 1500 CT

Inlet flange DN	200 ISO-F	250 ISO-F	200 CF
TURBOVAC MAG turbomolecular pump	**Part No. 400026V0002**	**Part No. 400027V0002**	**Part No. 400030V0002**
Electronic frequency converter			
MAG.DRIVE digital	**Part No. 400035V0011**	**Part No. 400035V0011**	**Part No. 400035V0011**
with Profibus interface	**Part No. 400035V0013**	**Part No. 400035V0013**	**Part No. 400035V0013**
with RS 232 C interface	**Part No. 400035V0014**	**Part No. 400035V0014**	**Part No. 400035V0014**
with Ethernet interface	**Part No. 400035V0015**	**Part No. 400035V0015**	**Part No. 400035V0015**
with DeviceNet interface	**Part No. 400035V0016**	**Part No. 400035V0016**	**Part No. 400035V0016**
Plug-in control	**Part No. 121 36**	**Part No. 121 36**	**Part No. 121 36**
Connecting cable converter – pump [1)]			
1.5 m (5.25 ft) DRIVE/BEARING	**Part No. 400036V0001**	**Part No. 400036V0001**	**Part No. 400036V0001**
1.5 m (5.25 ft) TMS	**Part No. 400037V0001**	**Part No. 400037V0001**	**Part No. 400037V0001**
3.0 m (10.5 ft) DRIVE/BEARING	**Part No. 400036V0008**	**Part No. 400036V0008**	**Part No. 400036V0008**
3.0 m (10.5 ft) TMS	**Part No. 400037V0008**	**Part No. 400037V0008**	**Part No. 400037V0008**
5 m (17.5 ft) DRIVE/BEARING	**Part No. 400036V0004**	**Part No. 400036V0004**	**Part No. 400036V0004**
5 m (17.5 ft) TMS	**Part No. 400037V0004**	**Part No. 400037V0004**	**Part No. 400037V0004**
10 m (35.0 ft) DRIVE/BEARING	**Part No. 400036V0002**	**Part No. 400036V0002**	**Part No. 400036V0002**
10 m (35.0 ft) TMS	**Part No. 400037V0002**	**Part No. 400037V0002**	**Part No. 400037V0002**
20 m (70.0 ft) DRIVE/BEARING	**Part No. 400036V0003**	**Part No. 400036V0003**	**Part No. 400036V0003**
20 m (70.0 ft) TMS	**Part No. 400037V0003**	**Part No. 400037V0003**	**Part No. 400037V0003**
Seal kit DN 250 metal	**Part No. 200 07 901**	**Part No. 200 07 901**	**Part No. 200 07 901**

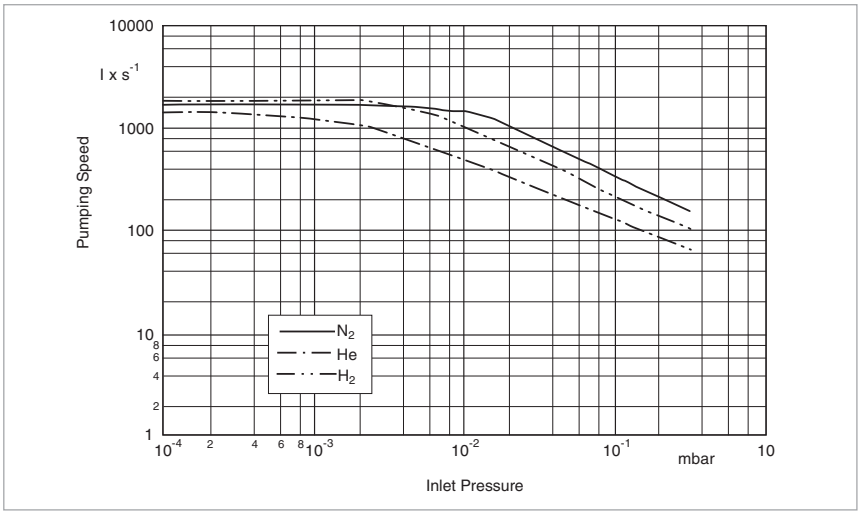
[1)] further connecting cables can be found under MAG.DRIVE digital in the section “Turbomolecular Pumps with Magnetic Rotor Suspension”, para. “Frequency Converters”

Notes

TURBOVAC MAG W 2000 C/CT



Dimensional drawing for the MAG W 2000 C/CT



Pumping speed of the TURBOVAC MAG W 2000 CT (DN 250) as a function of the inlet pressure

Typical Applications

- All major semiconductor processes such as Etch, CVD, PVD and Ion Implantation

Technical Features

- Active 5-axis magnetic bearing system
- Patented KEPLA-COAT® for rotor and stator to prevent corrosion
- Low noise and vibration levels
- Installation in any orientation
- Compound rotor design for high pumping speed and foreline pressure
- Integrated purge gas system
- CT versions: Integrated temperature management system

Advantages to the User

- Maintenance-free
- High throughput for all etch gases
- High pumping speed at low pressure
- High foreline pressure tolerance: up to 5.3 mbar (4 Torr)
- High resistance against corrosive gases
- Robust against particles and deposits
- Temperature management system to avoid condensation
- Application specific design

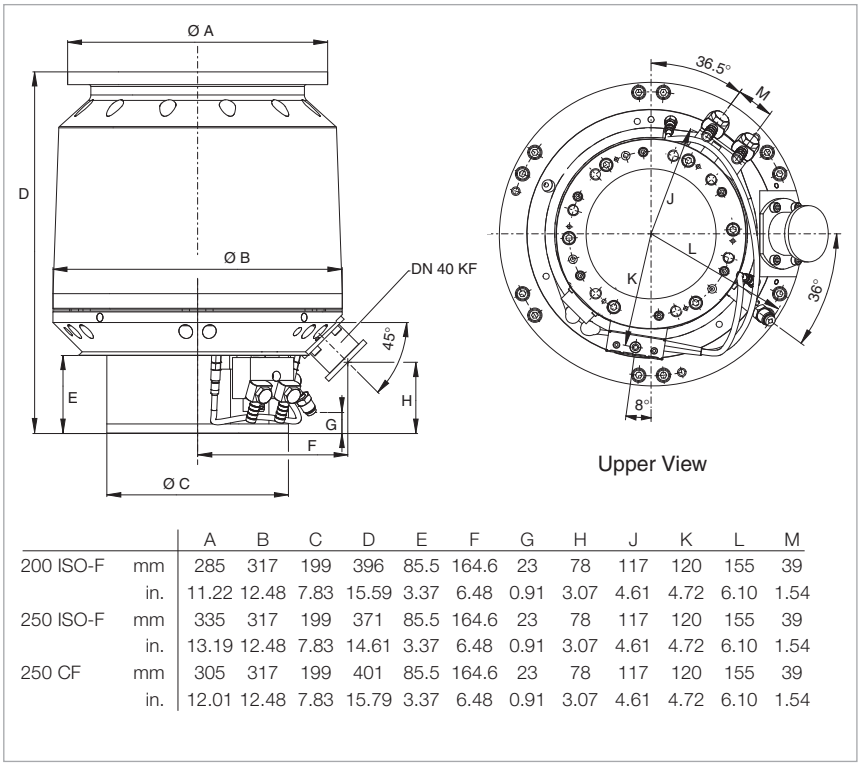
Technical Data

		TURBOVAC MAG	
		W 2000 C	**W 2000 CT**
Inlet flange	DN	250 ISO-F	250 ISO-F
Pumping speed according to PNEUROP			
N_2	l x s^{-1}	1650	1650
He	l x s^{-1}	1800	1800
H_2	l x s^{-1}	1720	1720
Speed	min^{-1}	28 800	28 800
Compression ratio			
N_2		> 10^8	> 10^8
Ultimate pressure according to DIN 28 400	mbar (Torr)	< 10^{-8} (< 0.75 x 10^{-8})	< 10^{-8} (< 0.75 x 10^{-8})
Max. foreline pressure for N_2	mbar (Torr)	3.5 (2.63)	3.5 (2.63)
Recommended forevacuum pump Rotary vane pump or dry compressing pump offering a pumping speed of 100 m^3/h		TRIVAC D 65 BCS	TRIVAC D 65 BCS
Run-up time	min	< 8	< 8
forevacuum flange	DN	40 KF	40 KF
Purge / vent port	VCR nut	1/4"	1/4"
Cooling water connection (OD tube)	mm (in.)	6,4 (0.25)	6.4 (0.25)
Weight, approx.	kg (lbs)	68 (150)	68 (150)

Ordering Information

	TURBOVAC MAG	
	W 2000 C	**W 2000 CT**
TURBOVAC MAG turbomolecular pump	**Part No. 400047V0001**	**Part No. 400047V0002**
Electronic frequency converter		
MAG.DRIVE digital	**Part No. 400035V0011**	**Part No. 400035V0011**
with Profibus interface	**Part No. 400035V0013**	**Part No. 400035V0013**
with RS 232 C interface	**Part No. 400035V0014**	**Part No. 400035V0014**
with Ethernet interface	**Part No. 400035V0015**	**Part No. 400035V0015**
with DeviceNet interface	**Part No. 400035V0016**	**Part No. 400035V0016**
Plug-in control	**Part No. 121 36**	**Part No. 121 36**
Connecting cable converter – pump		
1.5 m (5.25 ft) DRIVE/BEARING	**Part No. 400036V0001**	**Part No. 400036V0001**
1.5 m (5.25 ft) TMS	**Part No. 400037V0001**	**Part No. 400037V0001**
3.0 m (10.5 ft) DRIVE/BEARING	**Part No. 400036V0008**	**Part No. 400036V0008**
3.0 m (10.5 ft) TMS	**Part No. 400037V0008**	**Part No. 400037V0008**
5.0 m (17.5 ft) DRIVE/BEARING	**Part No. 400036V0004**	**Part No. 400036V0004**
5.0 m (17.5 ft) TMS	**Part No. 400037V0004**	**Part No. 400037V0004**
10.0 m (35.0 ft) DRIVE/BEARING	**Part No. 400036V0002**	**Part No. 400036V0002**
10.0 m (35.0 ft) TMS	**Part No. 400037V0002**	**Part No. 400037V0002**
20.0 m (70.0 ft) DRIVE/BEARING	**Part No. 400036V0003**	**Part No. 400036V0003**
20.0 m (70.0 ft) TMS	**Part No. 400037V0003**	**Part No. 400037V0003**

TURBOVAC MAG W 2200 C



		A	B	C	D	E	F	G	H	J	K	L	M
200 ISO-F	mm	285	317	199	396	85.5	164.6	23	78	117	120	155	39
	in.	11.22	12.48	7.83	15.59	3.37	6.48	0.91	3.07	4.61	4.72	6.10	1.54
250 ISO-F	mm	335	317	199	371	85.5	164.6	23	78	117	120	155	39
	in.	13.19	12.48	7.83	14.61	3.37	6.48	0.91	3.07	4.61	4.72	6.10	1.54
250 CF	mm	305	317	199	401	85.5	164.6	23	78	117	120	155	39
	in.	12.01	12.48	7.83	15.79	3.37	6.48	0.91	3.07	4.61	4.72	6.10	1.54

Dimensional drawing for the TURBOVAC MAG W 2200 C

Typical Applications

- All major semiconductor processes such as Etch, CVD, PVD and Ion Implantation
- Coaters

Versions with CF highvacuum connection

- Particle accelerators
- Research instruments and systems

Technical Features

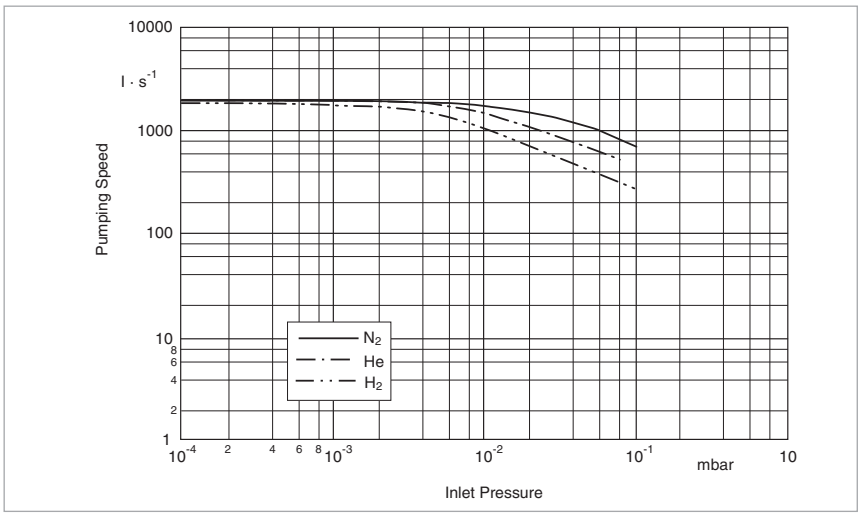
- Active 5-axis magnetic bearing system
- Bearing system are controlled digitally
- Low noise and vibration levels
- Operation in any orientation
- Compound rotor design for high pumping speed and foreline pressure
- purge gas connection
- Intelligent power control system

Advantages to the User

- Maintenance-free
- High throughput for all process gases
- High pumping speed at low pressure
- High foreline pressure tolerance: up to 2 mbar (1.5 Torr)
- Lowest weight and size in its class
- Application specific design

Technical Data

		TURBOVAC MAG W 2200 C		TURBOVAC MAG W 2200
Inlet flange	**DN**	200 ISO-F	250 ISO-F	250 CF
Pumping speed according to PNEUROP				
N_2	**l x s^{-1}**	1600	2000	1800
Ar	**l x s^{-1}**	1450	1900	1900
H_2	**l x s^{-1}**	1650	1800	1800
Speed	**min^{-1}**	29 400	29 400	29 400
Compression ratio				
N_2		> 1 x 10^8	> 1 x 10^8	> 1 x 10^8
Ultimate pressure according to DIN 28 400	**mbar (Torr)**	< 10^{-8} (< 0.75 x 10^{-8})	< 10^{-8} (< 0.75 x 10^{-8})	< 1 x 10^{-10} (< 0.75 x 10^{-10})
Max. foreline pressure for N_2				
with convection cooling	**mbar (Torr)**	–	–	0.1 (0.075)
with water cooling	**mbar (Torr)**	2 (1.5)	2 (1.5)	1 (0.75)
Recommended forevacuum pump				
Rotary vane pump		TRIVAC D 65 BCS	TRIVAC D 65 BCS	TRIVAC D 65 BCS
or dry compressing pump				
offering a pumping speed of 100 m^3/h				
Run-up time to 95% speed	**min**	< 8	< 8	< 8
forevacuum flange	**DN**	40 KF	40 KF	40 KF
Purge / vent port	**VCR nut**	1/4"	1/4"	1/4"
Cooling water connection				
(OD tube)	**mm (in.)**	1/2"	1/2"	1/2"
Weight, approx.	**kg (lbs)**	48 (106)	48 (106)	60 (132.45)



Pumping speed of the TURBOVAC MAG W 2200 C (DN 250) as a function of the inlet pressure

Ordering Information

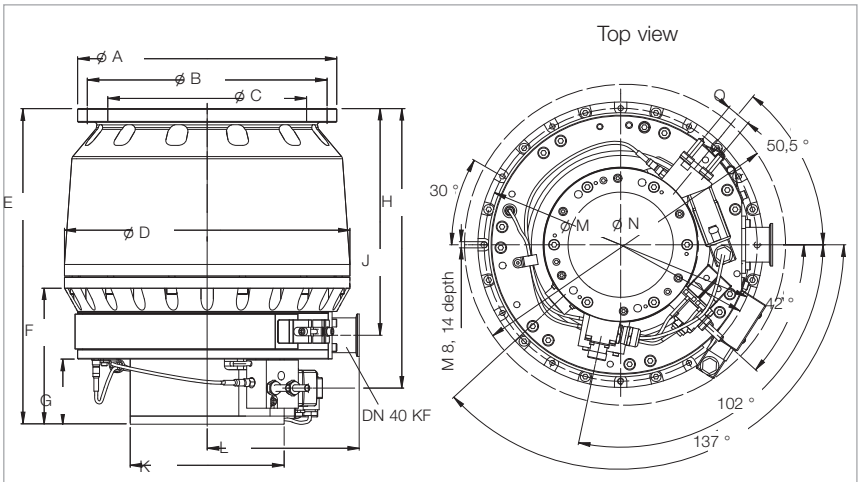
	TURBOVAC MAG		
	W 2200 C		W 2200
TURBOVAC MAG turbomolecular pump	**Part No. 400081V0011**	**Part No. 400081V0021**	**Part No. 400081V0061**
Electronic frequency converter			
MAG.DRIVE digital	**Part No. 400035V0011**	**Part No. 400035V0011**	**Part No. 400035V0011**
with Profibus interface	**Part No. 400035V0013**	**Part No. 400035V0013**	**Part No. 400035V0013**
with RS 232 C interface	**Part No. 400035V0014**	**Part No. 400035V0014**	**Part No. 400035V0014**
with Ethernet interface	**Part No. 400035V0015**	**Part No. 400035V0015**	**Part No. 400035V0015**
with DeviceNet interface	**Part No. 400035V0016**	**Part No. 400035V0016**	**Part No. 400035V0016**
Plug-in control	**Part No. 121 36**	**Part No. 121 36**	**Part No. 121 36**
Connecting cable converter – pump [1)]			
1.5 m (5.25 ft) DRIVE/BEARING	**Part No. 400036V0001**	**Part No. 400036V0001**	**Part No. 400036V0001**
3.0 m (10.5 ft) DRIVE/BEARING	**Part No. 400036V0008**	**Part No. 400036V0008**	**Part No. 400036V0008**
10.0 m (35.0 ft) DRIVE/BEARING	**Part No. 400036V0002**	**Part No. 400036V0002**	**Part No. 400036V0002**
20.0 m (70.0 ft) DRIVE/BEARING	**Part No. 400036V0003**	**Part No. 400036V0003**	**Part No. 400036V0003**
Connection cable for optional seal gas valve			
1.5 m pump/converter	**Part No. 400038V0007**	**Part No. 400038V0007**	**Part No. 400038V0007**
3.0 m pump/converter	**Part No. 400038V0006**	**Part No. 400038V0006**	**Part No. 400038V0006**
10.0 m pump/converter	**Part No. 400038V0002**	**Part No. 400038V0002**	**Part No. 400038V0002**
20.0 m pump/converter	**Part No. 400038V0009**	**Part No. 400038V0009**	**Part No. 400038V0009**

[1)] further connecting cables can be found under MAG.DRIVE digital in the section “Turbomolecular Pumps with Magnetic Rotor Suspension”, para. “Electronic Frequency Converters”

Notes

TURBOVAC MAG W 2800/3200 C/CT

TURBOVAC MAG W 2800 CT (left) and TURBOVAC MAG W 3200 CT (right)



		A	B	C	D	E	F	G	H	J
250 ISO-F	mm	335	310	261	369	408	176	89	361	293
	in.	13.19	12.2	10.28	14.53	16.06	6.93	3.50	14.21	11.54
250 CF	mm	305	284	268	369	422	176	89	361	248
	in.	12.01	11.18	10.55	14.53	16.61	6.93	3.50	14.21	9.76
320 ISO-F	mm	425	395	318	369	363	176	89	361	248
	in.	16.73	15.55	12.52	14.53	14.29	6.93	3.50	14.21	9.76

		K	L	M	N	O
250 ISO-F	mm	199	196.5	353	415	32
	in.	7.83	7.74	13.9	16.34	1.26
250 CF	mm	199	196.5	353	415	32
	in.	7.83	7.74	13.9	16.34	1.26
320 ISO-F	mm	199	196.5	353	415	32
	in.	7.83	7.74	13.9	16.34	1.26

Dimensional drawing for the TURBOVAC MAG W 2800/3200 C/CT

Typical Applications

- All major semiconductor processes such as Etch, CVD, PVD and Ion Implantation

Versions with CF highvacuum connection

- Particle accelerators
- Research instruments and systems

Technical Features

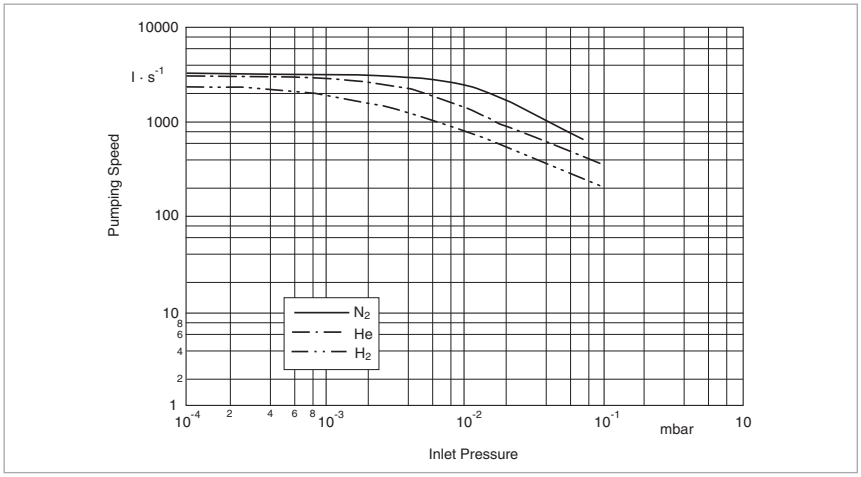
- Active 5-axis magnetic bearing system
- Bearing and temperature system are controlled digitally
- Corrosion resistant
- Low noise and vibration levels
- Installation in any orientation
- Compound rotor design for high pumping speed and foreline pressure
- Integrated purge gas system
- CT versions: Integrated temperature management system
- Intelligent power control system

Advantages to the User

- Maintenance-free
- High throughput for all process gases
- High pumping speed at low pressure
- High foreline pressure tolerance: up to 2 mbar (1.5 Torr)
- High resistance against corrosive gases
- Robust against particles and deposits
- Temperature control up to 90 °C (194 °F) to avoid condensation
- Lowest weight and size in its class
- Application specific design

Technical Data

	TURBOVAC MAG			
	W 2800 C	**W 2800 CT**	**W 2800**	**W 3200 CT**
Inlet flange DN	250 ISO-F	250 ISO-F	250 CF	320 ISO-F
Pumping speed according to PNEUROP				
N_2 l x s^{-1}	2650	2650	2400	3200
Ar l x s^{-1}	2450	2450	2450	3000
H_2 l x s^{-1}	2100	2100	2100	2250
Speed min^{-1}	28 800	28 800	28 800	28 800
Compression ratio				
N_2	1 x 10^8	1 x 10^8	1 x 10^9	1 x 10^8
Ultimate pressure according to DIN 28 400				
mbar (Torr)	< 10^{-8} (< 0.75 x 10^{-8})	< 10^{-8} (< 0.75 x 10^{-8})	< 1 x 10^{-10} (< 0.75 x 10^{-10})	< 10^{-8} (< 0.75 x 10^{-8})
Max. foreline pressure for N_2				
with convection cooling mbar (Torr)	–	–	0.3 (0.23)	–
with water cooling mbar (Torr)	2 (1.5)	2 (1.5)	3 (2.25)	2 (1.5)
Recommended forevacuum pump Rotary vane pump or dry compressing pump offering a pumping speed of 100 m^3/h	TRIVAC D 65 BCS	TRIVAC D 65 BCS	TRIVAC D 65 BCS	TRIVAC D 65 BCS
Run-up time min	< 10	< 10	< 10	< 10
Forevacuum flange DN	40 KF	40 KF	40 KF	40 KF
Purge / vent port VCR nut	1/4"	1/4"	1/4"	1/4"
Cooling water connection Swagelok tube	1/4"	1/4"	1/4"	1/4"
Weight, approx. kg (lbs)	64 (141.3)	64 (141.3)	75 (165.6)	65 (143.5)



Pumping speed of the TURBOVAC MAG W 3200 C (DN 320) as a function of the inlet pressure

Ordering Information

	TURBOVAC MAG			
	W 2800 C	W 2800 CT	W 2800	W 3200 CT
Inlet flange DN	250 ISO-F	250 ISO-F	250 CF	320 ISO-F
TURBOVAC MAG turbomolecular pump	Part No. 400000V0001	Part No. 400000V0002	Part No. 400006V0071	Part No. 400003V0002
Electronic frequency converter				
MAG.DRIVE digital	Part No. 400035V0011	Part No. 400035V0011	Part No. 400035V0011	Part No. 400035V0011
with Profibus interface	Part No. 400035V0013	Part No. 400035V0013	Part No. 400035V0013	Part No. 400035V0013
with RS 232 C interface	Part No. 400035V0014	Part No. 400035V0014	Part No. 400035V0014	Part No. 400035V0014
with Ethernet interface	Part No. 400035V0015	Part No. 400035V0015	Part No. 400035V0015	Part No. 400035V0015
with DeviceNet interface	Part No. 400035V0016	Part No. 400035V0016	Part No. 400035V0016	Part No. 400035V0016
Plug-in control	Part No. 121 36	Part No. 121 36	Part No. 121 36	Part No. 121 36
Connecting cable converter – pump [1]				
1.5 m (5.25 ft) DRIVE/BEARING	Part No. 400036V0001	Part No. 400036V0001	Part No. 400036V0001	Part No. 400036V0001
1.5 m (5.25 ft) TMS	Part No. 400037V0001	Part No. 400037V0001	–	Part No. 400037V0001
3.0 m (10.5 ft) DRIVE/BEARING	Part No. 400036V0008	Part No. 400036V0008	Part No. 400036V0008	Part No. 400036V0008
3.0 m (10.5 ft) TMS	Part No. 400037V0008	Part No. 400037V0008	–	Part No. 400037V0008
5.0 m (17.5 ft) DRIVE/BEARING	Part No. 400036V0004	Part No. 400036V0004	Part No. 400036V0004	Part No. 400036V0004
5.0 m (17.5 ft) TMS	Part No. 400037V0004	Part No. 400037V0004	–	Part No. 400037V0004
10.0 m (35.0 ft) DRIVE/BEARING	Part No. 400036V0002	Part No. 400036V0002	Part No. 400036V0002	Part No. 400036V0002
10.0 m (35.0 ft) TMS	Part No. 400037V0002	Part No. 400037V0002	–	Part No. 400037V0002
20.0 m (70.0 ft) DRIVE/BEARING	Part No. 400036V0003	Part No. 400036V0003	Part No. 400036V0003	Part No. 400036V0003
20.0 m (70.0 ft) TM	Part No. 400037V0003	Part No. 400037V0003	–	Part No. 400037V0003
Seal kit				
DN 250 metal	Part No. 200 07 901	Part No. 200 07 901	Part No. 200 07 901	Part No. 200 07 901

[1] further connecting cables can be found under MAG.DRIVE digital in the section “Turbomolecular Pumps with Magnetic Rotor Suspension”, para. “Electronic Frequency Converters”

Notes

Electronic Frequency Converters MAG.DRIVE digital

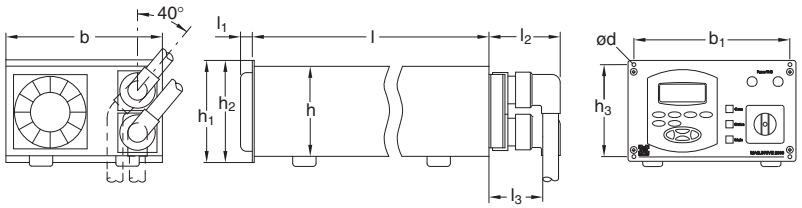
MAG.DRIVE digital without plug-in control

MAG.DRIVE digital with plug-in control

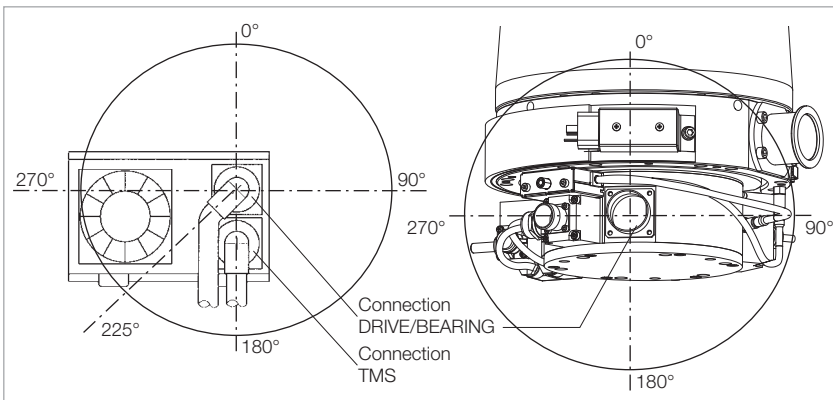
Advantages to the User

- Operation of turbomolecular pumps with magnetically levitated rotors:
  MAG (W) 830/1300 C,
  MAG (W) 1500 C/CT,
  MAG (W) 2000 C/CT,
  MAG (W) 2200 C und
  MAG (W) 2800/3200 C/CT
- Easy operation through the controls or the use of plug-in control unit
- Communication to host computer of the customer via serial interface and conventional interface possible
- Setting of speed, temperature of the basic flange and other functions
- Warning in case the pump is running out of specification
- Storing of all parameters in the pump's memory
- Plug-in control
- Small size and low weight
- Integrated fan
- Integrated temperature management system magnetic bearing control system

	b	b_1	d	h	h_1	h_2	h_3	l	l_1	l_2	l_3
mm	213	198	3.3	113	135	128	122.4	455	27	100	70
in.	8.39	7.80	0.13	4.45	5.31	5.04	4.82	17.91	1.06	3.94	2.76



Dimensional drawing for the MAG.DRIVE digital



Overview connection lines

Technical Data

		MAG.DRIVE digital
Mains connection, 50/60 Hz	V	200 - 240, +10%/-15%
Current for connected consumers, max.	A	20
Max. motor voltage	V	60
Nominal frequency	Hz	50/60
Permissible ambient temperature	°C (°F)	0 to +45 (+32 to +113)
Dimensions (W x H x D)	mm (in.)	483 x 213 x 1/2 19" (19.02 x 8.39 x 1/2 19")
Weight, approx.	kg (lbs)	10 (22)

Ordering Information

	MAG.DRIVE digital
Electronic Frequeny Converter	
MAG.DRIVE digital	**Part No. 400035V0011**
with Profibus interface	**Part No. 400035V0013**
with RS 232 C interface	**Part No. 400035V0014**
with Ethernet interface	**Part No. 400035V0015**
with DeviceNet interface	**Part No. 400035V0016**
Plug-in control	**Part No. 121 36**
Connection line leading to the DRIVE/BEARING of the TURBOVAC MAG ... C/CT	

	Cable outlet frequency converter	Cable outlet pump		
	DRIVE/BEARING	DRIVE/BEARING	PK	
1.5 m (5.25 ft)	bended 225°	straight	straight	**Part No. 400036V0001**
1.5 m (5.25 ft)	bended 40°	bended 180°	straight	**Part No. 400036V0025**
3.0 m (10.5 ft)	straight	bended 180°	straight	**Part No. 400036V0006**
3.0 m (10.5 ft)	bended 225°	straight	straight	**Part No. 400036V0008**
3.0 m (10.5 ft)	straight	bended 270°	straight	**Part No. 400036V0009**
5.0 m (17.5 ft)	bended 225°	straight	straight	**Part No. 400036V0004**
5.0 m (17.5 ft)	straight	straight	straight	**Part No. 400036V0010**
8.0 m (28.0 ft)	bended 225°	straight	straight	**Part No. 400036V0005**
10.0 m (35.0 ft)	bended 225°	straight	straigh	**Part No. 400036V0002**
20.0 m (70.0 ft)	bended 225°	straight	straight	**Part No. 400036V0003**
23.0 m (80.5 ft)	bended 225°	straight	straight	**Part No. 400036V0012**
30.0 m (105 ft)	bended 225°	straight	straight	**Part No. 400036V0011**

TMS
(only for CT versions)

	Cable outlet frequency converter	Cable outlet pump		
	TMS	TMS	Heater	
1.5 m (5.25 ft)	bended 225°	straight	bended 180°	**Part No. 400037V0001**
1.5 m (5.25 ft)	bended 40°	straight	bended 180°	**Part No. 400037V0025**
3.0 m (10.5 ft)	bended 225°	straight	bended 180°	**Part No. 400037V0008**
5.0 m (17.5 ft)	bended 225°	straight	bended 180°	**Part No. 400037V0004**
8.0 m (28.0 ft)	bended 225°	straight	bended 180°	**Part No. 400037V0005**
10.0 m (35.0 ft)	bended 225°	straight	bended 180°	**Part No. 400037V0002**
20.0 m (70.0 ft)	bended 225°	straight	bended 180°	**Part No. 400037V0003**

Purge / Vent (only for optional purge vent valve Part No. 121 33)

	Cable outlet frequency converter	Cable outlet pump		
	TMS	Purge	Vent	
1.5 m (5.25 ft)	straight	bended	bended	**Part No. 400038V0007**
3.0 m (10.5 ft)	bended 225°	bended	bended	**Part No. 400038V0006**
10.0 m (35.0 ft)	bended 225°	bended	bended	**Part No. 400038V0002**
20.0 m (70.0 ft)	straight	bended	bended	**Part No. 400038V0009**

Connector for hardware interface	**upon request**
19" installation frame	**Part No. 161 00**

(Miscellaneous) Accessories

Vibration Absorber

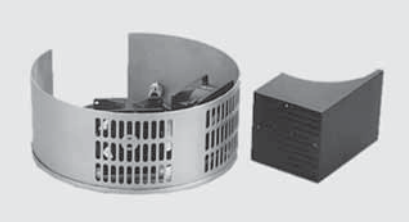
Vibration absorbers are used to inhibit the propagation of vibrations from the turbomolecular pump to highly sensitive instruments like electron beam microscopes, micro-balances or analytical instruments.

Ordering Information

	Vibration Absorber
Vibration absorber	
DN 63 ISO-K 66 mm (2.60 in.) long	**Part No. 800131V0063**
DN 63 CF 81 mm (3.19 in.) long	**Part No. 500 070**
DN 100 ISO-K 84 mm (3.31 in.) long	**Part No. 800131V0100**
DN 100 CF 100 mm (4.09 in.) long	**Part No. 500 071**
DN 160 ISO-K 84 mm (3.31 in.) long	**Part No. 500 073**
DN 160 CF 104 mm (4.09 in.) long	**Part No. 500 072**

Air Cooling Unit

Also an air cooling unit is available as a retrofit kit for convection cooling of the TURBOVAC 50 pump with air. This kit can be easily fitted to the pump in each case using the mounting components contained in the kit.



Technical Data

		Air Cooling Unit
Rated power consumption of the air cooling unit when connected to		
TURBOVAC 50, 151 (C)/361 (C)	W	10.5
TURBOVAC 600 C, 1000 C	W	21.0

Ordering Information

	Air Cooling Unit		
Air cooling unit for	230 V	110 V	100 V
TURBOVAC 50	**Part No. 854 05**	**Part No. 854 06**	**Part No. 800152V0015**
TURBOVAC 151 (C)/361 (C)	**Part No. 855 31**	**Part No. 894 08**	**Part No. 800152V0016**
TURBOVAC 600 C, 1000 C	**Part No. 855 41**	**Part No. 170 016**	**Part No. 800152V0017**

Flange Heaters for CF Highvacuum Flanges

Most TURBOVAC pumps can be baked out in order to improve the ultimate pressure attained in the UHV range. Degassing of the turbo-molecular pump will only be useful when simultaneously baking out the vacuum chamber.

Technical Data		Flange Heater
Rated power consumption of the flange heater		
DN 63 CF, DN 100 CF	W	100
DN 160 CF	W	150

Ordering Information	Flange Heater	
Flange heater	230 V	110 V
DN 63 CF	**Part No. 854 04**	**Part No. 854 07**
DN 100 CF	**Part No. 854 27**	**Part No. 854 28**
DN 160 CF	**Part No. 854 37**	**Part No. 854 38**

Fine Filter

A fine filter integrated in the centering ring protects the pump against particles and dust on the highvacuum side.

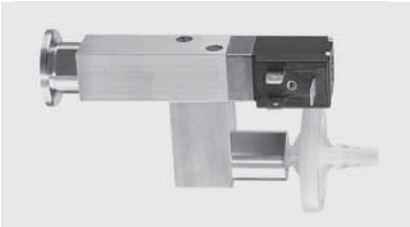
Ordering Information	Fine Filter
Connection flange of the fine filter	
DN 40 KF	**Part No. 883 98**
DN 63 ISO-K	**Part No. 887 20**
DN 100 ISO-K	**Part No. 887 21**

The following accessories are also available:

Vacuum gauge COMBIVAC 2T
Part No. 230 000
(see Product Section C16)

Delayed venting unit
Part No. 500 441
(see Product Section C10)

Solenoid Venting Valve



Technical Data		Venting Valve
Drive voltage	V DC	24
Power consumption	W	4
Connecting flange	DN	16 ISO-KF
Weight, approx.	kg (lbs)	0.3 (0.66)

Ordering Information	Venting Valve
Solenoid venting valve, normally closed	**Part No. 800120V0011**

Further vent valves available in US. Please contact your US sales office

Power Failure Venting Valve

Technical Data		Power Failure Venting Valve
Drive voltage	V DC	24
Power consumption	W	4
Connecting flange	DN	16 ISO-KF
Weight, approx.	kg (lbs)	0.3 (0.66)

Ordering Information	Power Failure Venting Valve
Power failure venting valve, normally open	**Part No. 800120V0021**

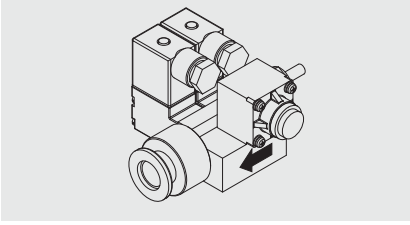
Further vent valves available in US. Please contact your US sales office

Purge Gas and Venting Valve

Technical Data		Purge Gas and Venting Valve
Connecting flange	DN	10 ISO-KF
Weight, approx.	kg (lbs)	0.7 (1.55)

Ordering Information	Purge Gas and Venting Valve
Purge gas and venting valve, 230 V 0.2 mbar x l x s^{-1} (12 sccm) 0.4 mbar x l x s^{-1} (24 sccm)	**Part No. 855 19** **Part No. 855 29**
Purge gas and venting valve, 110 V 0.2 mbar x l x s^{-1} (12 sccm)	**Part No. 190 351 069**

Purge Gas and Venting Valve



Technical Data		Purge Gas and Venting Valve
Connecting flange Inlet Outlet		 1/4" pipe pump specific or DN 16 ISO-KF
Purge gas pressure, abs.	bar	1.5 to 6.0
Weight, approx.	kg (lbs)	0.5 (1.1)

Ordering Information	Purge Gas and Venting Valve
Purge gas and venting valve, 24 V DC 0.6 mbar x l x s^{-1} (36 sccm)	**Part No. 121 33**

Further 0.6 mbar x l x s^{-1} valves upon request

Accessories for Serial Interfaces RS 232 C and RS 485 C

Through these accessories many control, monitoring and information capabilities can be implemented in connection with the electronic frequency converters and turbomolecular pumps.

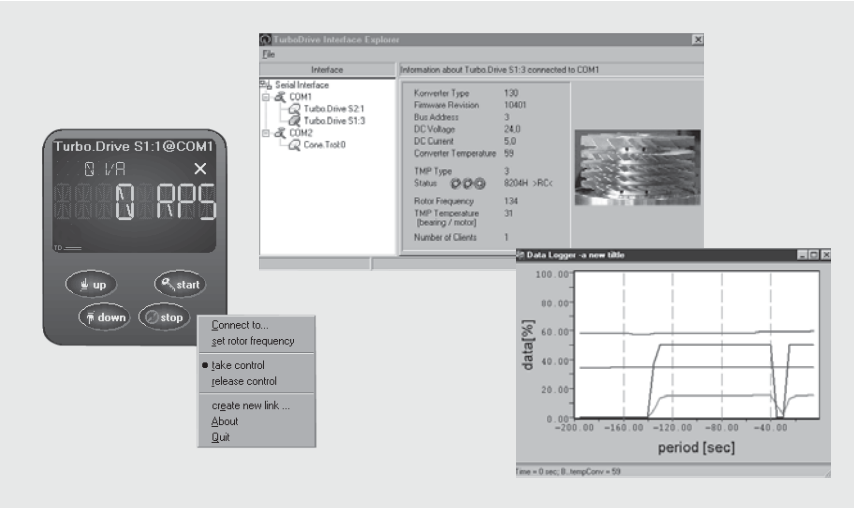
The following turbomolecular pumps or electronic frequency converters are supported:
TW 70 H / TURBO.DRIVE S
TW 250 S / TURBO.DRIVE S / TURBO.DRIVE 300
TW 300, TW 300 H / TURBO.DRIVE S / TURBO.DRIVE 300
TW 701
T 1600, TW 1600

Software

Ordering Information	Display Unit
Software „Turbo.Drive Panel“, 3.5 in. floppy [1]	**Part No. 800110V0104** [1]

[1] The panel software can be downloaded from “www.oerlikon.com“

PC Software



PC software for Windows 95 or higher

Technical Features

- Convenient graphical user inter-face
- Several turbomolecular pumps can be operated in parallel
- Display, modify, save and compare the parameter lists of the turbo-molecular pumps
- Integration of customer’s software
- Recording parameter data over time (for example, temperatures, rotor frequency)

Ordering Information	PC Software
PC software „Turbo.Drive Server“, CD ROM [1]	**Part No. 800110V0102** [1]

[1] The PC software can be downloaded from “www.oerlikon.com“
Software supports only RS 232 C, RS 485 C and Profibus

Adaptor RS 232 C/RS 485 C for Frequency Converter with RS 485 C Interface

Ordering Information	Adaptor RS 232 C/RS 485 C
Adaptor RS 232 C/RS 485 C, mains connection 220 V, 50 Hz, EURO plug	**Part No. 800110V0101**

Notes

Miscellaneous

Services for mechanically suspended turbomolecular pumps

Complete Refurbishing at the Service Centre

Complete refurbishing at the service centre includes the following:
Complete disassembly, cleaning, replacement of all wearing parts, mounting, electrical safety test, final test including vibration measurement

Complete Refurbishing with Decontamination at the Service Centre

Complete refurbishing with decontamination at the service centre includes the following:
Complete disassembly, cleaning and decontamination, replacement of all wearing parts, mounting, electrical safety test, final test including vibration measurement

Ordering Information	Complete Refurbishing at the Service Centre	Complete Refurbishing with Decontamination at the Service Centre
For pump TURBOVAC 35 / 50D	**Part No. AS 2165**	**Part No. AS 2165 D**
TURBOVAC 50	**Part No. AS 2133**	**Part No. AS 2133 D**
TURBOVAC TW 70	**Part No. AS 2368**	**Part No. AS 2368 D**
TURBOVAC 151	**Part No. AS 2134**	**Part No. AS 2134 D**
TURBOVAC TW 250 S	**Part No. AS 2168**	**Part No. AS 2168 D**
TURBOVAC TW 300	**Part No. AS 2369**	**Part No. AS 2369 D**
TURBOVAC 361	**Part No. AS 2135**	**Part No. AS 2135 D**
TURBOVAC 600 / 1000	**Part No. AS 2136**	**Part No. AS 2136 D**
TURBOVAC TW 701 / 690	**Part No. AS 2330**	**Part No. AS 2330 D**
TURBOVAC 1100	**Part No. AS 2137**	**Part No. AS 2137 D**
TURBOVAC T (W) 1600	**Part No. AS 2329**	**Part No. AS 2329 D**

Services for magnetically levitated turbomolecular pumps

Complete Refurbishing at the Service Centre

Complete refurbishing at the service centre includes the following:
Complete disassembly, cleaning, replacement of all wearing parts, mounting, electrical safety test, final test including vibration measurement

Complete Refurbishing with Decontamination at the Service Centre

Complete refurbishing with decontamination at the service centre includes the following:
Complete disassembly, cleaning and decontamination, replacement of all wearing parts, mounting, electrical safety test, final test including vibration measurement

Ordering Information	Complete Refurbishing at the Service Centre	Complete Refurbishing with Decontamination at the Service Centre
For pump TURBOVAC 340 M	**Part No. AS 2141**	**Part No. AS 2141 D**
TURBOVAC 340 MC/MCT	**Part No. AS 2142** [1)]	**Part No. AS 2142 D** [1)]
TURBOVAC MAG 400 C/CT	**Part No. AS 2143** [1)]	**Part No. AS 2143 D** [1)]
MAG (W) 1600 / 2000	**Part No. AS 2164** [1)]	**Part No. AS 2164 D** [1)]
MAG (W) 830 / 1300 / 1500	**Part No. AS 2370** [1)]	**Part No. AS 2370 D** [1)]
MAG 900 / 1000 / 1200	**Part No. AS 2160** [1)]	**Part No. AS 2160 D** [1)]
MAG 2200	**Part No. AS 2200** [1)]	**Part No. AS 2200 D** [1)]
MAG 2800 / 3200	**Part No. AS 2800** [1)]	**Part No. AS 2800 D** [1)]

Notes

The listed services include the costs for material and working hours for standard pumps. Services for pump variants upon request.
If additional spare parts are needed for repairs, then these are invoiced separately according to a cost estimate.

[1)] including rotor replacement

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LV_00933_2007 05.07