SCIENCE
SERVICES

Edwards Vacuum Pumps

-Technical Data-

2 Technical data

Note: *To comply with CSA standards, the pump must be installed and used indoors, and within the operating conditions specified in Table 1 below.*

2.1 Operating and storage conditions

Table 1 - Operating and storage conditions

Parameter	Reference data
Ambient temperature range (operation)	12 to 40°C
Ambient temperature range (storage)	-30 to 70°C
Normal surface temperature of the pump-body *	50 to 70°C
Maximum humidity (operation)	90% RH
Maximum altitude (operation)	2000 m
Pollution degree	2
Installation category	II

** At ultimate vacuum, with ambient temperature of 20°C.*

2.2 Performance

2.2.1 General

Note: *In Table 2 and Table 3, total pressures have been measured by a capacitance diaphragm gauge on a vacuum chamber without a cold trap, as specified by Pneurop Standard 6602 (1979).*

Table 2 - General performance data

Parameter	Reference data			
High Vacuum mode ♦ performance	See Table 3			
High Throughput mode ♦ performance	See Table 4			
Suckback protection	1×10^{-5} mbar l s^{-1}, 1×10^{-3} Pa l s^{-1}			
Maximum initial pressure rise with no gas-ballast flow	1×10^{-1} mbar, 10 Pa			
	RV3	**RV5**	**RV8**	**RV12**
Maximum displacement: m^3 h^{-1}				
50 Hz electrical supply	3.7	5.8	9.7	14.2
60 Hz electrical supply	4.5	5.0	11.7	17.0
Maximum pumping speed (Pneurop 6602, 1979): m^3 h^{-1}				
50 Hz electrical supply	3.3	5.1	8.5	12.0
60 Hz electrical supply	3.9	6.2	10.0	14.2
Maximum permitted inlet pressure and gas-ballast inlet pressure				
bar gauge	0.5	0.5	0.5	0.5
Pa	1.5×10^5	1.5×10^5	1.5×10^5	1.5×10^5
Maximum permitted outlet pressure				
bar gauge	1	1	1	1
Pa	2×10^5	2×10^5	2×10^5	2×10^5

Table 3 - Performance data: High Vacuum mode

HIGH VACUUM MODE ♦									
Parameter	**Units**	**RV3**		**RV5**		**RV8**		**RV12**	
		1-phase	**3-phase**	**1-phase**	**3-phase**	**1-phase**	**3-phase**	**1-phase**	**3-phase**
Gas-ballast control closed (position '0')									
Ultimate total pressure	mbar	2×10^{-3}		2×10^{-3}		2×10^{-3}		2×10^{-3}	
	Pa	2×10^{-1}		2×10^{-1}		2×10^{-1}		2×10^{-1}	
Gas-ballast control low flow (position 'I')									
Ultimate total pressure	mbar	3×10^{-2}		3×10^{-2}		3×10^{-2}		3×10^{-2}	
	Pa	3		3		3		3	
Gas-ballast flow	l min^{-1}	5		5		5		5	
Maximum water vapour pumping rate	kg h^{-1}	0.06	0.04	0.06	0.04	0.06	0.04	0.06	0.04
Maximum water vapour inlet pressure	mbar	27	18	16	11	10	7	7	5
	Pa	2.7×10^{3}	1.8×10^{3}	1.6×10^{3}	1.1×10^{3}	1×10^{3}	7×10^{2}	7×10^{2}	5×10^{2}
Gas-ballast control high flow (position 'II')									
Ultimate total pressure	mbar	1.2×10^{-1}		1×10^{-1}		6×10^{-2}		6×10^{-2}	
	Pa	1.2×10^{1}		1×10^{1}		6		6	
Gas-ballast flow	l min^{-1}	14		14		16		16	
Maximum water vapour pumping rate	kg h^{-1}	0.22	0.12	0.22	0.12	0.22	0.20	0.29	0.25
Maximum water vapour inlet pressure	mbar	80	54	50	32	38	34	32	28
	Pa	8×10^{3}	5.4×10^{3}	5×10^{3}	3.2×10^{3}	3.8×10^{3}	3.4×10^{3}	3.2×10^{3}	2.8×10^{3}

HIGH THROUGHPUT MODE ♦									
Parameter	**Units**	**RV3**		**RV5**		**RV8**		**RV12**	
		1-phase	**3-phase**	**1-phase**	**3-phase**	**1-phase**	**3-phase**	**1-phase**	**3-phase**
Gas-ballast control closed (position '0')									
Ultimate total pressure	mbar	3×10^{-2}		3×10^{-2}		3×10^{-2}		3×10^{-2}	
	Pa	3		3		3		3	
Gas-ballast control low flow (position 'I')									
Ultimate total pressure	mbar	6×10^{-2}		6×10^{-2}		4×10^{-2}		4×10^{-2}	
	Pa	6		6		4		4	
Gas-ballast flow	l min^{-1}	5		5		5		5	
Maximum water vapour pumping rate	kg h^{-1}	0.06	0.04	0.06	0.04	0.06	0.04	0.06	0.04
Maximum water vapour inlet pressure	mbar	27	18	16	11	10	7	7	5
	Pa	2.7×10^{3}	1.8×10^{3}	1.6×10^{3}	1.1×10^{3}	1×10^{3}	7×10^{2}	7×10^{2}	5×10^{2}
Gas-ballast control high flow (position 'II')									
Ultimate total pressure	mbar	1.2×10^{-1}		1×10^{-1}		6×10^{-2}		6×10^{-2}	
	Pa	1.2×10^{1}		1×10^{1}		6		6	
Gas-ballast flow	l min^{-1}	14		14		16		16	
Maximum water vapour pumping rate	kg h^{-1}	0.22	0.12	0.22	0.12	0.22	0.20	0.29	0.25
Maximum water vapour inlet pressure	mbar	80	54	50	32	38	34	32	28
	Pa	8×10^{3}	5.4×10^{3}	5×10^{3}	3.2×10^{3}	3.8×10^{3}	3.4×10^{3}	3.2×10^{3}	2.8×10^{3}

Table 5 - Performance characteristics

MODE SELECTOR POSITION	GAS BALLAST CONTROL					
	Closed (position '0')		Low flow (position 'I')		High flow (position 'II')	
High Vacuum mode ♦	Ultimate total pressure		Ultimate total pressure		Ultimate total pressure	
	mbar	Pa	mbar	Pa	mbar	Pa
	2×10^{-3}	2×10^{-1}	3×10^{-2}	3	1.2×10^{-1} (RV3) 1.0×10^{-1} (RV5) 6×10^{-2} (RV8/12)	1.2×10^{1} (RV3) 1.0×10^{1} (RV5) 6.0 (RV8/12)
	Use for the best ultimate pressure		Maximum water vapour pumping rate		Maximum water vapour pumping rate	
			1-phase pumps	3-phase pumps	1-phase pumps	3-phase pumps
			0.06 kg h^{-1}	0.04 kg h^{-1}	0.22 kg h^{-1} (RV3/5/8) 0.29 kg h^{-1} (RV12)	0.12 kg h^{-1} (RV3/5) 0.20 kg h^{-1} (RV8) 0.25 kg h^{-1} (RV12)
High Throughput mode ♦	Ultimate total pressure		Ultimate total pressure		Ultimate total pressure	
	mbar	Pa	mbar	Pa	mbar	Pa
	3×10^{-2}	3	6×10^{-2} (RV3/5) 4×10^{-2} (RV8/12)	6 (RV3/5) 4 (RV8/12)	1.2×10^{-1} (RV3) 1.0×10^{-1} (RV5) 6×10^{-2} (RV8/12)	1.2×10^{1} (RV3) 1.0×10^{1} (RV5) 6.0 (RV8/12)
	Use for continuous inlet pressure above 50 mbar/5×10^{3} Pa		Maximum water vapour pumping rate		Maximum water vapour pumping rate	
			1-phase pumps	3-phase pumps	1-phase pumps	3-phase pumps
			0.06 kg h^{-1}	0.04 kg h^{-1}	0.22 kg h^{-1} (RV3/5/8) 0.29 kg h^{-1} (RV12)	0.12 kg h^{-1} (RV3/5) 0.20 kg h^{-1} (RV8) 0.25 kg h^{-1} (RV12)

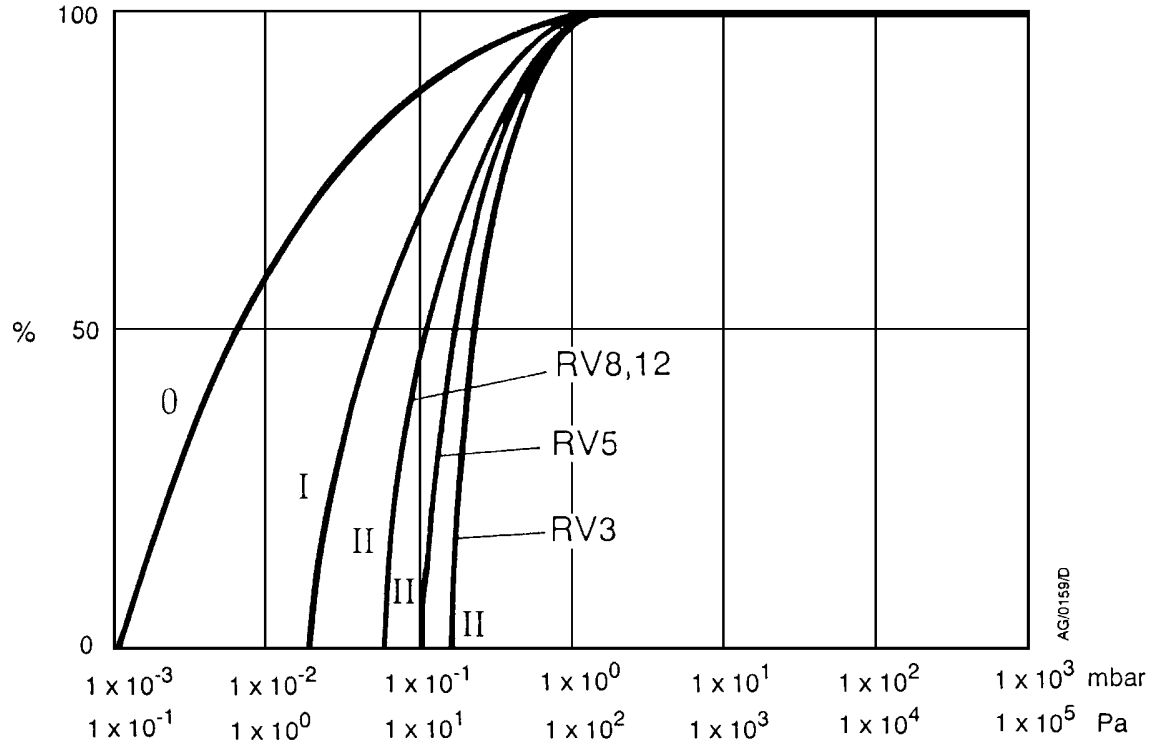
2.2.2 Performance characteristics

Note: *The performance characteristics described below are for use with hydrocarbon oil.*

The positions of the mode selector and the gas-ballast control define the performance characteristics of the pump. These performance characteristics are listed fully in Table 3 and Table 4.

Table 5 gives the ultimate vacuum and maximum water vapour inlet pressure for each of the six possible combinations of control positions. The curves 0, I, and II in Figure 2 show the relationship between inlet pressure and pumping speed for High Vacuum mode ♦

Figure 2 - Performance characteristics in High Vacuum mode (pumping speed against inlet pressure)



2.3 Mechanical data

Table 6 - Mechanical data

Parameter	Reference data			
Dimensions	See Figure 3			
Degree of protection (IEC 34-5: 1981)				
Single-phase pumps	IP44			
Three-phase pumps	IP54			
Maximum tilt angle	10°			
Motor rotational speed				
50 Hz electrical supply	1470 r min^{-1}			
60 Hz electrical supply	1760 r min^{-1}			
Maximum mass	**RV3**	**RV5**	**RV8**	**RV12**
Pumps with motor, without oil	23.3 kg	23.2 kg	26.0 kg	26.3 kg
Bareshaft pumps	14.0 kg	14.0 kg	16.5 kg	17.5 kg

2.4 Noise and vibration data

Table 7 - Noise and vibration data

Parameter	Reference data
Sound pressure*	
Single-phase pumps	48 dB (A)
Three-phase pumps	50 dB (A)
Vibration severity†	
Single-phase pumps	Class 1C
Three-phase pumps	Class 1C

* *Measured at ultimate vacuum 1 metre from the end of the pump to ISO 11201, High Vacuum mode S, 50 Hz operation.*

† *Measured at the inlet port to ISO 2372 (1974)*

2.5 Lubrication data

Note: *Edwards Material Safety Data sheets for the rotary pump oils are available on request.*

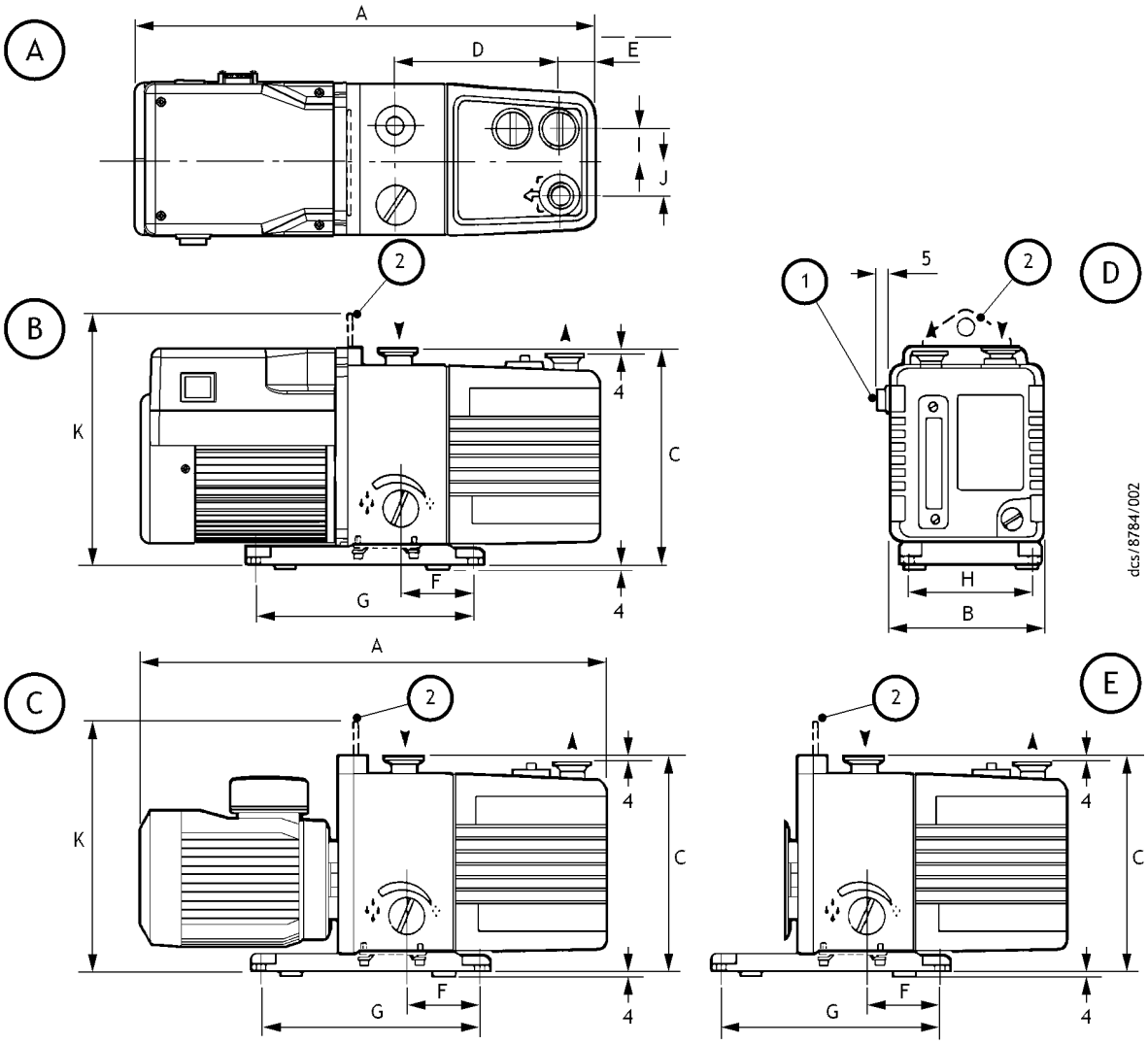
Table 8 - Lubrication data

Parameter	Reference data			
Recommended oil*				
Hydrocarbon-prepared pumps	Edwards Ultragrade 19			
PFPE-prepared pumps	Krytox 1506 or Fomblin 06/6			
Oil capacity	**RV3**	**RV5**	**RV8**	**RV12**
Maximum	0.70 litres	0.70 litres	0.75 litres	1.00 litres
Minimum	0.42 litres	0.42 litres	0.45 litres	0.65 litres

* *To operate the pump when the ambient temperature is outside the limits specified in Section 2.1, or to optimise the pump performance when you pump condensible vapours, you may need to use a different oil.*

Technical data

Figure 3 - Dimensions (mm)



1. On-off switch (single-phase pumps only)
2. Lifting bracket (Not fitted to RV3 and RV5 pumps: a lifting handle is fitted instead)

A. Top view of single-phase pump
B. Side view of single-phase pump
C. Side view of three-phase pump
D. Front view of single-phase pump
E. Side view of bareshaft pump

Pump	A*	A†	B	C	D	E	F	G	H	I	J	K
RV3	430	429	158	225	127	29	78	230	120	37	32	-
RV5	430	429	158	225	127	29	78	230	120	37	32	-
RV8	470	429	158	225	161	35	78	230	120	37	32	261
RV12	439	429	158	225	181	35	78	230	120	37	32	261

* *Single-phase pumps.*

† *Three-phase pumps.*

2.6 Electrical data: single-phase pumps

Note: We recommend that you use fuses of the maximum ratings specified in Table 9 and Table 10. You must not use fuses of a higher rating.

The dual-voltage, dual-frequency motor is designed for a single-phase electrical supply and is suitable for 50 Hz or 60 Hz operation. The motor can be manually switched between nominal supply voltages of 110-120 V and 220-240 V (refer to Section 3.7.1).

When you start a cold pump, the motor will draw the start-up current shown in Table 9 and Table 10 for up to several seconds, so you must use a slow-blow fuse to prevent unnecessary fuse failure during pump start-up. Within five minutes, as the oil in the pump warms up, the current drawn will slowly reduce to the full load current specified in Table 9 and Table 10.

Table 9 - Electrical data (single-phase pumps with Item Numbers -903 or -906)

Pump	Nominal supply (V)	Frequency (Hz)	Power (W)	Full load current (A)	Start-up current (A)	Maximum fuse rating (A)
RV3 and RV5	220-240	50	250	2.7	17.0	5
	230-240	60	300	2.1	17.0	5
	110	50	250	4.6	30.8	10
	115-120	60	300	4.4	30.8	10
RV8 and RV12	220-240	50	450	3.4	17.0	5
	230-240	60	550	3.4	18.0	5
	110	50	450	7.8	34.0	13
	115-120	60	550	6.9	30.8	13

Table 10 - Electrical data (single-phase pumps with Item Numbers -904)

Pump	Nominal supply (V)	Frequency (Hz)	Power (W)	Full load current (A)	Start-up current (A)	Maximum fuse rating (A)
RV3 and RV5	200	50	250	2.7	17.0	5
	200-210	60	300	2.1	17.0	5
	100	50	250	5.4	30.8	10
	100-105	60	300	4.6	30.8	10
RV8 and RV12	200	50	450	3.4	17.0	5
	200-210	60	550	3.4	20.6	5
	100	50	450	7.6	40.0	13
	100-105	60	550	6.9	30.8	13

Note: The fuse type chosen should be either a time delay type CC or a type M, or (in the UK) they should be to BS 88.

2.7 Electrical data: three-phase pumps

The dual-voltage, dual-frequency motor is designed for a three-phase electrical supply and is suitable for 50 Hz or 60 Hz operation. The motor can be manually switched between nominal supply voltages of 220–240 V and 380–460 V (refer to Section 3.8.1). Pumps are supplied preset for nominal 380–460 V electrical supplies.

When you start a cold pump, the motor will draw the start-up current shown in Table 11 for up to 0.5 seconds. The current will then reduce quickly as the motor reaches rated rotational speed. Within 5 minutes, as the oil and pump warms up, the current drawn will slowly reduce to a maximum of the full load current specified in Table 11.

When you start a warm pump, the motor will draw the start-up current shown in Table 11 for up to 0.5 seconds. The current drawn will then immediately fall to a maximum of the full load current.

Electrical short-circuit and ground-fault protection of the pump will be provided by fitting Class CC fuses of the values shown in Table 11 at the point of connection to the supply. If these are not available in your country of use, Type aM European fuses of the same rating can also be used.

Table 11 - Electrical data (three-phase pumps with Item Numbers -905)

Pump	Nominal supply (V)	Frequency (Hz)	Power (W)	Full load current (A)	Start-up current (A)	Maximum fuse rating (A)
RV3 and RV5	220-240	50	250	1.7	10.2	2.5
	200-230	60	300	1.7	10.2	2.5
	380-415	50	250	1.0	5.7	2.5
	460	60	300	1.0	7.0	2.5
RV8 and RV12	220-240	50	450	2.5	14.0	4.0
	200-230	60	550	2.9	12.0	4.0
	380-415	50	450	1.5	9.0	2.5
	460	60	550	1.5	8.7	2.5