

# Edwards



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Supersedes  
03-A360-01-880

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E1M5 — E1M8  
E2M2-E2M5-E2M8 SERIES  
ROTARY VACUUM PUMPS

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Operating and Service Manual

**Edwards High Vacuum**

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# Data and specification

PUMP MODEL	E2M2	E1M5	E2M5	E1M8	E2M8
Displacement (swept volume) 50Hz motor 60Hz motor	2.8 3.4	5.6 6.7	5.6 6.7	9.5 11.4	9.5 11.4
Speed (Pneurop) 50Hz motor 60Hz motor	2.4 2.9	5.0 6.0	5.0 6.0	8.2 9.8	8.2 9.8
Ultimate vacuum: - without gas ballast (partial pressure) (mbar) - without gas ballast (total pressure) (mbar) - with full gas ballast (partial pressure)(mbar)	$2.5 \times 10^{-4}$ $1 \times 10^{-3}$ $3 \times 10^{-2}$	$3 \times 10^{-2}$ 2	$2.5 \times 10^{-4}$ $1 \times 10^{-3}$ $3 \times 10^{-2}$	$3 \times 10^{-2}$ 2	$2.5 \times 10^{-4}$ $1 \times 10^{-3}$ $3 \times 10^{-2}$
Maximum inlet pressure for water vapour (Gas ballast control open 5 turns)	25	35	25	45	15
Pump rotational speed $\text{rev min}^{-1}$	1425 (50Hz) 1725 (60Hz)	1425 (50Hz) 1725 (60Hz)	1425 (50Hz) 1725 (60Hz)	1425 (50Hz) 1725 (60Hz)	1425 (50Hz) 1725 (60Hz)
Pump operating temperature - without gas ballast ( $^{\circ}\text{C}$ ) - with gas ballast ( $^{\circ}\text{C}$ )	38 47	- -	52 55	- -	66 67
Oil capacity * Recommended grade of oil	0.55	0.55	0.55	0.55	0.55
50Hz Motor - rating (continuous) 60Hz Motor - rating (continuous)	0.25 0.25	0.25 0.25	0.25 0.37	0.37 0.37	0.37 0.55
Weight of pump (complete) 1-phase motor	18.2	16.8	19.6	20	22.8
Product description: Pump outfit 220/240, 1-phase, 50Hz - Ordering No.	03-A360-01-912	03-A341-01-912	03-A361-01-912	03-A342-01-912	03-A362-01-912
(For alternative motors - see table, Page 6)					

\* For low temperature lubricants and details of chemically resistant FOMBLIN lubricant - see page 7.

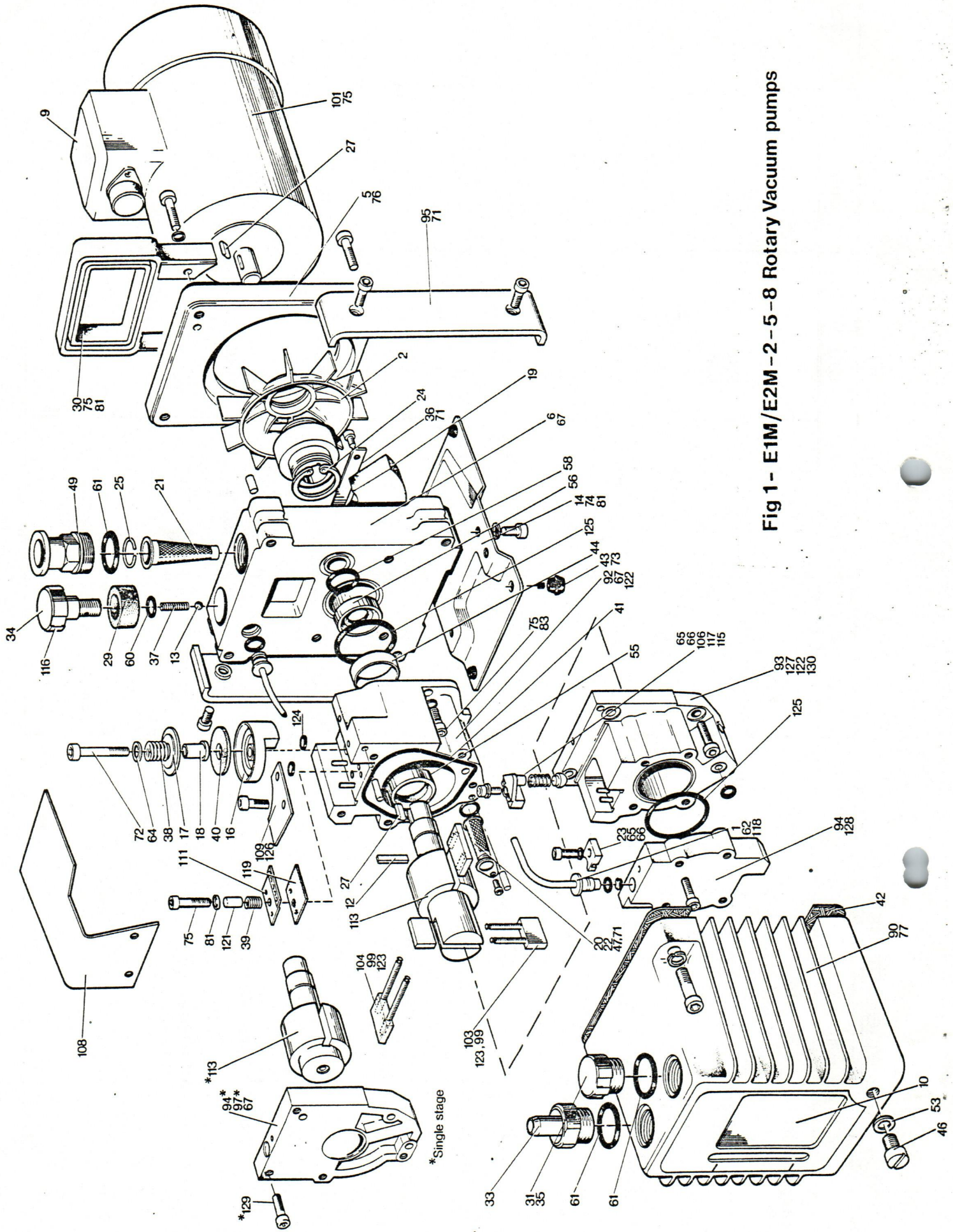


Fig 1 - E1M/E2M-2-5-8 Rotary Vacuum pumps

\*Single stage

PARTS LIST FOR E2M2, E1M5, E2M5, E1M8, E2M8 ROTARY PUMPS - Common Parts (Items 1-83)

Item No.	Code No.	Description	Quantity
1	A34001002	Gas ballast tube assembly	1
2	A34001020	Coupling and fan assembly	1
3			
4			
5	A34001012	Motor plate	1
6	A34001013	Adaptor	1
7	A34001026	Polythene pack (not shown)	1
8			
9	E20001063	Warning label	1
10	A20001065	Label	1
11			
12	A20402095	Oil pump blade	1
13	A20414003	Steel ball	1
14	A20499016	Baseplate	1
15			
16	A34001034	Distributor valve	1
17	A21042008	Distributor weight	1
18	A34001035	Distributor sleeve	1
19	A22302013	Felt pad	1
20	A22305003	Oil filter assembly	1
21	A22305007	Inlet filter assembly	1
22	A22305010	Filter clamp	1
23	A21042013	Clamp	1
24	A22426004	Circlip	1
25	A22426005	Circlip	1
26			
27	A24301010	Key	2
28			
29	A25907200	Ballast filter	1
30	A25908025	Handle	1
31	A25908027	Oil filler plug	1
32			
33	A25908029	Nozzle	1
34	A25908034	Gas ballast insert	1
35	A25908035	Oil filler insert	1
36	A25976015	Strap	1
37	A27102010	Ballast spring	1
38	A27102021	Spring	1
39	A27102029	Valve spring HV	1
40	A27159414	Distributor rubber	1
41	A27159503	Seal	1
42	A27159616	Oil box gasket	1

Item No.	Code No.	Description	Quantity
43	A26501024	Foot	4
44	A27802006	Sleeve	1
45			
46	A00714012	Plug	1
47	A00906042	Filter seal	1
48			
49	C10501014	Inlet adaptor	1
50			
51			
52			
53	H02104-001	Seal	1
54			
55	H02109066	Oil seal	1
56	H02109067	Oil seal	1
57			
58	H02120041	O-ring	1
59			
60	H02125013	O-ring	1
61	H02125026	O-ring	3
62	H02125116	O-ring	2
63			
64	21181-4057	Washer 2BA	1
65	21898-0607	Washer M4	2
66	21809-1290	Screw M4	2
67	212181030	Parallel dowel	4
68			
69			
70			
71	218091288	Screw M4	7
72	218091295	Screw M4	1
73	218121328	Screw M5	4
74	218091370	Screw M6	4
75	218091371	Screw M6	10
76	218091372	Screw M6	4
77	218091374	Screw M6	4
78			
79			
80			
81	218980209	Washer M6	7
82			
83	218982709	Washer shakeproof	7

PARTS LIST FOR E2M2, E1M5, E2M5, E1M8, E2M8 ROTARY PUMPS (continued)

Item No.	Description	E2M2		E1M5		E2M5		E1M8		E2M8	
		Code No.	Qty.	Code No.	Qty.	Code No.	Qty.	Code No.	Qty.	Code No.	Qty.
90	Oil box assembly	A34101001	1	A34101001	1	A34201001	1	A34101001	1	A34201001	1
91											
92	Stator HV	A36001010	1	A34101010	1	A36101010	1	A34201010	1	A36201010	1
93	Stator LV	A36010014	1			A36001014	1			A36001014	1
94	Rear cover	A36001015	1	A34001015	1	A36001015	1	A34001015	1	A36001015	1
95	Cover	A36001017	2	A34101017	2	A631101017	2	A34201017	2	A36201017	2
96											
97	Core plug			A21078002	1			A21078002	1		
98											
99	Blade spring	A00906077	3	A00906077	4	A00906077	4	A00906077	4	A00906077	4
100											
101	Motor										
102											
103	Blade LV	A20402079	2			A20402079	2			A20402079	2
104	Blade HV	A20402081	2	A20402083	2	A20402083	2	A20402085	2	A20402085	2
105											
106	Spring support	A21042012	1			A21042012	1			A21042012	1
107											
108	Discharge baffle	A25970041	1	A25970043	1	A25970042	1	A25970043	1	A25970042	1
109	Valve baffle			A25970044	1	A25970044	1	A25970044	1	A25970044	1
110											
111	Valve backplate HV	A25976013	1	A25976014	1	A25976014	1	A25976014	1	A25976014	1
112											
113	Rotor assembly	A26401025	1	A26401027	1	A2641028	1	A2641030	1	A26401031	1
114											
115	Button	A26501017	1			A26501017	1			A26501017	1
116	Ballast knob	A25908037	1	A25908028	1	A25908028	1	A25908028	1	A25908028	1
117	Valve spring LV	A27102016	1			A27102016	1			A27102016	1
118	Ballast valve	A25906600	1	A11301045	1	A11301045	1	A11301045	1	A11301045	1
119	Valve rubber HV	A27159418	1	A27159417	1	A27159417	1	A27159417	1	A27159417	1
120											
121	Valve spacer	A27804006	1	A27804006	1	A27804006	1	A27804006	1	A27804006	1
122	Pin	211174033	2	211174033	2	211174033	4	211174033	2	211174033	4
123	Blade spring pin	A29203003	3	A29203003	4	A29203003	4	A29203003	4	A29203003	4
124	O-ring	H02120004	3	H02120004	2	H02120004	3	H02120004	2	H02120004	3
125	O-ring	H02120077	2	H02120077	1	H02120077	2	H02120077	1	H02120077	2
126	Screw M4			218091288	2	218091288	2	218091288	2	218091288	2
127	Screw M6	218091371	5			218091371	5			218091371	5
128	Screw M6	218091372	4			218091372	4			218091372	4
129	Screw M6			218091373	5	218091372	4	218091373	5	218091372	4
130	Pin	21217434	1	218091373	1	212174134	1	218091373	5	212174134	1

# General description

The E1M and E2M series pumps comprise single and two-stage direct drive, oil sealed outfits designed for a wide range of basic vacuum pumping duties. The pumps are free-standing units of basically similar construction but of varying displacement -  $2\text{m}^3\text{h}^{-1}$ ,  $5\text{m}^3\text{h}^{-1}$  and  $8\text{m}^3\text{h}^{-1}$  (nominal). Direct drive is provided, via a flexible coupling, from a single-phase or 3-phase (4-pole) motor which also provided the drive for the cooling fan. The motors normally fitted are to IEC - IP44 Safety Classification; the single-phase versions incorporate a thermal overload protective device with manual push-button re-set, also a mains isolator (ON/OFF) switch.

## Construction

The pumps is a slotted rotor/sliding vane type and the two-stage versions incorporate separate high vacuum (HV) and low vacuum (LV) stages with interconnecting ports. Each stage comprises a rotor and stator assembly, the rotor forming an integral assembly with the shaft. The HV and LV stator bores provide high grade, cast iron journal bearings for the rotor(s). The complete pumping mechanism is mounted on an adaptor at the drive end and is enclosed by an oil box.

Pressurised lubrication of the shaft journals and the end faces of the rotors is provided by a sliding blade operating in an eccentric housing at the inner end of the HV stator journal and actuated by the drive shaft. The oil is circulated from the oil box reservoir via a gauze filter and internal drillings to the pressurised distribution valve then to the grooved interstage journal and the rotor end faces. Nitrile shaft seals are positioned in the adaptor and in the HV stator. To prevent oil suck-back into the vacuum system when the pump stops for any reason, the oil distributor valve prevents further discharge of oil to the pump interior. Since the pumping chambers are air tight, this arrangement prevents both air and oil suck-back unless the gas ballast valve is open. (For protection in this case, refer to page 6 (f)). The level of oil in the oil box reservoir is indicated by a sight-glass mounted in the front of the oil box. Oil filler and drain plugs are fitted at the top and bottom of the oil box, respectively.

External connexions comprise a vacuum inlet connexion (with internal strainer) and an outlet nozzle. A gas ballast facility is also incorporated to prevent contamination of the oil by the vapours being pumped; this consists of an orifice in the adaptor housing communicating with the pump interior and fitted with a threaded plug with knurled extension to permit manual control of air/gas ballasting. Pump mounting is by means of a steel baseplate on rubber pads. Details of suitable anti-vibration mountings together with other recommended accessories are provided on page 9.

## Working principle

During operation, the rotor blades sweep the crescent shaped volume formed by the eccentrically mounted rotor and the stator. As each blade passes the inlet port, a quantity of gas is induced and is subsequently trapped and compressed by the following blade until finally ejected via the discharge valve in single stage pumps (or via the interconnecting port, LV stage and discharge valve in two-stage pumps).

## Gas ballasting

The E1M, E2M series pumps incorporates a gas ballast facility to enable them to pump most condensable vapours directly without significant contamination of the pump oil. This entails the introduction of a quantity of gas or air at atmospheric pressure, via a manually operated valve, into the volume between the LV stage, rotor blade and the discharge valve whilst the gas/vapour mixture in this volume is at a comparatively low pressure.

When the volume of gas/vapour mixture is compressed prior to expulsion, the discharge valve opens before the partial pressure of the vapour component is high enough to cause it to condense. To prevent ingress of dust and to improve silencing, a polyester foam filter/silencer is fitted underneath the gas ballast control knob.

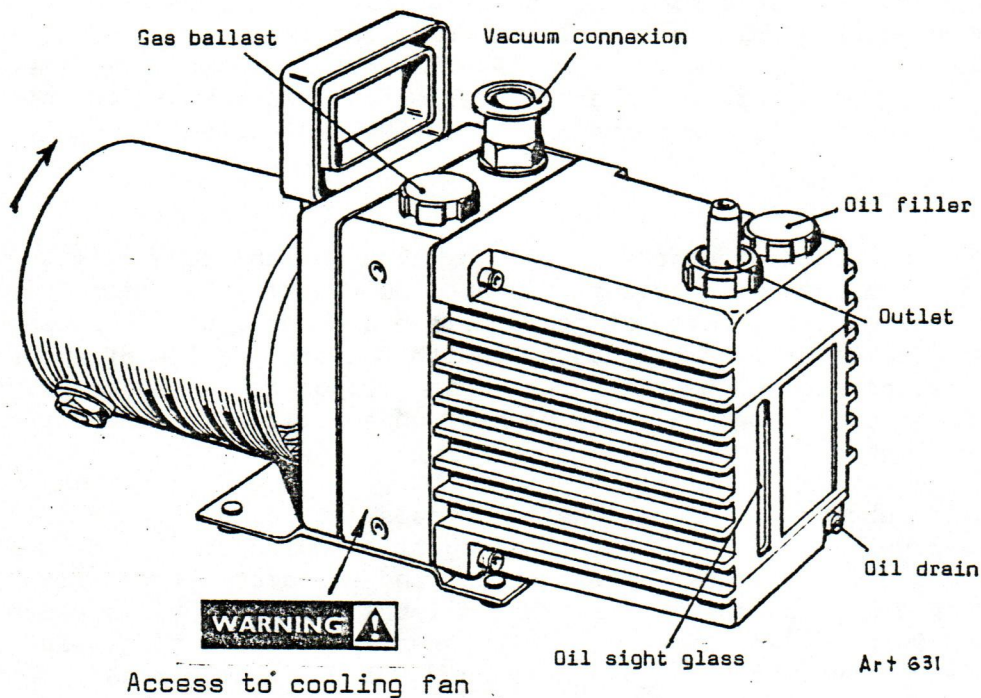


Fig.2 Pump external connexions

## Installation

### Unpacking

Remove all packing material, protective blanks and covers and inspect the outfit for possible damage during transit.

### Vacuum connexion

The vacuum inlet connexion is a KF25 flange to ISO, Pneurop and British standards, it is also compatible with the ISO SC series couplings. A component pack containing a KF25 centering ring and O-ring is supplied separately - the method of assembly is shown in Fig.3.

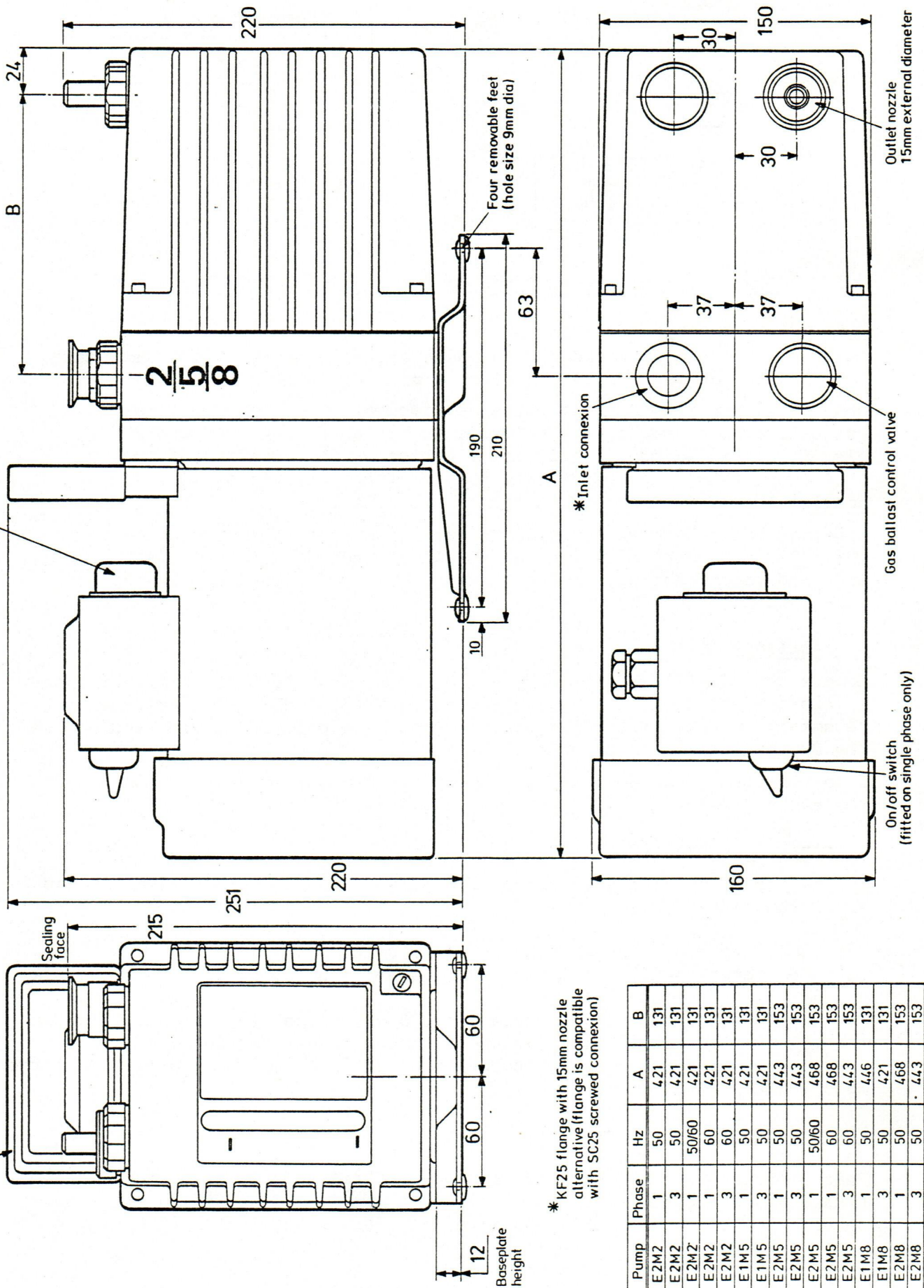
Also included in the component pack is a spare outlet nozzle which may be substituted for the KF25 flange where a rubber or plastic tube connexion is preferred - the nozzle is suitable for 10mm bore vacuum hose or 12mm bore plastic tubing.

Note: To protect the pump against fine dust, coarse particles or chemically active gases, externally mounted inlet filters are available - refer to ACCESSORIES for details.



Handle may be removed if required

Hand reset thermal overload switch  
(fitted on single phase only)



\*KF25 flange with 15mm nozzle alternative (flange is compatible with SC25 screwed connexion)

Pump	Phase	Hz	A	B
E2M2	1	50	421	131
E2M2	3	50	421	131
E2M2	1	50/60	421	131
E2M2	1	60	421	131
E2M2	3	60	421	131
E1M5	1	50	421	131
E1M5	3	50	421	131
E2M5	1	50	443	153
E2M5	3	50	443	153
E2M5	1	50/60	468	153
E2M5	1	60	468	153
E2M5	3	60	443	153
E1M8	1	50	446	131
E1M8	3	50	421	131
E2M8	1	50	468	153
E2M8	3	50	443	153

# Operating notes



ENSURE THE PUMP OUTLET IS NOT OBSTRUCTED. THIS MAY CAUSE DANGEROUS INTERNAL PRESSURE BUILD-UP.

(a) Before starting the pump, check that the oil level is visible in the sight glass - above the MINIMUM level. The pump will operate satisfactorily at this level during normal use.

(b) When condensable vapours are present in the system, gas ballast must be introduced into the pump by rotating the gas ballast valve anticlockwise. Before pumping vapours, the pump should be isolated from the system and allowed to run for approximately 30 minutes to warm the oil and assist in preventing vapour condensation in a cold pump.

Note: The ITD20 inlet desiccant trap is recommended for applications where water vapour is present and a rapid pump down to low partial pressures is required.

An inlet catchpot (ITD20) is required when vapours condense in the vacuum lines and drain into the pump.

(c) After pumping large quantities of vapour, it is recommended that the pump is isolated from the system and run for at least 30 minutes with the gas ballast operating; this particularly applies after corrosive vapours have been pumped.

If the pumps are being used in systems which produce heavy evolution of vapours, particularly if the vapours are of a corrosive nature, the gas ballast flow may not completely protect the pump. The ITC20 chemical inlet trap is recommended to reduce the harmful vapours carried over to the pump.

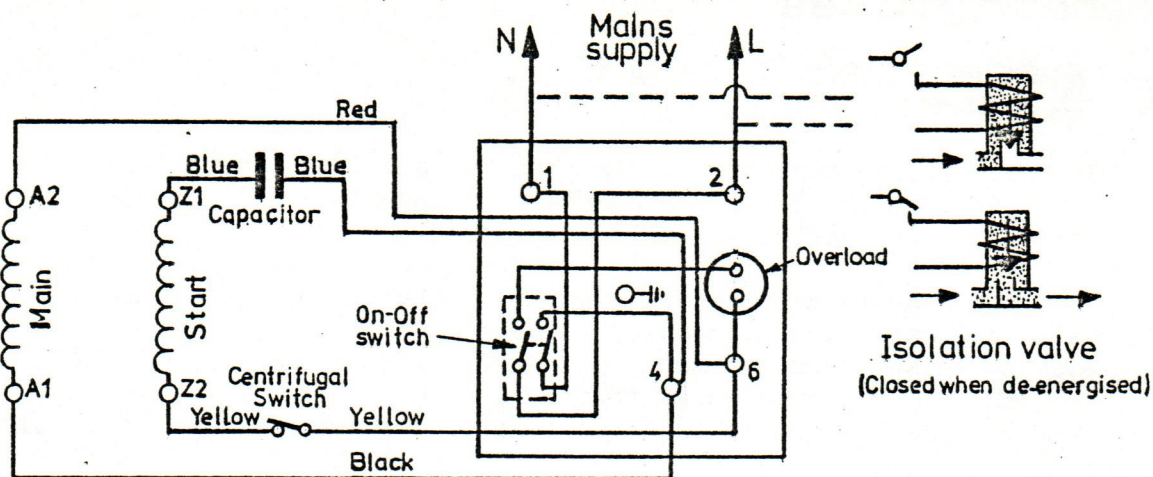
(d) If there is any likelihood of solid particles from the vacuum system entering the pump, an ITF20 or ITM20 inlet filter should be fitted. For details of these and above-mentioned traps, refer to ACCESSORIES.

(e) When measuring ultimate vacuum, it should be noted that the pump oil may have a vapour pressure which is higher than that of the permanent gases in the evacuated system. Gauges of the Pirani type measure the total pressure of permanent gases and vapours and will register differently from gauges of the McLeod type which will only indicate the pressure of the permanent gases.

To achieve highest vacuum when the pump has been filled with fresh oil, it is recommended that the pump is run on full gas ballast for some time. This has the effect of purging the oil and improves the ultimate vacuum.

(f) If the pump is operating on gas ballast and is shut down for any reason, the system vacuum will not be maintained. Hence where greater system security is required, it is recommended that a PV25E solenoid operated isolation valve is fitted in the inlet line. A typical arrangement is shown in Fig.4 and details of the PV25E valve are provided in ACCESSORIES.

(g) The pump is of rugged construction, designed for long term, trouble-free service, provided the recommended operating and servicing procedure is adhered to. Before despatch, each pump is inspected, and tested for performance. Many cases of suspected failure or poor pump performance are in fact due to leakage in the vacuum system, faulty gauges or unsuspected contamination of the pump oil, and any such possibilities should be carefully checked.



Art 728

Fig.5 Motor electrical circuit and isolation valve arrangement

### Standard and low temperature lubricants

Edwards No. 15 oil is recommended for all standard pumping duties.

Edwards No. 17 oil provides protection against corrosion when pumping acidic vapour or large amounts of water vapour but ultimate vacuum is somewhat less good than when using No. 15 oil.

Both No. 15 and No. 17 oils should permit satisfactory starting at temperatures down to 5°C.

Should ambient conditions lower the pump temperature below 5°C then Shell Tellus T37 (or T27) is recommended. Since Tellus oils contain polymers which may be gradually degraded by the pumping mechanism, they will become gradually thinner during usage. More frequent oil changing is, therefore, recommended than when our standard oils are used, the frequency being assessed by service experience in a particular duty.

### Chemically resistant lubricants

Where oxygen or aggressive materials have to be pumped, an inert and chemically resistant lubricant must be used. Suitable members of the range of fully fluorinated oils known as 'FOMBLINS' can be used for this purpose. Fomblin YVAC 06/6 oil has viscosity and vapour pressure characteristics suitable for Edwards rotary pumps and should permit satisfactory starting down to 5°C.

### FOMBLIN YVAC 06/6 - its use in rotary pumps

Since it is a fully fluorinated fluid, Fomblin is inert to most reactive chemicals such as UF<sub>6</sub>, F<sub>2</sub>, oxygen, ozone, etc.

The major growth in its use has been in applications where hostile conditions are encountered which quickly destroy normal hydrocarbon pump oils. The corrosion resistant properties and chemical inertness of Fomblin result in greatly increased operational times between oil changes or pump maintenance and it provides a cost effective solution to many difficult pumping problems.

It is worth noting that Fomblin is inactive to amines, does not hydrolyse to form hydrochloric acid and is insoluble in most inorganic solvents. This is in contrast to the fluoro-chloro oils. However, as in all new technology, practice becomes tempered with experience. Edwards work on Fomblin and our close contact with the field have led to two practical points which must be considered for the successful use of Fomblin in rotary pumps:

Firstly, corrosive material (such as mineral acids) which pass through the pump can then remain floating on the top of the Fomblin if the pump outlet is in any way restricted. A slightly negative pressure on the oil box would more effectively remove them from this area. Although it has not been quantified, there is strong evidence that the non-miscibility of Fomblin with corrosive materials allows it to protect the surfaces of the pump.

Secondly, as a result of its non solubility and extreme resistance to nearly all chemical materials, it has no detergent action, unlike mineral oils. Thus, particulate material (dust) carried over from the system to be exhausted can easily deposit out in the rotary pump resulting in a seizure. Except under gross conditions, this is more likely to show itself as an inability to restart than a catastrophic seizure during running. To combat this, Edwards has produced a range of in-line filters to be placed between the system and the rotary pump. These remove particles down to 2 microns and will protect the pump from this hazard. Thus, if a dirty system is being pumped with a Fomblin charged rotary pump, it is strongly recommended that such a filter should be fitted.

With proper consideration of the application and the appropriate precautions, Fomblin provides an excellent solution to the pumping of otherwise difficult substances. If a new process is being considered and there is some doubt, please consult Edwards.

## Servicing

The following routine servicing only will be required:

Daily - check pump oil level.

After initial 100 hours running and then every 6 months - change oil.

### 1. Oil level check

To top-up the oil - remove the oil filler plug located on top of the oil box and fill with the recommended grade of oil until the level is visible in the sight glass - above the MINIMUM oil level. Replace the filler plug and ensure the O-ring seal is in position.

### 2. Oil changing

Note: During initial running, a small quantity of sludge may collect in the pump case. This sludge will not affect the performance of the pump but a change of oil after the first 100 hours use is recommended. Do not attempt to remove the sludge by pouring volatile cleaning fluids down the vacuum inlet.

To change the oil, proceed as follows:

#### (a) Gravity drain:

Switch-off pump then place a suitable, clean container beneath the drain plug and remove the plug. Allow oil to drain completely. Switch the pump on, then pour a small quantity of oil down the vacuum inlet for flushing purposes. Switch off the pump and replace the drain plug; remove the oil filler plug and refill the pump to the correct level with the recommended grade of oil. Replace the filler plug and ensure the O-ring seal is in position.

Note: An extension tube for the oil drain is supplied separately in pack Code No: 04-A500-02-000

(b) A pressure drain accessory is available for use where the gravity drain may be inaccessible as in some plant installations. This accessory is also supplied in pack Code No: 04-A500-02-000 and full instructions for method of assembly and operation are provided with the pack.



**WARNING** Do not completely restrict the pump outlet as this may cause excessively high internal pressure build-up with resultant explosive rupture of the pump casing.

Allow oil to drain completely then pour a small quantity of clean oil down the pump inlet for flushing purposes - again drain pump as above. Switch-off pump and remove the pressure drain tube. Refill the pump to the correct level with the recommended grade of oil and replace filler plug- ensure the O-ring seal is in position.

## Spares

### Spares

### Ordering No.

Spares kit comprising:

Blades, springs, seals, gaskets, filters, washers	14-A360-01-800 (E2M2)	
	14-A341-01-800 (E1M5)	14-A361-01-800 (E2M5)
	14-A342-01-800 (E1M8)	14-A362-01-800 (E2M8)
KF 25 centring ring	08-C105-10-004	
KF O-ring	08-H021-24-005	
Edwards No. 15 oil (1 litre)	09-H110-02-015	
Edwards No. 17 oil (1 litre)	09-H110-04-015	

## Accessories

A fully comprehensive series of accessories is available for the EM range of pumps as shown in Fig. 6, these comprise:

### Inlet Catchpots/Filters

IT020 Catchpot - Ordering No. 04-A441-01-000 - designed for vacuum processes in which large quantities of vapours tend to condense in the pumping lines and be carried towards the pump.

ITF20 Inlet Dust Filter - Ordering No. 04-A442-01-000 - designed to prevent ingress of abrasive dust particles into a vacuum pump - incorporates a pleated nylon fibre element which is wire mesh supported.

ITD20 Inlet Desiccant Trap - Ordering No. 04-A445-01-000 - designed for use on systems where the requirement is for removal of limited quantities of moisture to low vapour pressures. The phosphorous pentoxide ( $P_2O_5$ ) desiccant is contained in a four-tier tray assembly.

ITC20 Inlet Chemical Trap - Ordering No. 04-A444-01-000 - to protect the pump against chemically active vapours and gases. Incorporates a fine mesh basket to contain trapping media for chemical vapours (e.g. activated charcoal to trap organic materials; soda lime for inorganic acids, etc).

### Foreline Trap

FL20 - For use on clean pumping systems - utilises the trapping properties for oil vapour of activated alumina to prevent back migration of rotary pump oil vapour into the vacuum system. Ordering No. 04-A133-04-000

### Mist Filter/Odour Filter

MF20 - Mist Filter - Ordering No. 04-A462-01-000 - can be utilised to capture oil mist which would otherwise be emitted to the environment with effluent gas, either when gas ballasting or when pumping high gas throughputs.

OF20 - Odour Filter - Ordering No. 04-A462-10-000 - mounts directly on MF20 filter - uses activated charcoal to trap vapours associated with oil discharge and thus prevents oil odours.

### Anti-Vibration Mountings

Rubber pedestal type mountings for pumps installed in frame structure - to reduce transmission of noise and relieve stresses due to misalignment of mounting points on structure. Ordering No: 04-248-01-404 (Set of 4)  
A flexible bellows is recommended for fitting between the pump inlet connexion and the system - Ordering No: 08-C110-04-442

### PV25E Isolation Valve

Compact light-weight solenoid operated isolation valve supplied with two SC25 coupling nuts for direct connexion to pump inlet to provide full protection against air return when the gas ballast valve is open. Ordering No: 08-C313-03-000.

ODP20 Oil Drain Pack - contains gravity drain extension and pressure drain facility. Ordering No. 04-A500-02-000

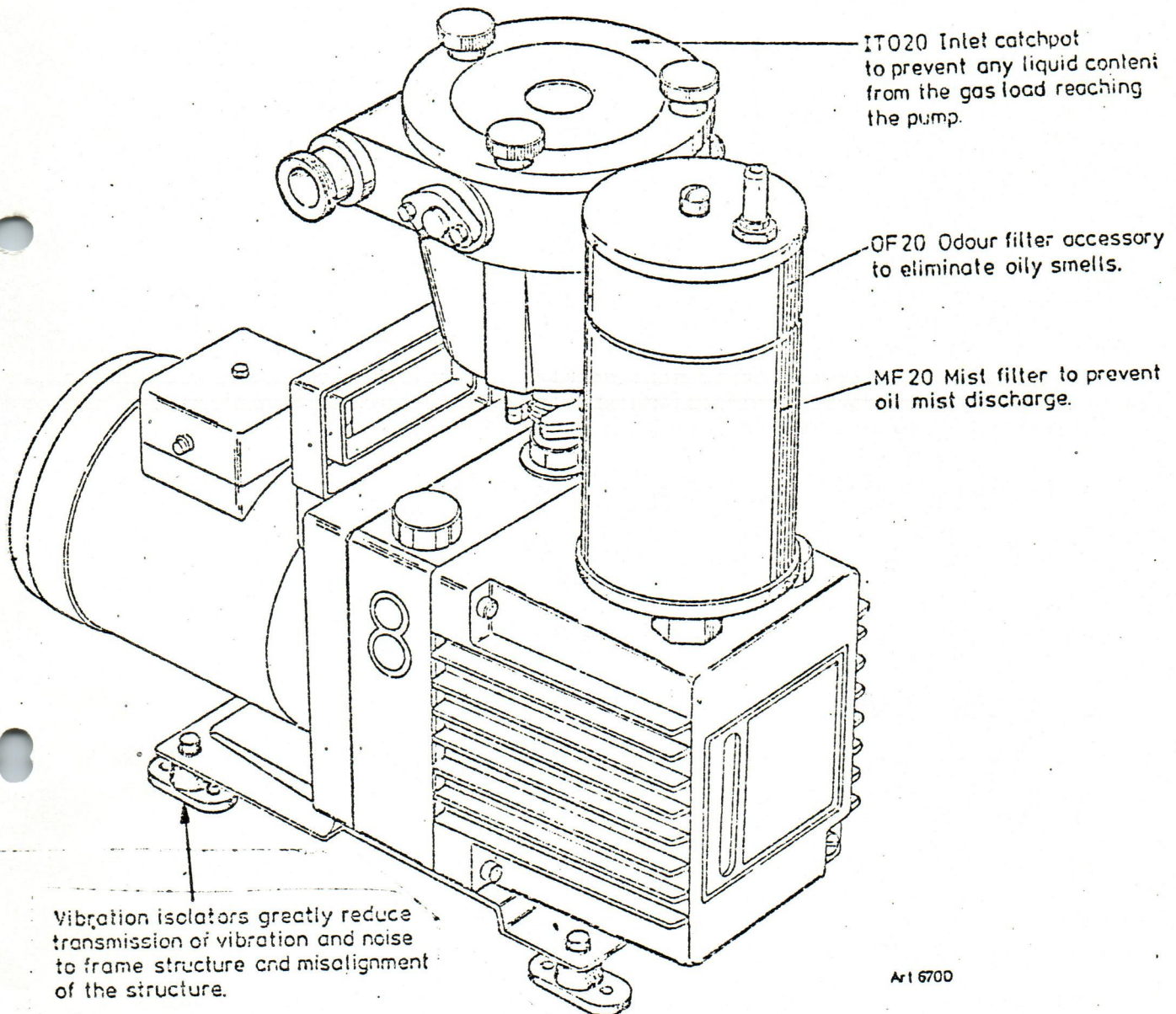


Fig.6 EM pump fitted with accessories

# Lubricants and related products - health and safety aspects

Edwards recommended lubricants and related products (see table 1) are not normally hazardous when correctly used and applied. However, certain hazards may arise due to misuse or accident and the following precautions should be observed to avoid danger to health or safety.

ROTARY PUMP OILS - Table 1

Oil Grade	Product Class	*Flash Point °C	Molecular Weight
Edwards No.8A	)	222	420
Edwards No.15	)	234	490
Edwards No.16	)	237	515
Edwards No.17	) A	236	495
Edwards No.18	)	240	520
Edwards No.20	)	234	490
Shell Tellus Oil 29	)	216	450

Note: When oxygen is pumped, a chemically inert and stable pump oil must be used. Use of such an oil can also be advantageous when chemically aggressive gases are liable to enter the pump. Suitable members of the range of synthetic oils known as 'Fomblins' have excellent properties for these applications. Fomblins are fully fluorinated perfluoropolyethers and are non-toxic; they are practically inert chemically and have no flash point or fire point.

\* Determined by Pensky-Martans closed cup method.

## HEALTH ASPECTS

### Skin and Eye contact

Class A - mineral oil based lubricants are only slightly to moderately irritating to skin and eyes. Prolonged exposure of skin to mineral oils may give rise to dermatitis.

The main precautionary measures entail minimising contact with the skin and the observance of good hygiene. Where skin rashes or other abnormalities occur as a result of prolonged contact with mineral oils, medical advice should be sought immediately.

Protective clothing, regularly laundered overalls and personal clothing plus careful skin cleansing, are all important measures to limit contact. Such measures are detailed in HM Factory Inspectorate Cautionary Notices, SHW 295, Effects on the Skin of Mineral Oil and SHW 397, Effects of Mineral Oil on the skin.

.../continued

## Inhalation

Class A - lubricants do not normally give rise to harmful concentrations of vapour except where high temperature and open systems are involved.

Oil mist, however, such as that generated by rotary vacuum pumps should be kept to a minimum, preferably well below the Threshold Limit Value of 5 mg/m<sup>3</sup> for mineral oil. Note: The discharge from rotary pumps will contain a small quantity of oil mist and this can contaminate the environment if the pump is used in enclosed or inadequately ventilated surroundings. It is strongly recommended that a suitable oil mist filter is fitted to the pump or alternatively, the exhaust should be piped away externally. The Edwards OMF and CVP series oil mist filters are recommended for applications in this field.

## Fire hazards, storage and spillage

These products require no special fire precautions but it is recommended practice to store away from heat. When heat is required to facilitate handling of the product, this should be kept to a minimum.

If the pump operates in close proximity to possible sources of ignition or where oxygen may form a large proportion of the pumped load, then suitable fire-resistant pump oils (such as Fomblin) should be used.

The pumping of significant amount of flammable gases and vapours can also present a safety hazard, since explosive mixtures can exist in pump component housings, mist filters and effluent pipes. This hazard can sometimes be controlled by diluting the effluent with nitrogen gas ballast or nitrogen flush, and the fire risk reduced by use of non-flammable pump oil - control methods, however, depend on particular circumstances.

Fluid spillage should be absorbed with sand, earth or mineral absorbent and disposed of in accordance with the Disposal of Poisonous Wastes Act and Control of Pollution Act 1974.

In the event of large spillages, steps should be taken to prevent pollution of drainage systems, rivers or waterways, or infringement of the above acts.

## SOLVENTS

GENKLENE (stabilised trichloroethane) is the preferred cleaning solvent for Edwards products - it has low toxicity and is non-flammable. However, in common with all highly volatile oil and grease solvents, the main hazard is the narcotic, anaesthetic and toxic effects of breathing concentrations of vapour resulting from its use in confined spaces.

Ensure there is adequate ventilation and rate of air change in the cleaning area. Smoking must be prohibited.

## Communication with Edwards

Any communication relating to the subject of this instruction should be addressed to Edwards High Vacuum or to the supplier from whom it was purchased.

Please specify:

- 1) the model, serial number and code.
- 2) the date of purchase.
- 3) your order number and the suppliers sales reference.

Equipment should not be returned to the supplier without prior arrangement.

### IMPORTANT Health and Safety

Under Section 3 of the Health and Safety at Work Etc Act 1974 every employer has a duty to conduct his business so as not to expose persons not in his employment to risks to their health and safety. When goods are returned to the supplier, therefore, warning must be given if their usage is likely to render the equipment hazardous in any way.

Edwards High Vacuum and its distributors reserve the right to refuse acceptance of any equipment returned which they have reason to believe may be hazardous.

### Damage in transit

If any damage has occurred in transit, it is important to inform both the carrier and the supplier within three days of delivery.