H H Mulder.

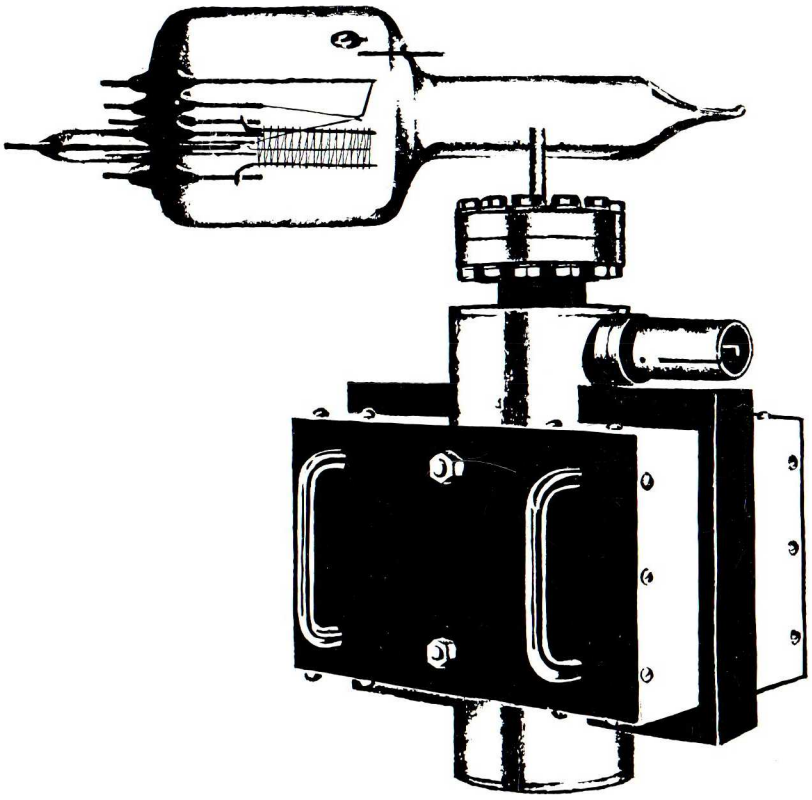
PHILIPS

PRODUCT DATA

PHILIPS ELECTRONIC COMPONENTS AND MATERIALS DIVISION

VACUUM DEVICES

MARCH 1969



VACUUM DEVICES

March 1969

Pumps

PUMP PERFORMANCE OF SPUTTER ION PUMPS

It has been established that the performance of all sputter ion pumps varies according to the treatment of the pump and the quantity and nature of the gas being pumped. Since no standard is yet available, the data presented here is based on experiments carried out according to the recommendations of a working group of the International Union for Vacuum Science Techniques and Applications (I.U.V.S.T.A.). These recommendations have the support of many international workers and will, it is hoped, form the basis of a standard of the International Standards Organisation (I.S.O.).

The ultimate pressure is determined in a specially constructed apparatus after preparing the equipment according to a well defined procedure. In this way the total gas load evolved from the measuring equipment is controlled, and comparisons between different pumps can be made.

The pumping speed for dry air is recommended as the basic performance data. The experiments are carried out in an apparatus with well-defined geometry. Two curves are given. The regenerated curve corresponds to the condition immediately after bakeout, when high values of pumping speed are obtained. At pressures below 5×10^{-9} torr, these pumping speeds are maintained for many hours, and can be determined under equilibrium conditions; at higher pressures pumping causes a more rapid fall in the pumping speed, and the speed tends to fall to a lower steady value. This value is the saturated speed plotted in the lower curve. The time taken to saturate depends on the quantity of gas pumped, and varies approximately inversely with the operating pressure.

The techniques for preparing the pump and the measuring equipment and the method of data presentation are carried out according to the recommendations of the I.U.V.S.T.A. group.

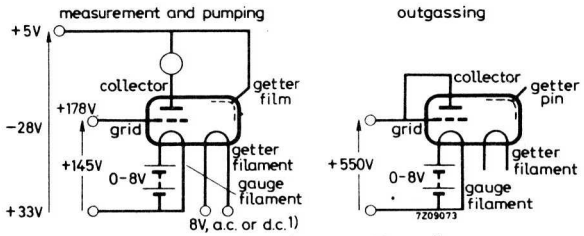
EVAPORATION ION PUMP

One-shot evaporation ion pump, consisting of a Bayard-Alpert gauge with the addition of a zirconium getter filament. The getter is evaporated from the getter filament, the pumping speed being enhanced by the ionising action of the gauge.
The Bayard-Alpert gauge can be used independently for measuring purposes.

CHARACTERISTICS

Pressure range, pumping	10^{-3} to 10^{-11}	torr
measurement	10^{-3} to 10^{-10}	torr
Pumping speed average (for nitrogen) at 10 mA emission current	0.4	l/s
Gauge sensitivity (for nitrogen)	approx. 12	per torr
Gauge filament characteristics	see page 3	
Gauge emission current range	1 μA to 75	mA
Insulation resistance before pumping		
Collector to other electrodes	min. 10^{14}	Ω
Grid to other electrodes	min. 10^{12}	Ω

TYPICAL OPERATING CONDITIONS



potentials are given with respect to earth

Gauge emission current (see also page 2)

measurement	100 μA, 1 mA or 10	mA
outgassing	75	mA

---

1) Getter filament current at the given supply voltage 8 A

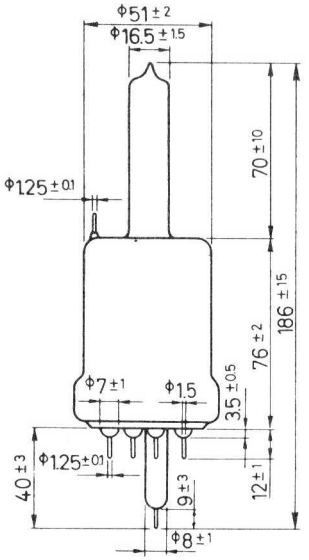
LIMITING VALUES

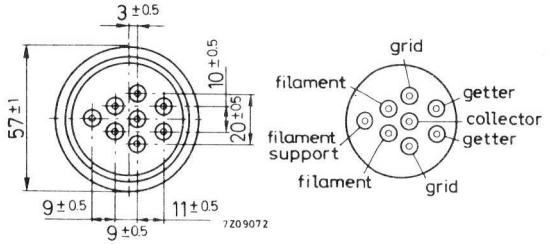
Gauge filament voltage	max.	8	V
Gauge emission current	max.	75	mA
Getter filament current	max.	10	A
Grid wattage	max.	40	W
Bulb temperature during operation	max.	100	°C
Bake-out temperature	max.	450	°C

MECHANICAL DATA

Dimensions in mm

Material W1 glass

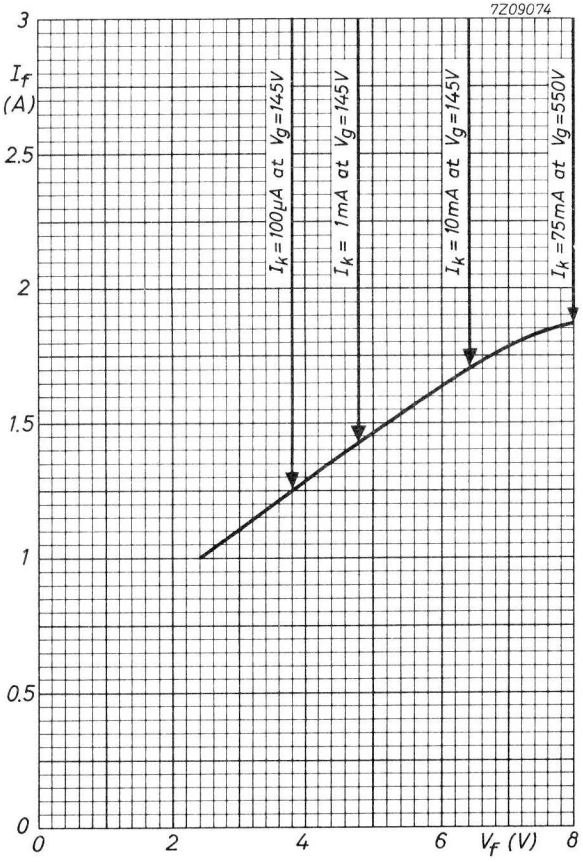




ASSOCIATED EQUIPMENT

Gauge control unit GCU-1

Note: The getter filament supply cannot be derived from the above mentioned control unit.


7Z09074
3
I_f (A)
2.5
2
1.5
1
0.5
0
0
2
4
6
V_F (V)
8
I_k = 100µA at V_g = 145V
I_k = 1mA at V_g = 145V
I_k = 10mA at V_g = 145V
I_k = 75mA at V_g = 550V

SORPTION PUMP

Molecular sieve sorption pump, based on the absorption of gasses by molecular sieve when the latter is cooled to, for example, liquid nitrogen temperature. The pump will pump a closed volume of maximal two litres from atmospheric pressure down to approx. 10^{-3} torr. Pump-down time depends on a number of local factors such as water vapour content and internal impedance; generally with a system of 1 litre pumping is completed in less than 10 minutes.

The device consists of a stainless steel tube to which a flange is fitted, the latter being designed for use with gold wire seals. A glass Dewar vase, which can be suspended from the fitting provided on the pump, is supplied with the pump. For carrying off the absorded gasses, which are freed when the pump is allowed to re-cever to room temperature, an outlet is provided; normally the outlet is closed with a rubber bung.

CHARACTERISTICS

Closed volume to be pumped	max.	2	litres
Refrigeration temp. (liquid nitrogen)		-196	°C
Final pressure	<	10^{-3}	torr
Pump down time to 10^{-2} torr for a volume of 1 litre (see also page 3)			
with prechill	≈	10	min.
without prechill	≈	15	min.
Temperature for reactivating the molecular sieve after contamination with water and hydrocarbonates		250	°C
Weight of molecular sieve charge		68	gram

LIMITING VALUES

Bake-out temperature	max. 300 °C

ASSOCIATED COMPONENTS

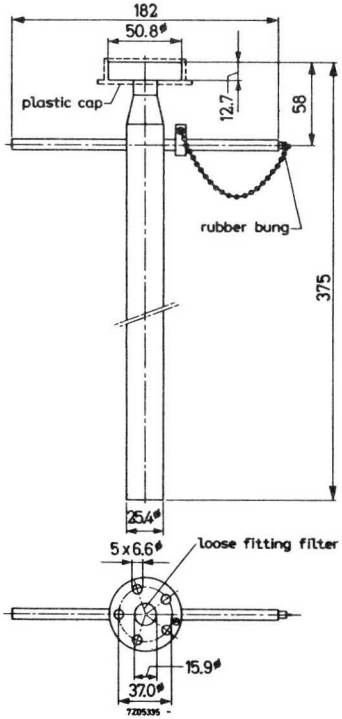
Mating flange	VMF-18 series
Gold wire seal	VMS-18 series
Insulating tap (non bakeable)	VT-18F
Insulating tap (bakeable)	VTB-18F
Set of nuts, bolts, washers and studding	V-1018

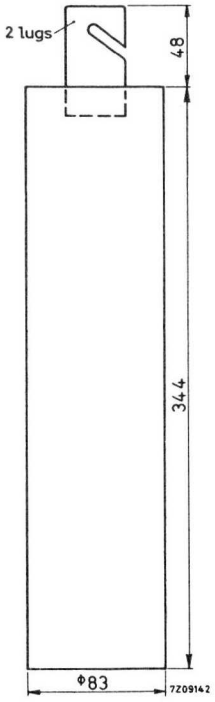
SPARE PARTS

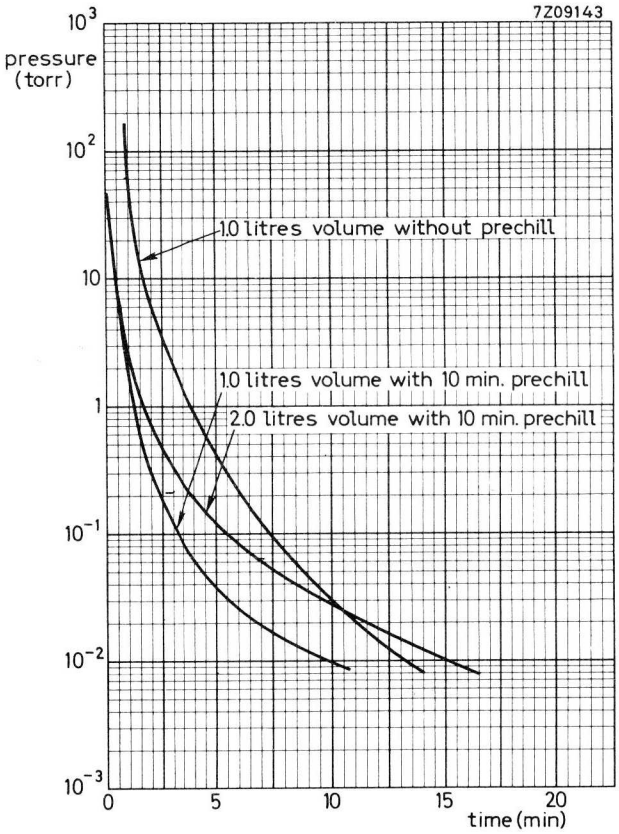
Glass dewar	V-1001
Charge of molecular sieve	V-1005

DIMENSIONS

Dimensions in mm






7Z09143
pressure (torr)
10^3
10^2
10
1
10^{-1}
10^{-2}
10^{-3}
1.0 litres volume without prechill
1.0 litres volume with 10 min. prechill
2.0 litres volume with 10 min. prechill
0
5
10
15
20
time (min)

SORPTION PUMP

Molecular sieve sorption pump, based on the absorption of gasses by molecular sieve when the latter is cooled to, for example, liquid nitrogen temperature.
The pump will pump a closed volume of maximal twenty litres from atmospheric pressure down to approx. 10^{-3} torr. Pumpdown time depends on a number of local factors such as water vapour content and internal impedance; generally with a system of 10 litres pumping is completed in less than 10 minutes.

The device consists of a stainless steel tube to which a flange is fitted, the latter being designed for use with gold wire seals. The pump is provided with a fitting from which a Dewar vase can be suspended; both a glass and a stainless steel dewar are available. For carrying off the absorded gasses, which are freed when the pump is allowed to recover to room temperature, an outlet is provided; normally the outlet is closed with a rubber bung.

CHARACTERISTICS

Closed volume to be pumped	max. 20	litres
Refrigeration temp. (liquid nitrogen)	−196	°C
Final pressure	$< 10^{-3}$	torr
Pump-down time to 10^{-2} torr for a volume of 10 litres (see also page 3)		
with prechill	≈ 10	min.
without prechill	≈ 15	min.
Temperature for reactivating the molecular sieve after contamination with water and hydrocarbonates	250	°C
Weight of molecular sieve charge	650	gram

LIMITING VALUES

Bake-out temperature	max. 300	°C

ASSOCIATED COMPONENTS

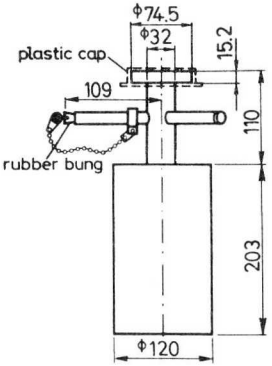
Class Dewar	V-1002
Stainless steel Dewar	V-1003
Heater (230 V, 325 Watt)	V-1004
Mating flange	VMF-25 series
Gold wire seal	VMS-25 series
Insulating tap (non bakeable)	VT-25F
Insulating tap (bakeable)	VTB-25F
Set of nuts, bolts, washers and studding	V-1019

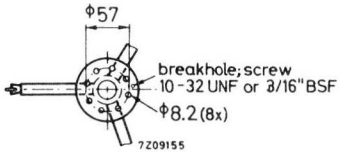
SPARE PARTS

Charge of molecular sieve	V-1006

DIMENSIONS

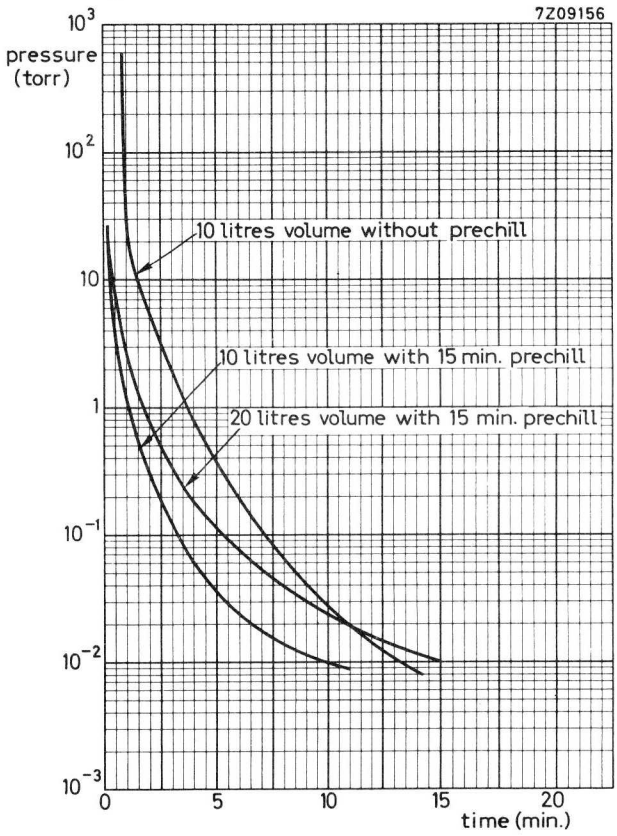
Dimensions in mm





Note

Minimum height, required by pump
in combination with Dewar 700 mm


7Z09156
10^3
pressure
(torr)
10^2
10
1
10^{-1}
10^{-2}
10^{-3}
10 litres volume without prechill
10 litres volume with 15 min. prechill
20 litres volume with 15 min. prechill
0
5
10
15
20
time (min.)

"K" TYPE MAGNETRON SPUTTER ION PUMP

1 litre/s sputter ion pump based on the Penning principle with magnetron structure cells, featuring a highly stable pumping action and a high pumping speed for Argon; pressure range 10^{-2} torr to 10^{-11} torr.

Pumping action starts immediately as soon as the operating voltage is switched on. Bake-out temperatures up to 450 °C may be used with the magnets in position; however, when higher bake-out temperatures and/or a low thermal inertia are preferred, the magnets can easily be removed.

Type VKP-1 has a stainless steel tubulation
Type VKP-1F has a metal flange
Type VKP-1K has a Kodial glass tubulation
Type VKP-1P has a Pyrex glass tubulation

CHARACTERISTICS

(pump in combination with the power supply type KPS-1)

Pressure range	10^{-2} to 10^{-11}	torr
Pumping speed, air	see page 4	
argon	12 to 20% of that of nitrogen	
Operating voltage, D.C.	4.9	kV
Discharge current	see page 5	
Average life at 10^{-6} torr (below 10^{-4} torr inversely proportional to pressure)	50 000	h

LIMITING VALUES

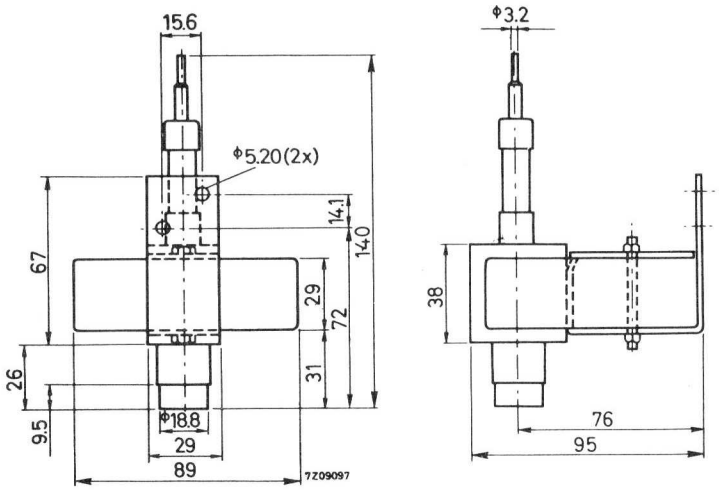
Striking pressure	max.	2×10^{-2}	torr
Operating voltage, d.c.	max.	8	kV
Input power	max.	25	W [1]
Bake-out temperature, with magnets	max.	450	°C
without magnets	max.	500	°C
Ambient temperature during operation (See also data KPS-1)	max.	300	°C

[1] The regulation of the power supply should be such that this input power is not exceeded at any pressure.

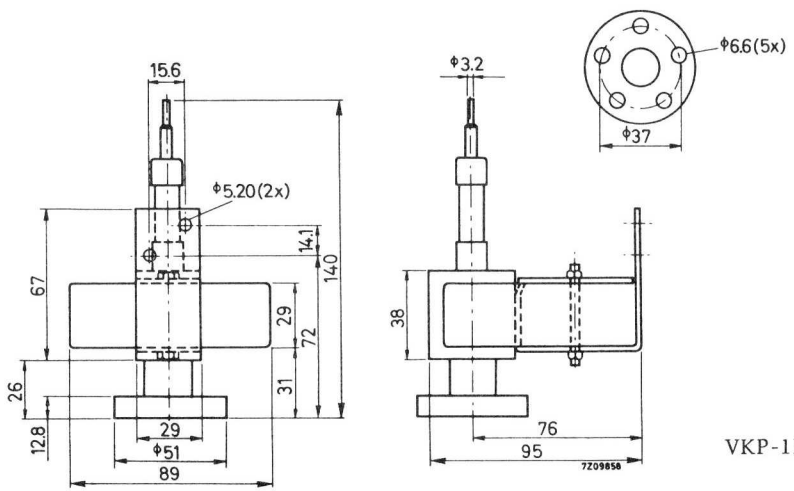
MECHANICAL DATA

Dimensions in mm

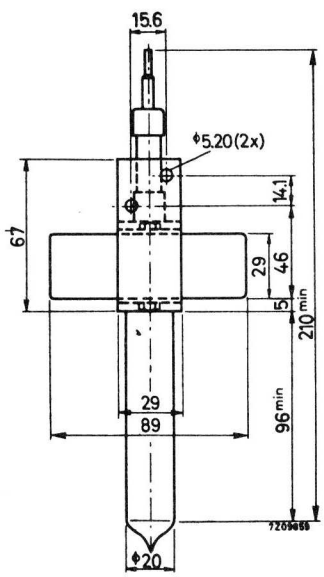
Mounting position: any. The distance to adjacent ferro-magnetic materials should be at least 75 mm.

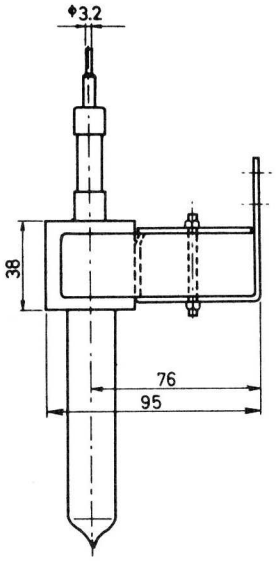


VKP-1



VKP-1F

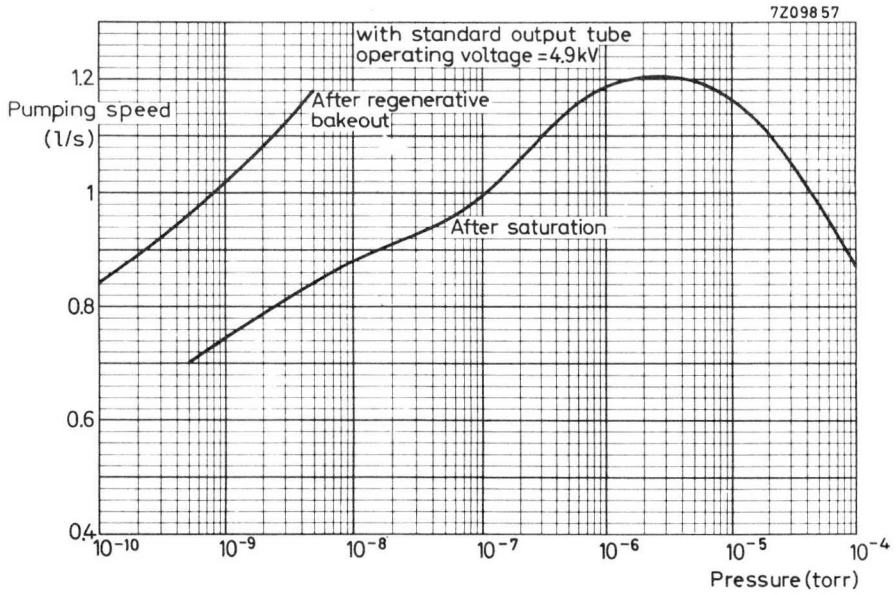


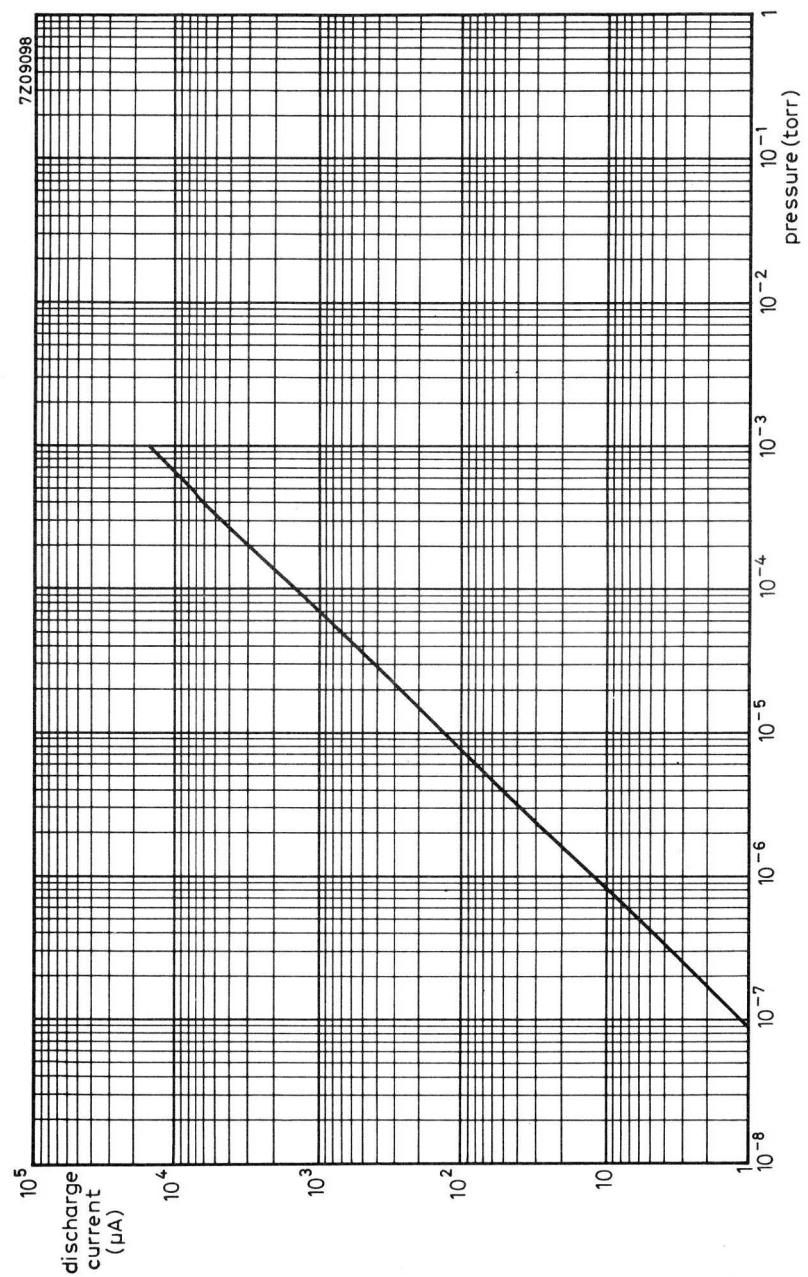


VKP-1K
VKP-1P

ASSOCIATED EQUIPMENT

Power supply	KPS-1


7Z09857
with standard output tube
operating voltage = 4.9kV
After regenerative
bakeout
After saturation
Pumping speed
(l/s)
1.2
1
0.8
0.6
0.4
10⁻¹⁰
10⁻⁹
10⁻⁸
10⁻⁷
10⁻⁶
10⁻⁵
10⁻⁴
Pressure (torr)


7Z09098
discharge current (μA)
10^5
10^4
10^3
10^2
10
1
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
1
pressure (torr)

"K" TYPE MAGNETRON SPUTTER ION PUMP

8 litre/s sputter ion pump based on the Penning principle with magnetron structure cells, featuring a highly stable pumping action and a high pumping speed for Argon; pressure range 10^{-2} torr to 10^{-11} torr.
Pumping action starts immediately as soon as the operating voltage is switched on.
Bake-out temperatures up to 400 °C may be used with the magnets in position; however, when higher bake-out temperatures and/or a low thermal inertia are preferred, the magnets can easily be removed.
Also the complete h.t. connector assembly is removable for cleaning purposes without disassembling the rest of the pump.
The pump is provided with a flange.

CHARACTERISTICS

(pump in combination with the power supply type KPS-8)

Pressure range	10^{-2} to 10^{-11}	torr
Pumping speed, air	see page 3	
argon	12 to 20% of that of nitrogen	
Operating voltage, D.C.	4.9	kV
Discharge current	see page 4	
Average life at 10^{-6} torr (below 10^{-4} torr inversely proportional to pressure)	50 000	h

LIMITING VALUES

Striking pressure	max.	2×10^{-2}	torr
Operating voltage, d.c.	max.	8	kV
Input power	max.	100	W [1]
Bake-out temperature, with magnets	max.	400	°C
without magnets	max.	500	°C
Ambient temperature during operation (See also data KPS-8)	max.	300	°C

[1] The regulation of the power supply should be such that this input power is not exceeded at any pressure.

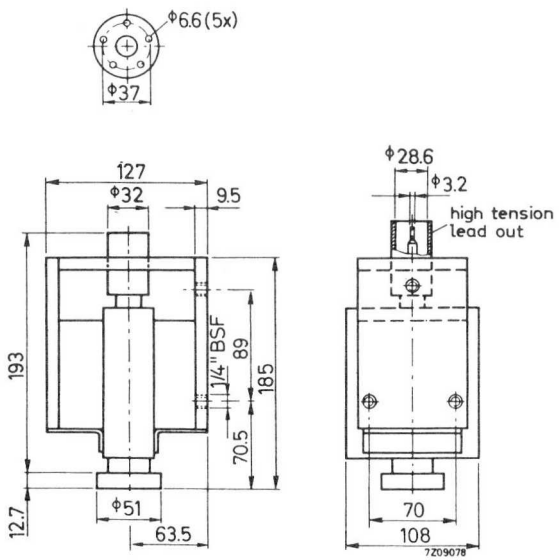
MECHANICAL DATA

Dimensions in mm

Flange type VMF-18 [1])

Mounting position: any

The distance to adjacent ferro-magnetic materials should be at least 75 mm.



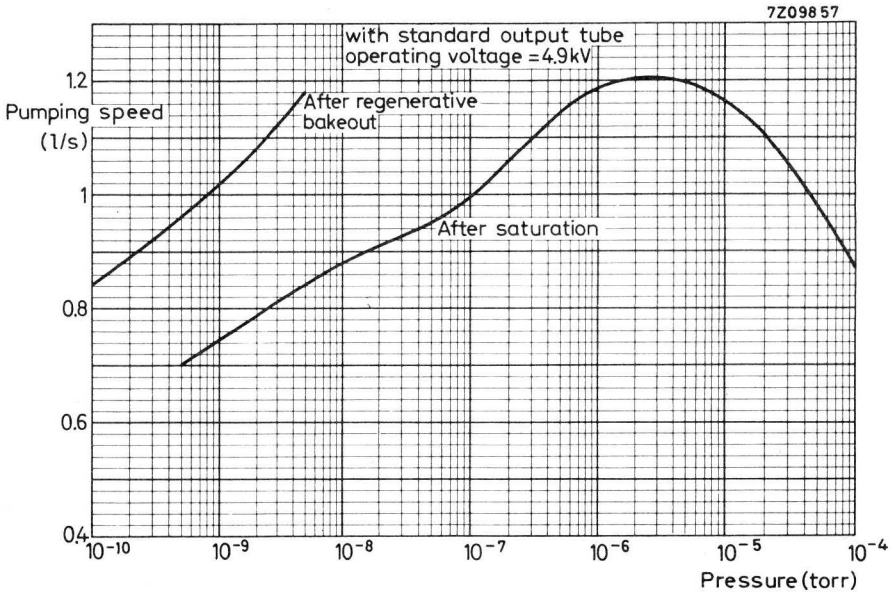
Remark

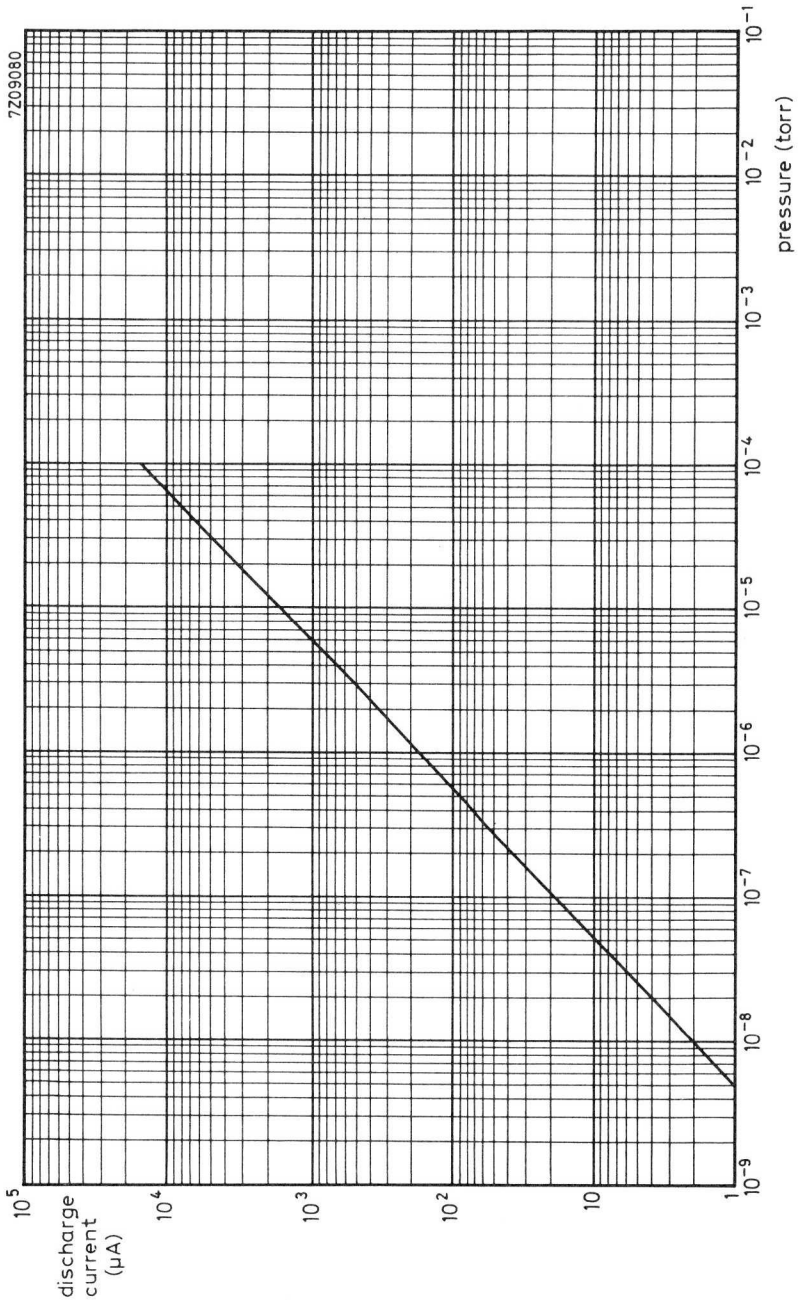
The pump is supplied in evacuated condition and should be kept sealed until ready for use.

ASSOCIATED EQUIPMENT AND COMPONENTS

Power supply	KPS-8
Mating flange	VMF-18series
Gold wire seal	VMS-18series
Set of nuts, bolts, washers and studding	V-1018

1) Special flanges to customer design can be fitted on request.


7Z09857
with standard output tube
operating voltage = 4.9kV
After regenerative
bakeout
After saturation
Pumping speed
(l/s)
1.2
1
0.8
0.6
0.4
10-10
10-9
10-8
10-7
10-6
10-5
10-4
Pressure (torr)


7Z09080
discharge current (μA)
10^5
10^4
10^3
10^2
10
1
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
pressure (torr)

"K" TYPE MAGNETRON SPUTTER ION PUMP

15 litre/s sputter ion pump based on the Penning principle with magnetron structure cells, featuring a highly stable pumping action and a high pumping speed for Argon; pressure range 10^{-2} torr to 10^{-11} torr.
Pumping action starts immediately as soon as the operating voltage is switched on. Bake-out temperatures up to 400 °C may be used with the magnets in position; however, when higher bake-out temperatures and/or a low thermal inertia are preferred, the magnets can easily be removed.
Also the complete h.t. connector assembly is removable for cleaning purposes without disassembling the rest of the pump.

The pump is provided with a flange.

CHARACTERISTICS

(pump in combination with the power supply type KPS-15)

Pressure range	10^{-2} to 10^{-11}	torr
Pumping speed, air	see page 3	
argon	12 to 20% of that of nitrogen	
Operating voltage, D.C.	4.9	kV
Discharge current	see page 4	
Average life at 10^{-6} torr (below 10^{-4} torr inversely proportional to pressure)	50 000	h

LIMITING VALUES

Striking pressure	max.	2×10^{-2}	torr
Operating voltage, d.c.	max.	8	kV
Input power	max.	200	W [1]
Bake-out temperature, with magnets	max.	400	°C
without magnets	max.	500	°C
Ambient temperature during operation (See also data KPS-15)	max.	300	°C

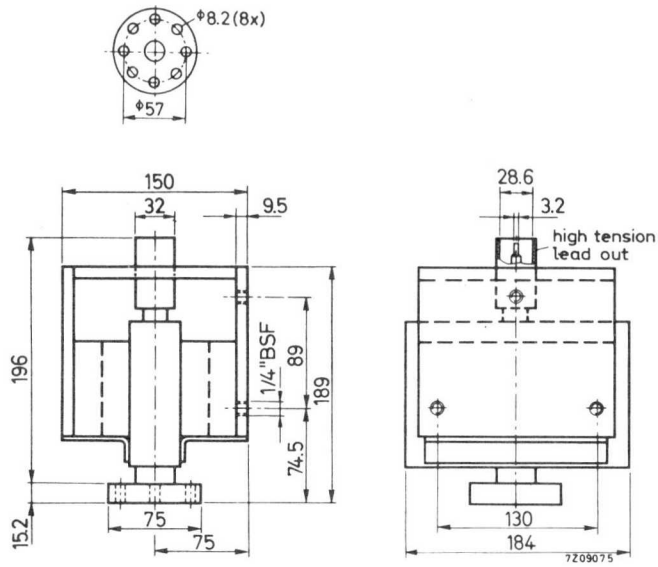
[1]) The regulation of the power supply should be such that this input power is not exceeded at any pressure.

MECHANICAL DATA

Dimensions in mm

Flange type VMF-25 [1])

Mounting position: any. The distance to adjacent ferro-magnetic materials should be at least 75 mm.



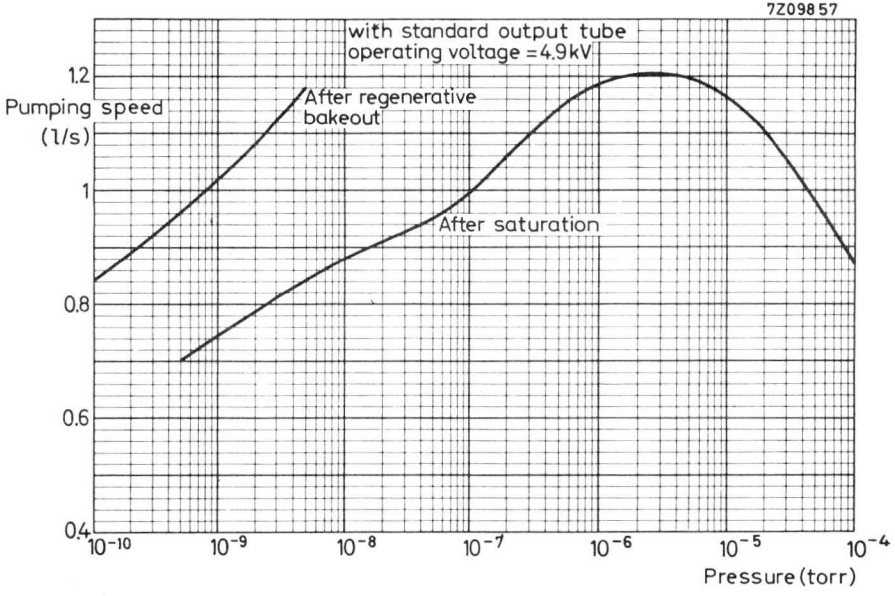
Remark

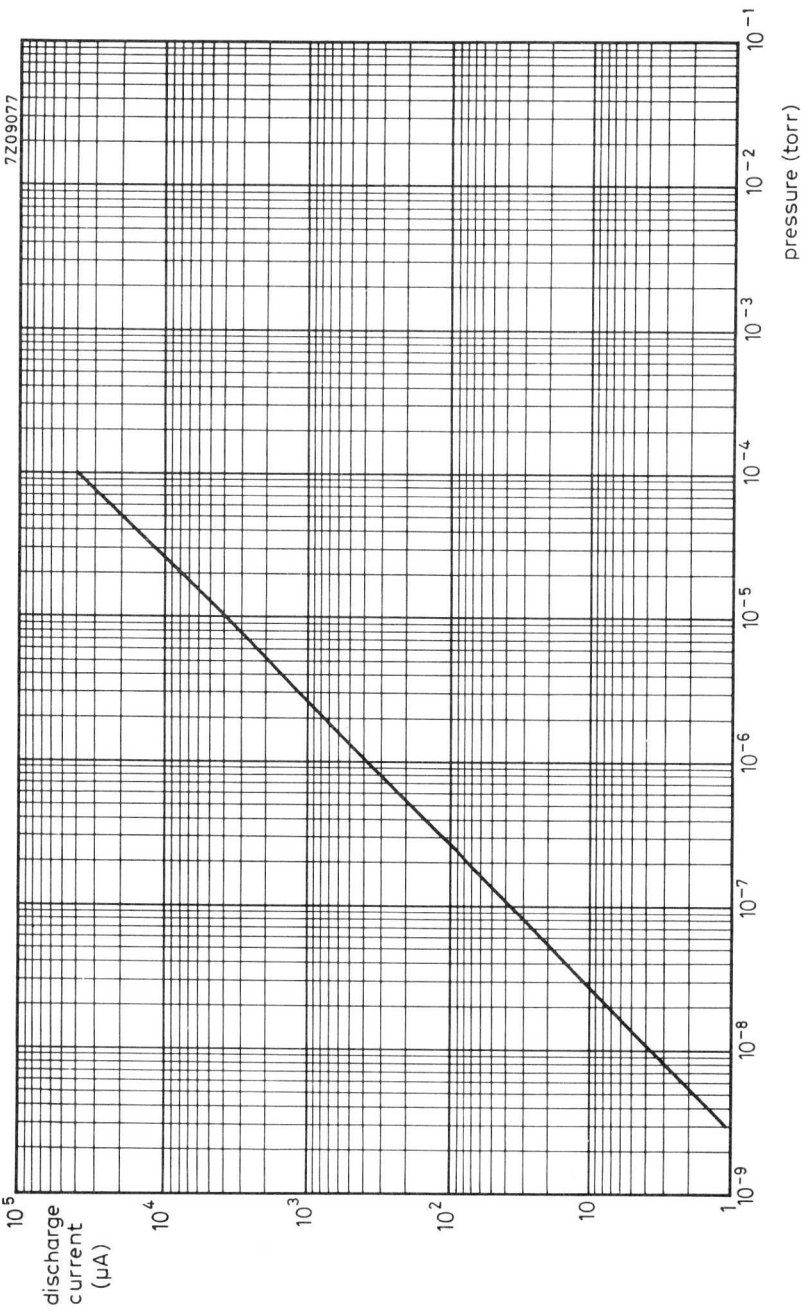
The pump is supplied in evacuated condition and should be kept sealed until ready for use.

ASSOCIATED EQUIPMENT AND COMPONENTS

Power supply	KPS-15
Mating flange	VMF-25 series
Gold wire seal	VMS-25 series
Set of nuts, bolts, washers and studding	V-1019

[1]) Special flanges to customer design can be fitted on request.


7Z09857
with standard output tube
operating voltage = 4.9kV
After regenerative
bakeout
After saturation
Pumping speed
(l/s)
1.2
1
0.8
0.6
0.4
10-10
10-9
10-8
10-7
10-6
10-5
10-4
Pressure (torr)


7Z09077
discharge current (μA)
10^5
10^4
10^3
10^2
10
1
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
pressure (torr)

"K" TYPE MAGNETRON SPUTTER ION PUMP

50 litre/s sputter ion pump based on the Penning principle with magnetron structure cells, featuring a highly stable pumping action and a high pumping speed for Argon; pressure range 10^{-2} torr to 10^{-11} torr.
Pumping action starts immediately as soon as the operating voltage is switched on. Bake-out temperatures up to 400 °C may be used with the magnets in position; however, when higher bake-out temperatures and/or a low thermal inertia are preferred, the magnets can easily be removed.
Also the pumping elements and the complete h.t. connector assembly are removable for cleaning purposes without disassembling the rest of the pump.

The pump is provided with a flange. If required, an extra flange connection can be provided opposite the existing entry to accommodate a sublimation pump or a bake-out heater.

CHARACTERISTICS

(pump in combination with the power supply type KPS-50)

Pressure range	10^{-2} to 10^{-11}	torr
Pumping speed, air	see page 3	
argon	12 to 20% of that of nitrogen	
Operating voltage, D.C.	4.9	kV
Discharge current	see page 4	
Average life at 10^{-6} torr (below 10^{-4} torr inversely proportional to pressure)	50 000	h

LIMITING VALUES

Striking pressure	max.	2×10^{-2}	torr
Operating voltage, d.c.	max.	8	kV
Input voltage	max.	300	W [1]
Bake-out temperature, with magnets	max.	400	°C
without magnets	max.	500	°C
Ambient temperature during operation (See also data KPS-50)	max.	300	°C

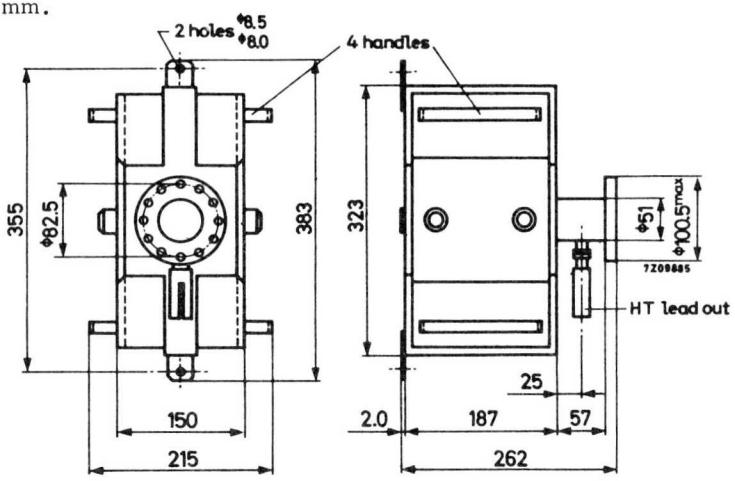
[1]) The regulation of the power supply should be such that this input power is not exceeded at any pressure.

MECHANICAL DATA

Dimensions in mm

Flange type VMF-51 [1])

Mounting position: any. The distance to adjacent ferro-magnetic materials should be at least 75 mm.



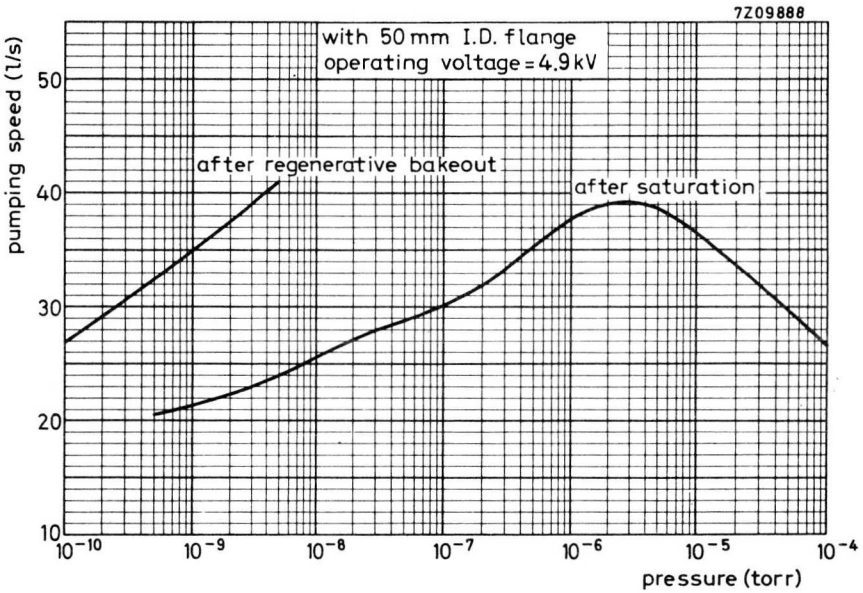
Remark

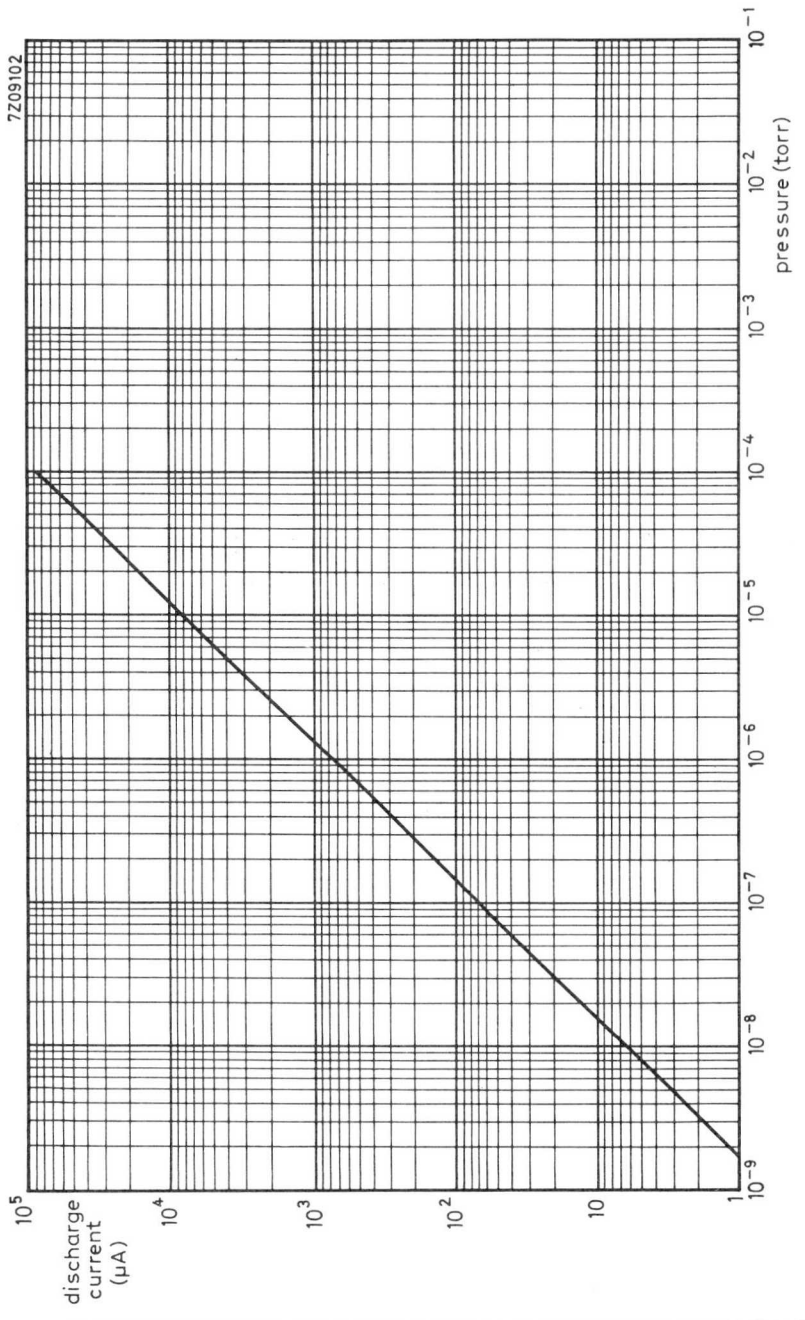
The pump is supplied in evacuated condition and should be kept sealed until ready for use.

ASSOCIATED EQUIPMENT AND COMPONENTS

Power supply	KPS -50
Mating flange	VMF-51 series
Gold wire seal	VMS-51 series
Set of nuts, bolts, washers and studding	V-1019
Bake-out jacket	V-1056

[1]) Special flanges to customer design can be fitted on request.


7Z09888
with 50 mm I.D. flange
operating voltage = 4.9 kV
after regenerative bakeout
after saturation
pumping speed (l/s)
50
40
30
20
10
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
pressure (torr)


7Z09102
discharge current (μA)
10^5
10^4
10^3
10^2
10
1
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
pressure (torr)

"K" TYPE MAGNETRON SPUTTER ION PUMP

100 litre/s sputter ion pump based on the Penning principle with magnetron structure cells, featuring a highly stable pumping action and a high pumping speed for Argon; pressure range 10^{-2} torr to 10^{-11} torr.
Pumping action starts immediately as soon as the operating voltage is switched on.
Bake-out temperatures up to 400 °C may be used with the magnets in position; however, when higher bake-out temperatures and/or a low thermal inertia are preferred, the magnets can easily be removed.
Also the pumping elements and the complete h.t. connector assembly are removable for cleaning purposes without disassembling the rest of the pump.

The pump is provided with a flange. If required, an extra flange connection can be provided opposite the existing entry to accommodate a sublimation pump or a bake-out heater.

CHARACTERISTICS

(pump in combination with the power supply type KPS-100)

Pressure range	10^{-2} to 10^{-11}	torr
Pumping speed, air	see page 3	
argon	12 to 20 % of that of nitrogen	
Operating voltage, D.C.	4.9	kV
Discharge current	see page 4	
Average life at 10^{-6} torr (below 10^{-4} torr inversely proportional to pressure)	50 000	h

LIMITING VALUES

Striking pressure	max.	2×10^{-2}	torr
Operating voltage, d.c.	max.	8	kV
Input power	max.	400	W [1]
Bake-out temperature, with magnets	max.	400	°C
without magnets	max.	500	°C
Ambient temperature during operation (See also data KPS-100)	max.	300	°C

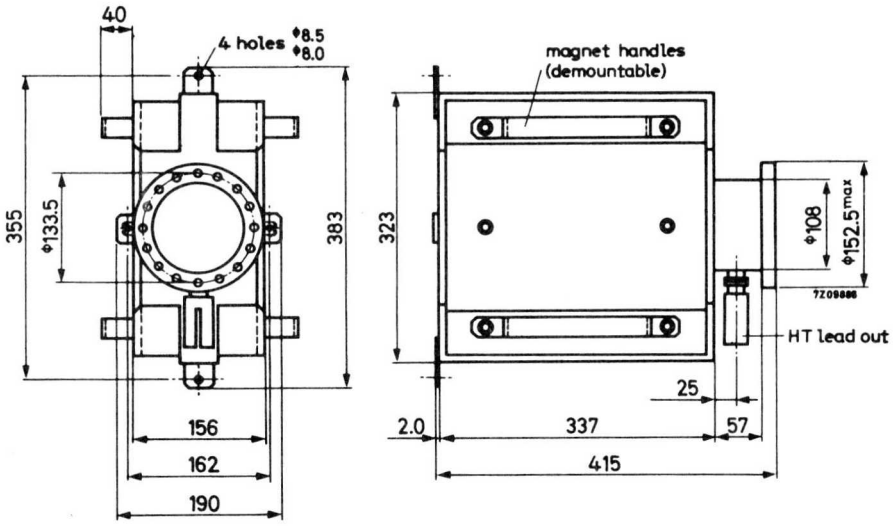
1) The regulation of the power supply should be such that this input power is not exceeded at any pressure.

MECHANICAL DATA

Dimensions in mm

Flange type VMF-100 [1])

Mounting position: any. The distance to adjacent ferro-magnetic materials should be at least 75 mm.



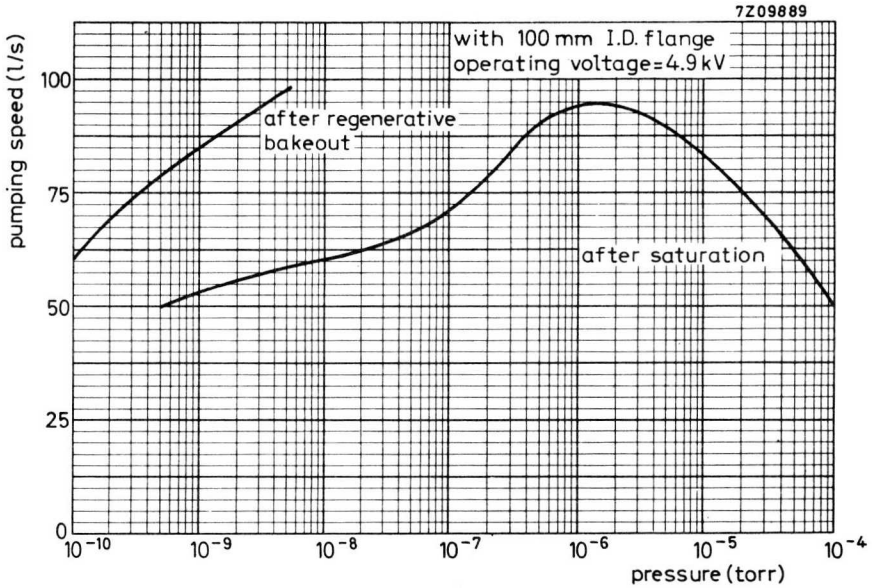
Remark

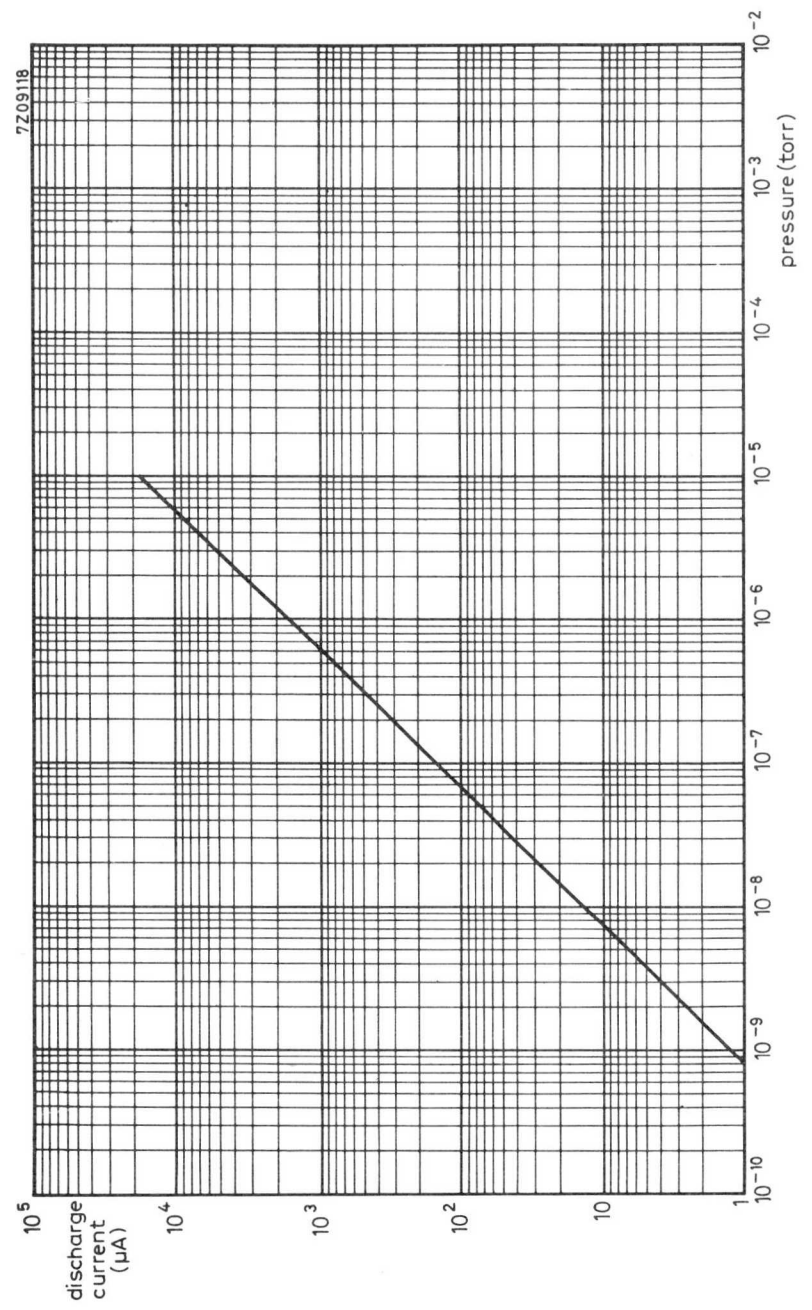
The pump is supplied in evacuated condition and should be kept sealed until ready for use.

ASSOCIATED EQUIPMENT AND COMPONENTS

Power supply	KPS-100
Mating flange	VMF-100 series
Gold wire seal	VMS-100 series
Set of nuts, bolts, washers and studding	V-1020
Bake-out jacket	V-1057

[1]) Special flanges to customer design can be fitted on request.


7Z09889
with 100 mm I.D. flange
operating voltage=4.9 kV
after regenerative
bakeout
after saturation
pumping speed (l/s)
100
75
50
25
0
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
pressure (torr)


7Z09118
discharge current (μA)
10^5
10^4
10^3
10^2
10
1
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
pressure (torr)

"K" TYPE MAGNETRON SPUTTER ION PUMP

150 litre/s sputter ion pump based on the Penning principle with magnetron structure cells, featuring a highly stable pumping action and a high pumping speed for Argon; pressure range 10^{-2} torr to 10^{-11} torr.
Pumping action starts immediately as soon as the operating voltage is switched on.
Bake-out temperatures up to 400 °C may be used with the magnets in position; however, when higher bake-out temperatures and/or a low thermal inertia are preferred, the magnets can easily be removed.
Also the pumping elements and the complete h.t. connector assembly are removable for cleaning purposes without disassembling the rest of the pump.

The pump is provided with a flange. If required, an extra flange connection can be provided opposite the existing entry to accommodate a sublimation pump or a bake-out heater.

CHARACTERISTICS

(pump in combination with the power supply type KPS-150)

Pressure range	10^{-2} to 10^{-11}	torr
Pumping speed, air	see page 3	
argon	12 to 20 % of that of nitrogen	
Operating voltage, D.C.	4.9	kV
Discharge current	see page 4	
Average life at 10^{-6} torr (below 10^{-4} torr inversely proportional to pressure)	50 000	h

LIMITING VALUES

Striking pressure	max.	2×10^{-2}	torr
Operating voltage, d.c.	max.	8	kV
Input power	max.	400	W [1]
Bake-out temperatures, with magnets	max.	400	°C
without magnets	max.	500	°C
Ambient temperature during operation (See also data KPS-150)	max.	300	°C

1) The regulation of the power supply should be such that this input power is not exceeded at any pressure.

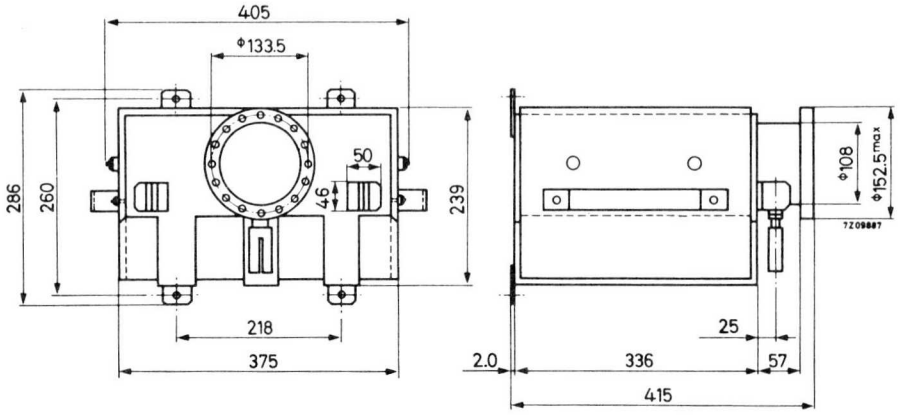
MECHANICAL DATA

Dimensions in mm

Flange type VMF-100 [1])

Mounting position: any

The distance to adjacent ferro-magnetic materials should be at least 75 mm



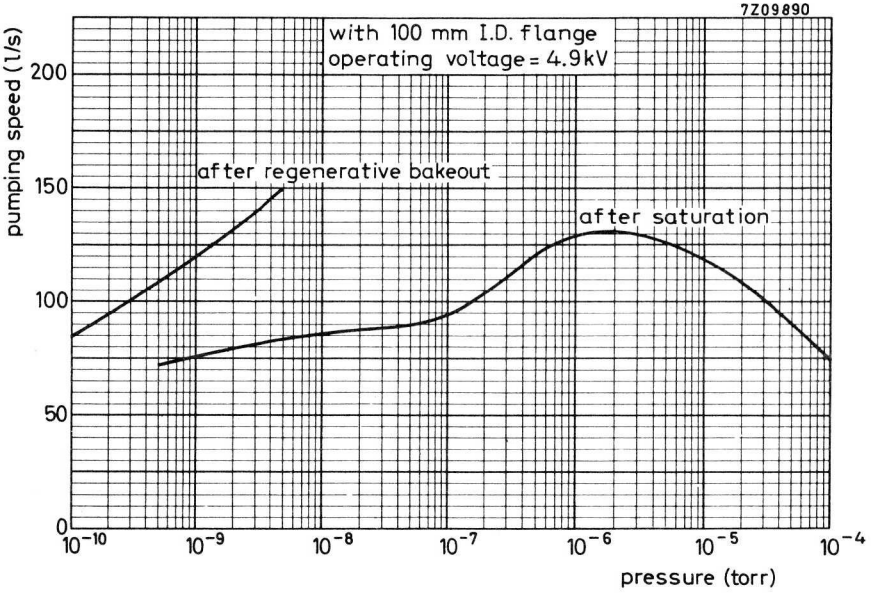
Remark

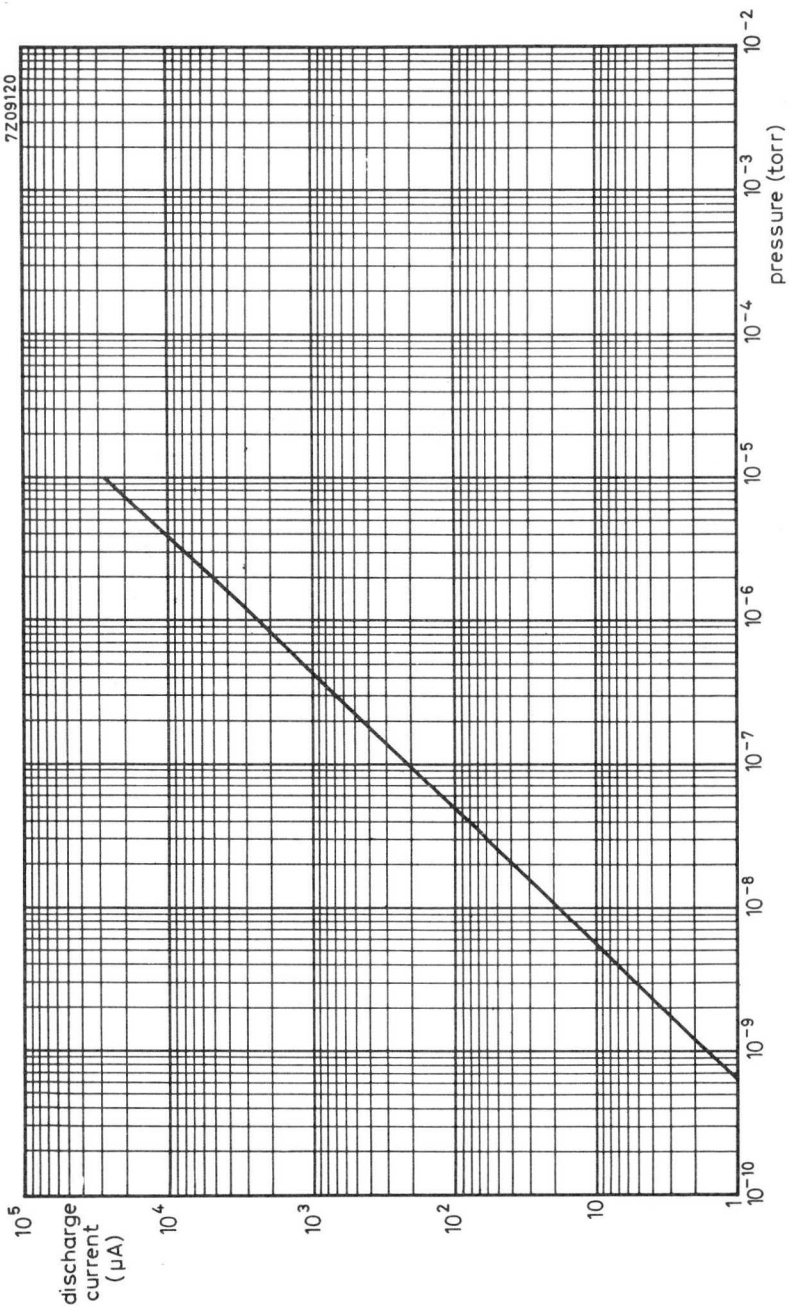
The pump is supplied in evacuated condition and should be kept sealed until ready for use.

ASSOCIATED EQUIPMENT AND COMPONENTS

Power supply	KPS-150
Mating flange	VMF-100 series
Gold wire seal	VMS-100 series
Set of nuts, bolts, washers and studding	V-1020
Bake-out jacket	V-1055

[1]) Special flanges to customer design can be fitted on request.


7Z09890
with 100 mm I.D. flange
operating voltage = 4.9kV
after regenerative bakeout
after saturation
pumping speed (l/s)
200
150
100
50
0
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
pressure (torr)


7Z09120
discharge current (μA)
10^5
10^4
10^3
10^2
10
1
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
pressure (torr)

"K" TYPE MAGNETRON SPUTTER ION PUMP

200 litre/s sputter ion pump based on the Penning principle with magnetron structure cells, featuring a highly stable pumping action and a high pumping speed for Argon; pressure range 10^{-2} torr to 10^{-11} torr.
Pumping action starts immediately as soon as the operating voltage is switched on.
Bake-out temperatures up to 400 °C may be used with the magnets in position; however, when higher bake-out temperatures and/or a low thermal inertia are preferred, the magnets can easily be removed.
Also the pumping elements and the complete h.t. connector assembly are removable for cleaning purposes without disassembling the rest of the pump.

The pump is provided with a flange. If required, an extra flange connection can be provided opposite the existing entry to accommodate a sublimation pump or a bake-out heater.

CHARACTERISTICS

(pump in combination with the power supply type KPS-200)

Pressure range	10^{-2} to 10^{-11}	torr
Pumping speed, air	see page 3	
argon	12 to 20 % of that of nitrogen	
Operating voltage, D.C.	4.9	kV
Discharge current	see page 4	
Average life at 10^{-6} torr (below 10^{-4} torr inversely proportional to pressure)	50 000	h

LIMITING VALUES

Striking pressure	max.	2×10^{-2}	torr
Operating voltage, d.c.	max.	8	kV
Input power	max.	400	W [1]
Bake-out temperature, with magnets	max.	400	°C
without magnets	max.	500	°C
Ambient temperature during operation (See also data KPS-200)	max.	300	°C

1) The regulation of the power supply should be such that this input power is not exceeded at any pressure.

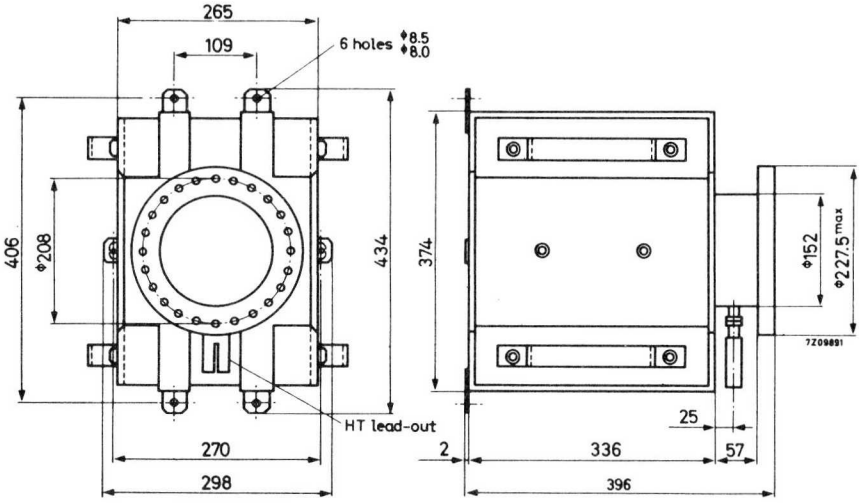
MECHANICAL DATA

Dimensions in mm

Flange type VMF-150 [1])

Mounting position: any

The distance to adjacent ferro-magnetic materials shouldbe at least 75 mm



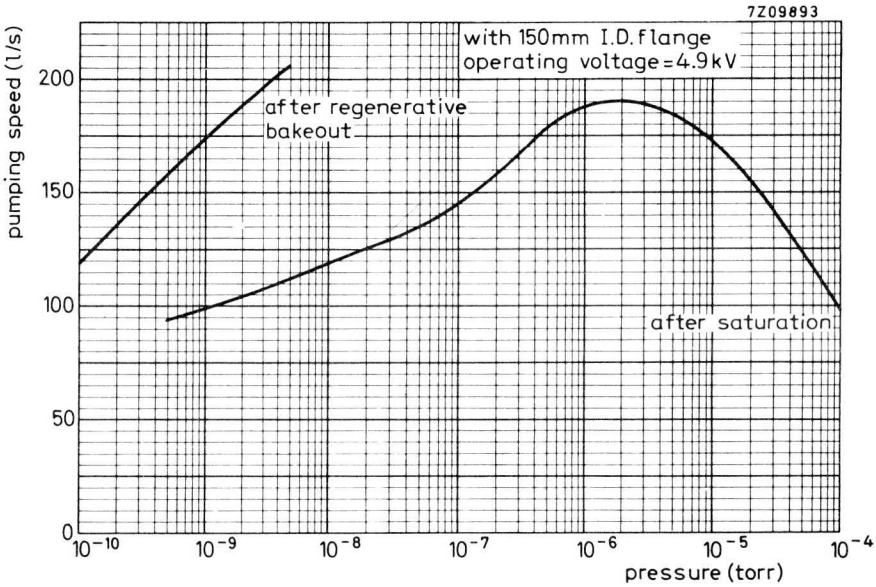
Remark

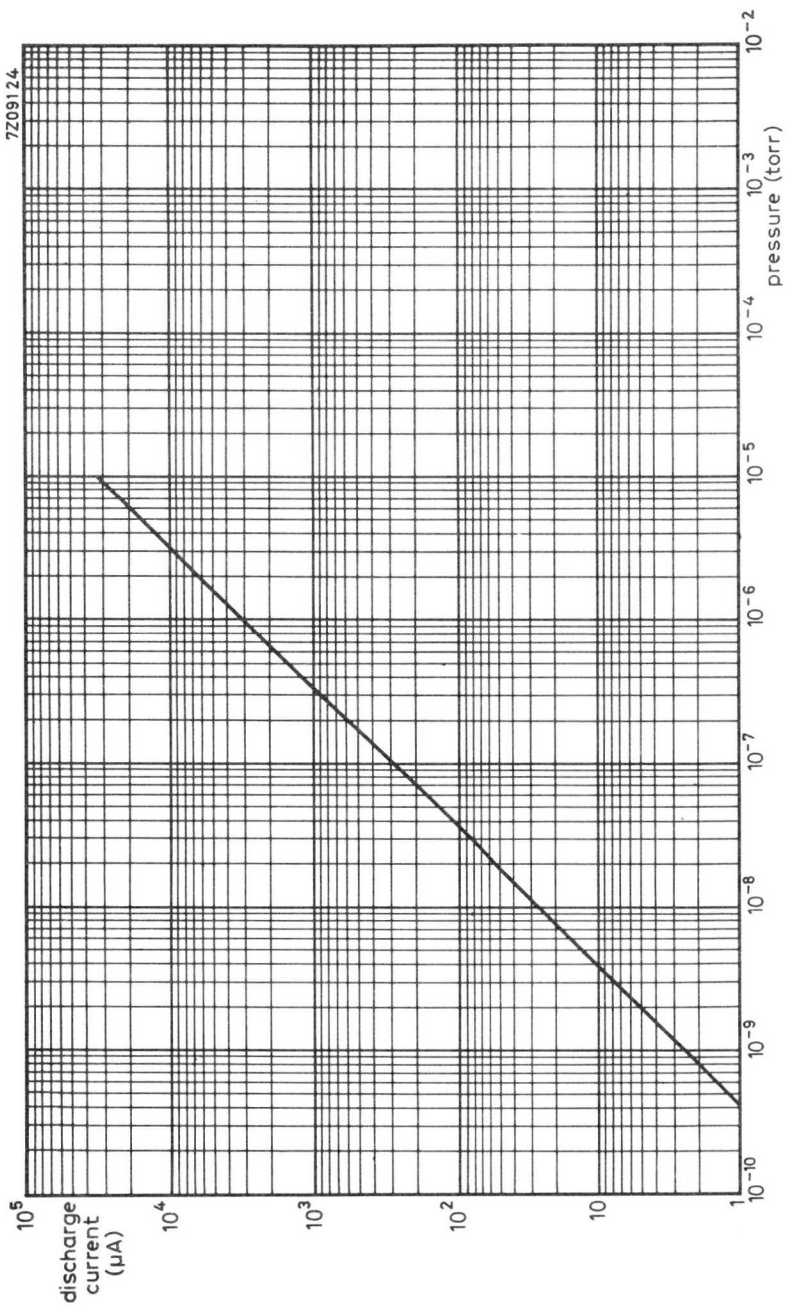
The pump is supplied in evacuated condition and should be kept sealed until ready for use.

ASSOCIATED EQUIPMENT AND COMPONENTS

Power supply	KPS-200
Mating flange	VMF-150series
Gold wire seal	VMS-150series
Set of nuts, bolts, washers and studding	V-1021
Bake-out jacket	V-1058

[1]) Special flange to customer design can be fitted on request.


7Z09893
with 150mm I.D. flange
operating voltage = 4.9 kV
after regenerative
bakeout
after saturation
pumping speed (l/s)
200
150
100
50
0
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
pressure (torr)


7Z09124
discharge current (μA)
10^5
10^4
10^3
10^2
10
1
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
pressure (torr)

"K" TYPE MAGNETRON SPUTTER ION PUMP

400 litre/s sputter ion pump based on the Penning principle with magnetron structure cells, featuring a highly stable pumping action and a high pumping speed for Argon; pressure range 10^{-2} torr to 10^{-11} torr.
Pumping action starts immediately as soon as the operating voltage is switched on.
Bake-out temperatures up to 400 °C may be used with the magnets in position; however, when higher bake-out temperatures and/or a low thermal inertia are preferred, the magnets can easily be removed.
Also the pumping elements and the complete h.t. connector assembly are removable for cleaning purposes without disassembling the rest of the pump.

The pump is provided with a flange. If required, an extra flange connection can be provided opposite the existing entry to accommodate a sublimation pump or a bake-out heater.

CHARACTERISTICS

(pump in combination with the power supply type KPS-400)

Pressure range	10^{-2} to 10^{-11}	torr
Pumping speed, air	see page 3	
argon	12 to 20 % of that of nitrogen	
Operating voltage, D.C.	4.9	kV
Discharge current	see page 4	
Average life at 10^{-6} torr (below 10^{-4} torr inversely proportional to pressure)	50 000	h

LIMITING VALUES

Striking pressure	max.	2×10^{-2}	torr
Operating voltage, d.c.	max.	8	kV
Input power	max.	800	W [1]
Bake-out temperature, with magnets	max.	400	°C
without magnets	max.	500	°C
Ambient temperature during operation (See also data KPS-400)	max.	300	°C

[1]) The regulation of the power supply should be such that this input power is not exceeded at any pressure.

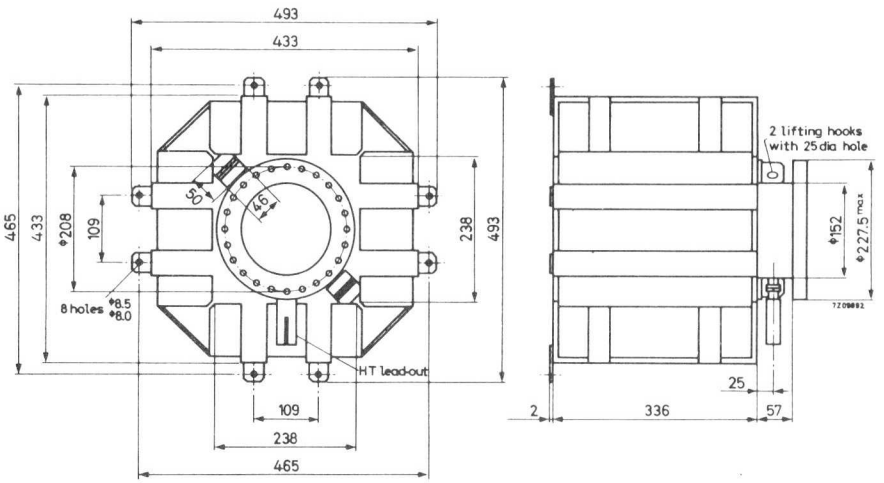
MECHANICAL DATA

Dimensions in mm

Flange type VMF-150 [1])

Mounting position: any

The distance to adjacent ferro-magnetic materials should be at least 75 mm



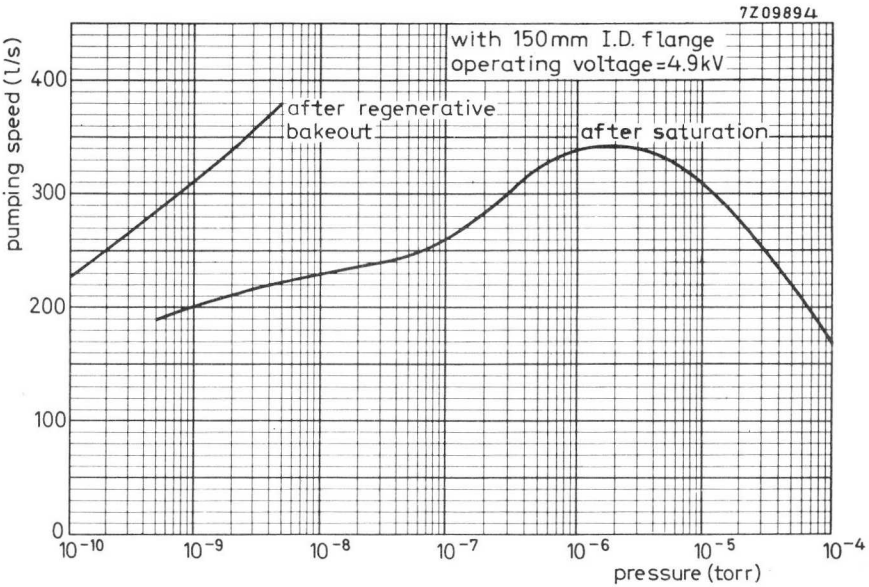
Remark

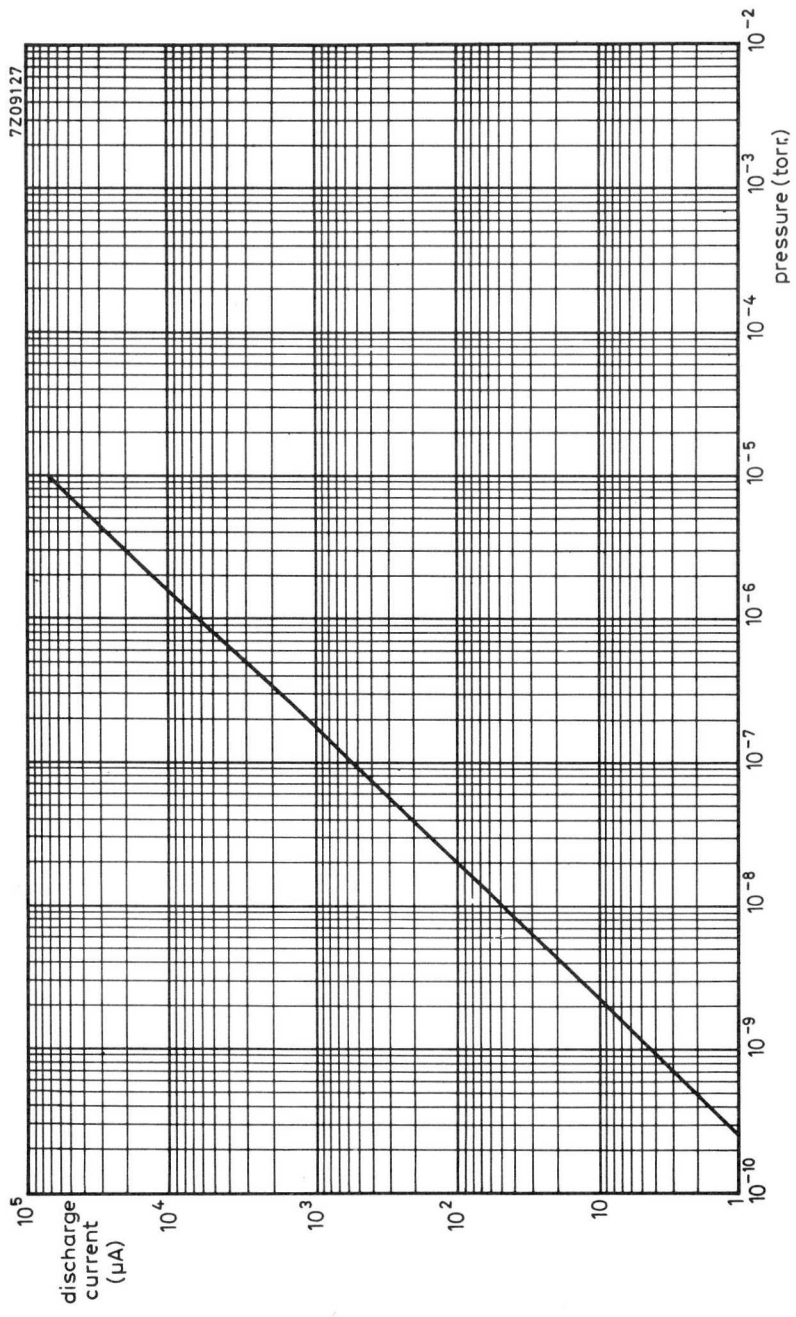
The pump is supplied in evacuated condition and should be kept sealed until ready for use.

ASSOCIATED EQUIPMENT AND COMPONENTS

Power supply	KPS-400
Mating flange	VMF-150 series
Gold wire seal	VMS-150 series
Set of nuts, bolts, washers and studding	V-1021
Bake-out jacket	V-1059

[1]) Special flanges to customer design can be fitted on request.


7Z09894
with 150mm I.D. flange
operating voltage=4.9kV
after regenerative
bakeout
after saturation
pumping speed (l/s)
400
300
200
100
0
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
pressure (torr)


7209127
discharge current (μA)
10^5
10^4
10^3
10^2
10
1
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
pressure (torr)

"K" TYPE MAGNETRON SPUTTER ION PUMP

500 litre/s sputter ion pump based on the Penning principle with magnetron structure cells, featuring a highly stable pumping action and a high pumping speed for Argon; pressure range 10^{-2} torr to 10^{-11} torr.
Pumping action starts immediately as soon as the operating voltage is switched on.
Bake-out temperatures up to 400 °C may be used with the magnets in position; however, when higher bake-out temperatures and/or a low thermal inertia are preferred, the magnets can easily be removed.
Also the pumping elements and the complete h.t. connector assembly are removable for cleaning purposes without disassembling the rest of the pump.

The pump is provided with a flange. If required, an extra flange connection can be provided opposite the existing entry to accommodate a sublimation pump or a bake-out heater.

CHARACTERISTICS

(pump in combination with the power supply type KPS-500)

Pressure range	10^{-2} to 10^{-11}	torr
Pumping speed, air	see page 3	
argon	12 to 20 % of that of nitrogen	
Operating voltage, D.C.	4.9	kV
Discharge current	see page 4	
Average life at 10^{-6} torr (below 10^{-4} torr inversely proportional to pressure)	50 000	h

LIMITING VALUES

Striking pressure	max.	2×10^{-2}	torr
Operating voltage, d.c.	max.	8	kV
Input power	max.	800	W [1]
Bake-out temperature, with magnets	max.	400	°C
without magnets	max.	500	°C
Ambient temperature during operation (See also data KPS-500)	max.	300	°C

1) The regulation of the power supply should be such that this input power is not exceeded at any pressure.

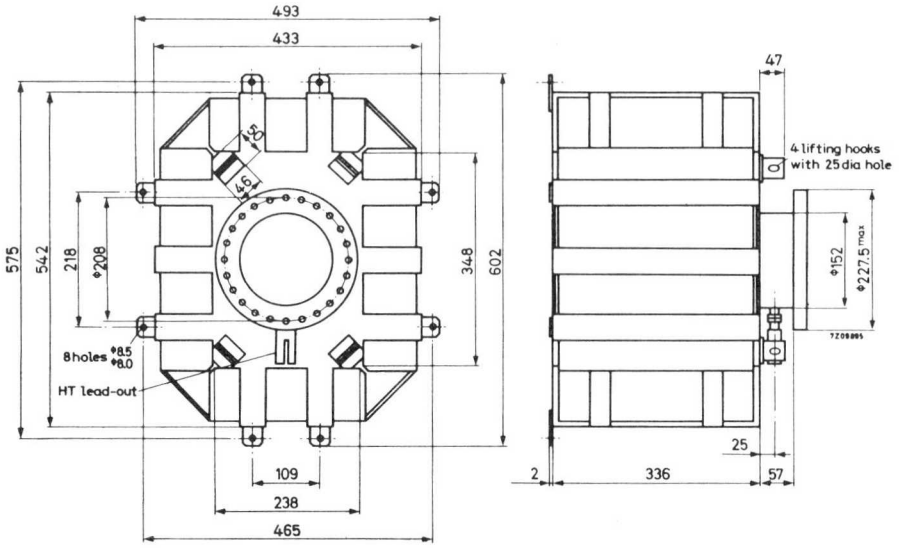
MECHANICAL DATA

Dimensions in mm

Flange type VMF-150 [1])

Mounting position: any

The distance to adjacent ferro-magnetic materials should be at least 75 mm



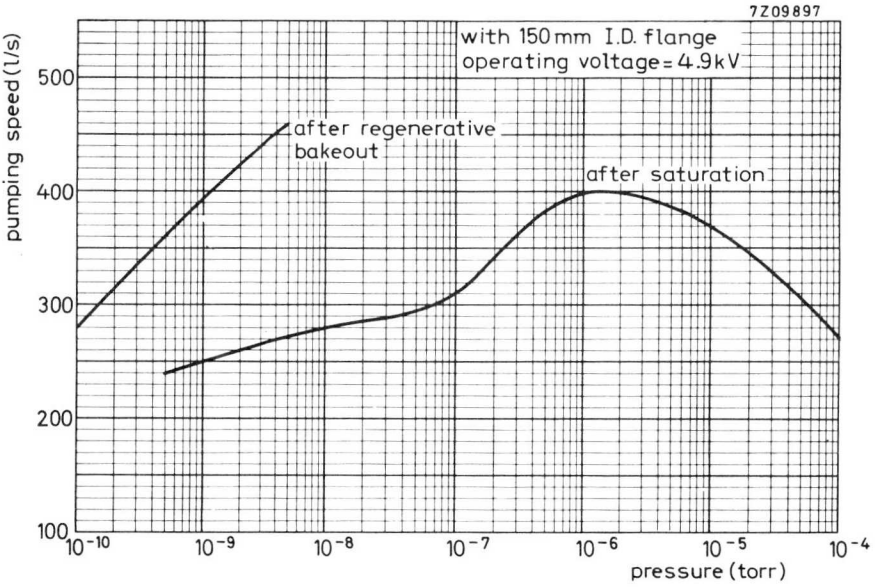
Remark

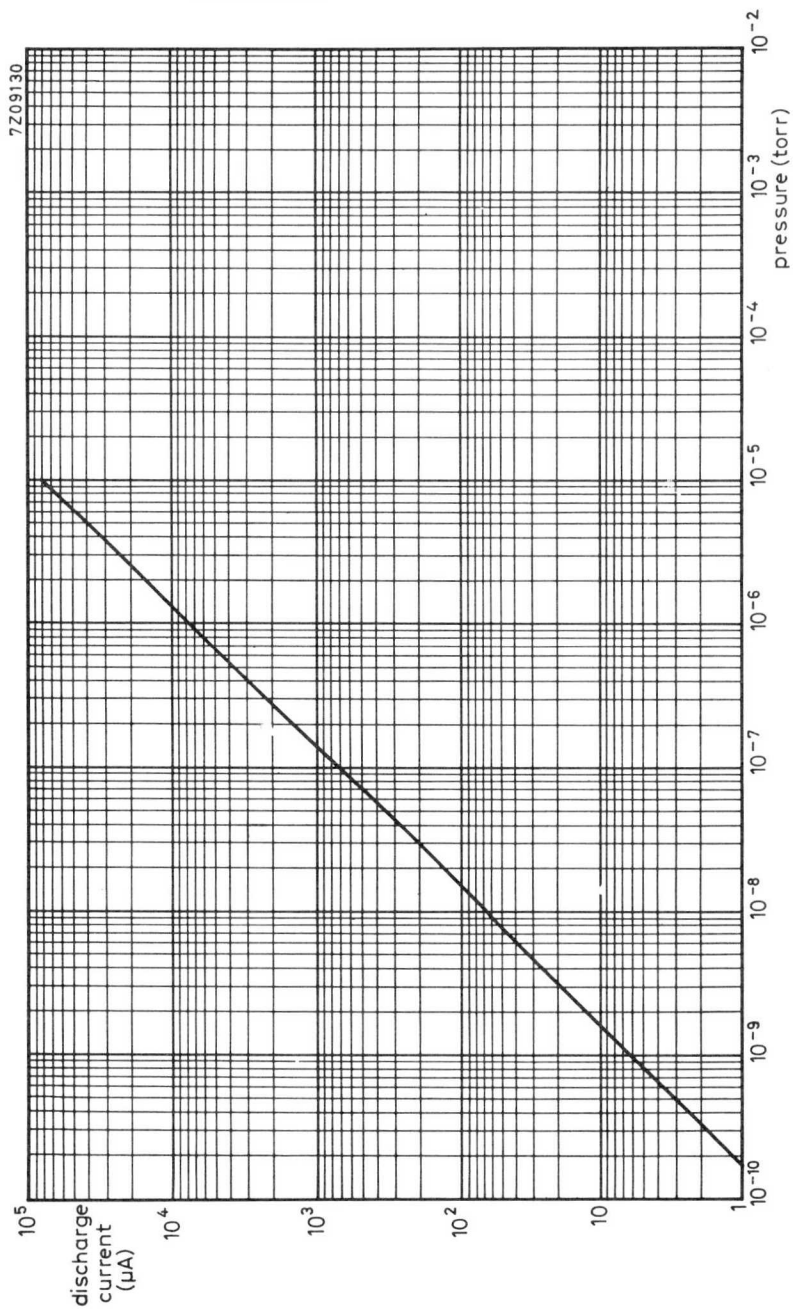
The pump is supplied in evacuated condition and should be kept sealed until ready for use.

ASSOCIATED EQUIPMENT AND COMPONENTS

Power supply	KPS-500
Mating flange	VMF-150 series
Gold wire seal	VMS-150 series
Set of nuts, bolts, washers and studding	V-1021
Bake-out jacket	V-1060

[1]) Special flanges to customer design can be fitted on request.


7Z09897
with 150 mm I.D. flange
operating voltage = 4.9 kV
after regenerative bakeout
after saturation
pumping speed (l/s)
500
400
300
200
100
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
pressure (torr)


7Z09130
discharge current (μA)
10^5
10^4
10^3
10^2
10
1
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
pressure (torr)

"K" TYPE MAGNETRON SPUTTER ION PUMP

1000 litre/s sputter ion pump based on the Penning principle with magnetron structure cells, featuring a highly stable pumping action and a high pumping speed for Argon; pressure range 2×10^{-2} torr to 10^{-11} torr.
Pumping action starts immediately as soon as the operating voltage is switched on. Bake-out temperatures up to 400 °C may be used with the magnets in position; however, when higher bake-out temperatures and/or a low thermal inertia are preferred, the magnets can easily be removed.
Also the pumping elements and the complete h.t. connector assembly are removable for cleaning purposes without disassembling the rest of the pump.

The pump is provided with a flange. If required, an extra flange connection can be provided opposite the existing entry to accommodate a sublimation pump or a bake-out heater.

CHARACTERISTICS

(pump in combination with the power supply type KPS-1000)

Pressure range	2×10^{-2} to 10^{-11}	torr
Pumping speed, air	see page 3	
argon	12 to 20 % of that of nitrogen	
Operating voltage, D.C.	4.9	kV
Discharge current	see page 4	
Average life at 10^{-6} torr (below 10^{-4} torr inversely proportional to pressure)	50 000	h

LIMITING VALUES

Striking pressure	max.	2×10^{-2}	torr
Input power	max.	800	W [1]
Bake-out temperature, with magnets	max.	400	°C
without magnets	max.	500	°C
Ambient temperature during operation (See also data of KPS-1000)	max.	300	°C

1) The regulation of the power supply should be such that this input power is not exceeded at any pressure.

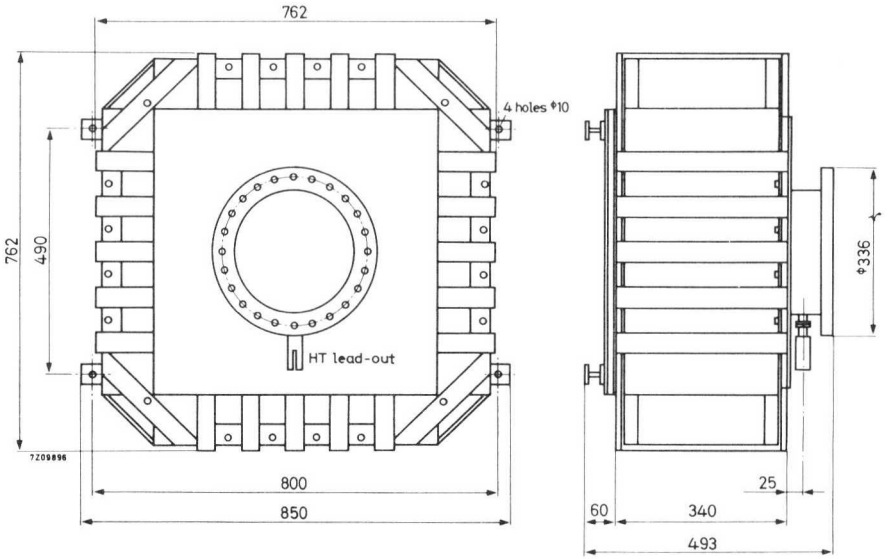
MECHANICAL DATA

Dimensions in mm

Flange type VMF-250 [1])

Mounting position: any

The distance to adjacent ferro-magnetic materials should be at least 75 mm



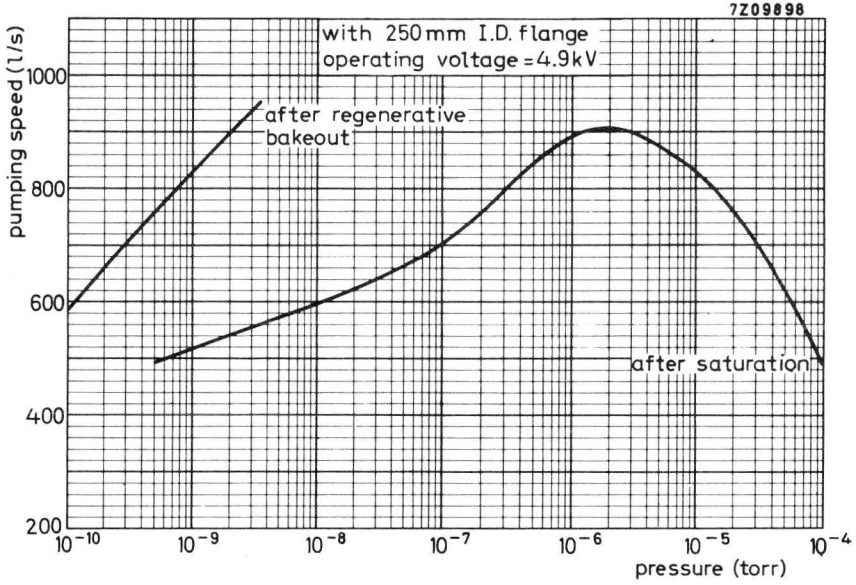
Remark

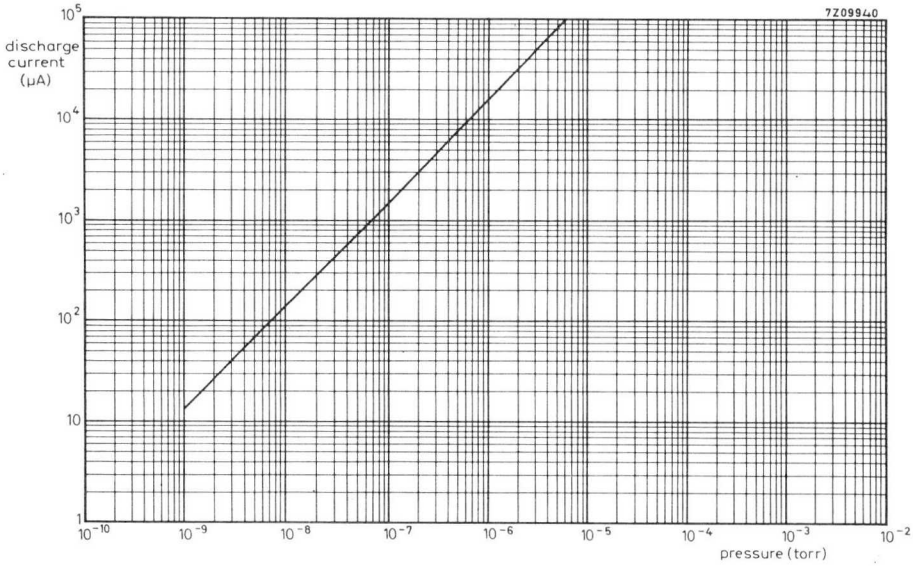
The pump is supplied in evacuated condition and should be kept sealed until ready for use.

ASSOCIATED EQUIPMENT AND COMPONENTS

Power supply	KPS-1000
Mating flange	supplied with pump
Gold wire seal	
Set of nuts, bolts, washers and studding	special
Bake-out jacket	V-1061

[1]) Special flanges to customer design can be fitted on request.


7Z09898
with 250 mm I.D. flange
operating voltage = 4.9 kV
after regenerative bakeout
after saturation
pumping speed (l/s)
1000
800
600
400
200
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
pressure (torr)


7Z09940
discharge current (μA)
10^5
10^4
10^3
10^2
10
1
10^-10
10^-9
10^-8
10^-7
10^-6
10^-5
10^-4
10^-3
10^-2
pressure (torr)

MERCURY DIFFUSION PUMP

2.5 litre/s two-stage mercury diffusion pump.
Pressure range, water cooling only, 8 torr to 1.5×10^{-3} torr; when used in combination with appropriate liquid air or liquid nitrogen cooler 8 torr to $< 10^{-5}$ torr.
The pump has been designed to work with a backing pressure of 5 torr while its pumping action is not broken off when the backing pressure rises up to 8 torr.
A centrifugal mercury trap is incorporated in this type. This trap prevents the mercury being flung out of the pump when during operation the latter is let up to atmospheric pressure, and then suddenly reconnected to the backing pressure.

The delivery includes a heating element for 220 V and a female plug. It does not include mercury.

CHARACTERISTICS

Pressure range: water cooling only (including rest pressure of mercury vapour)	8 to 1.5×10^{-3}	torr
when used in combination with a liquid air or liquid nitrogen cooler	8 to $< 10^{-5}$	torr
Pumping speed at 10^{-4} torr (see also page 3)	2.5	l/s
Backing pressure required for full capacity	5	torr
Backing pressure above which pump may cut off	8	torr
Mercury content	50	cm^3
Heater element	220 V, 370	W
Cooling water required	36	l/h
Warming-up and cooling-down time (cooling water circulating)	15	min.
Weight without mercury	2.5	kg

LIMITING VALUES

Outlet temperature of cooling water	max. 23	°C

MOUNTING

The pump is mounted by clamping it around the body.

ASSOCIATED COMPONENTS

Coupling piece to couple the high vacuum side of the pump to a rubber hose with an inner diameter of 18 mm	56110

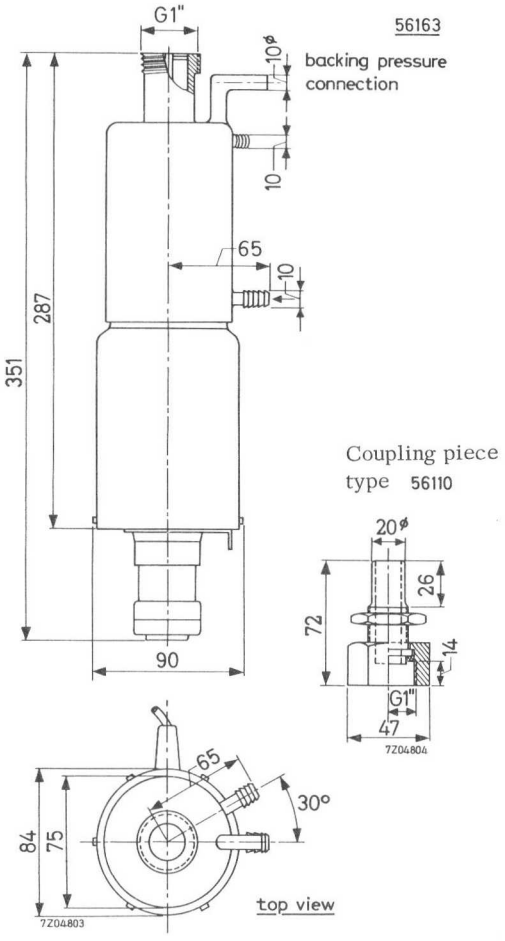
SPARE PARTS

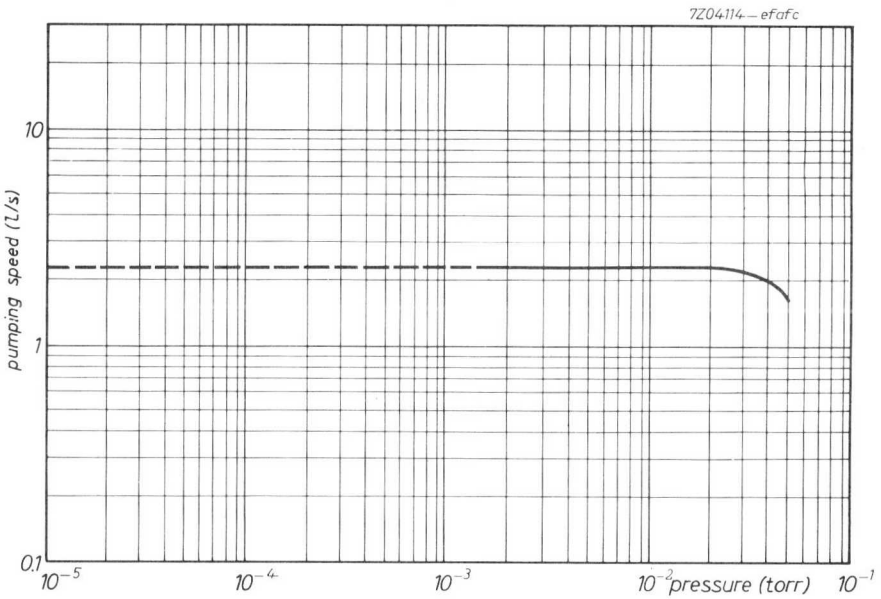
Heater element	7222 903 80020

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Mercury pump type 56163




7Z04114 – efafc
10
1
0.1
pumping speed (L/s)
10^{-5}
10^{-4}
10^{-3}
10^{-2}
pressure (torr)
10^{-1}

MERCURY DIFFUSION PUMP

30 litre/s three-stage mercury diffusion pump.
Pressure range, water cooling only, 8 torr to 1.5×10^{-3} torr; when used in combination with appropriate liquid air or liquid nitrogen cooler 8 torr to 10^{-7} torr.
The pump has been designed to work with a backing pressure of 5 torr, while its pumping action is not broken off when the backing pressure rises up to 8 torr.

A centrifugal mercury trap is incorporated in this type. This trap prevents the mercury being flung out of the pump when during operation the latter is let up to atmospheric pressure and then suddenly reconnected to the backing pressure. A water cooled baffle is part of the pump.

The delivery includes two heating elements for 110 V and two female plugs. The pump is supplied without mercury.

CHARACTERISTICS

Pressure range: water cooling only (including rest pressure of mercury vapour)	8 to 1.5×10^{-3}	torr
when used in combination with a liquid air or liquid nitrogen cooler	8 to $< 10^{-7}$	torr
Pumping speed at 10^{-4} torr (see also page 4)	30	l/s
Backing pressure required for full capacity	5	torr
Backing pressure above which the pump may cut off	8	torr
Mercury content	180	cm^3
Heater element: 2 elements 110 V, 330 W	totalling 660	W
Cooling water required	120	l/h
Warming-up and cooling-down time (cooling water circulating)	15	min.
Weight without mercury	6.5	kg

LIMITING VALUES

Outlet temperature of cooling water	max. 23 °C

MOUNTING

Three connecting lips are provided to fasten the pump on a platform

ASSOCIATED COMPONENTS

Cap nut coupling piece to connect the high vacuum side of the pump to a glass tubing with an outer diameter of 36 mm	56111

SPARE PARTS

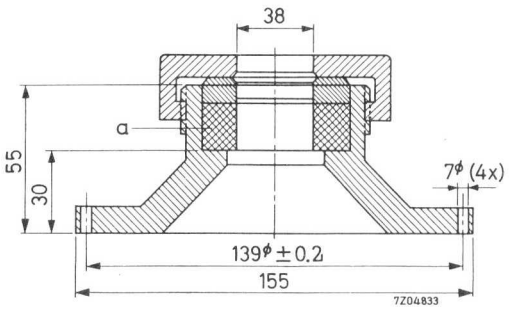
"O" ring for high vacuum side (d_{int} = 113.7 mm; s = 5.34 mm)	2622 080 31805
Heater element	7222 906 58010

DIMENSIONS

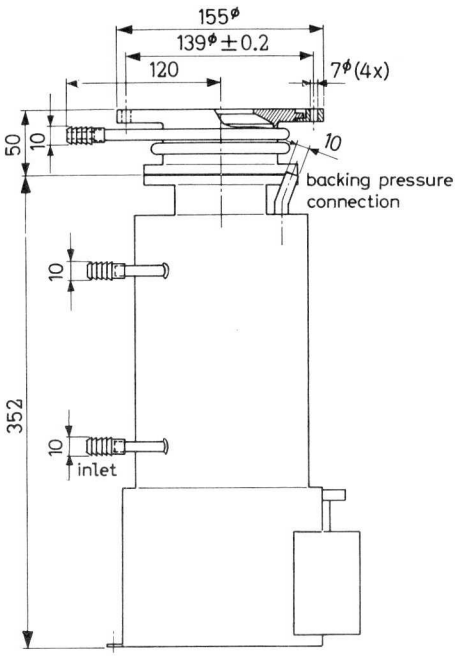
Dimensions in mm

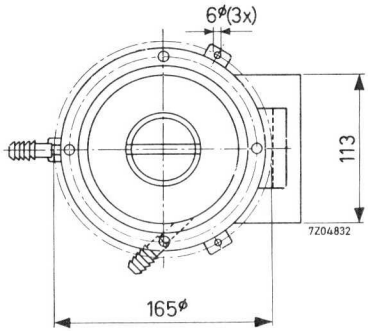
Cap nut coupling piece type 56111

a = rubber compression ring

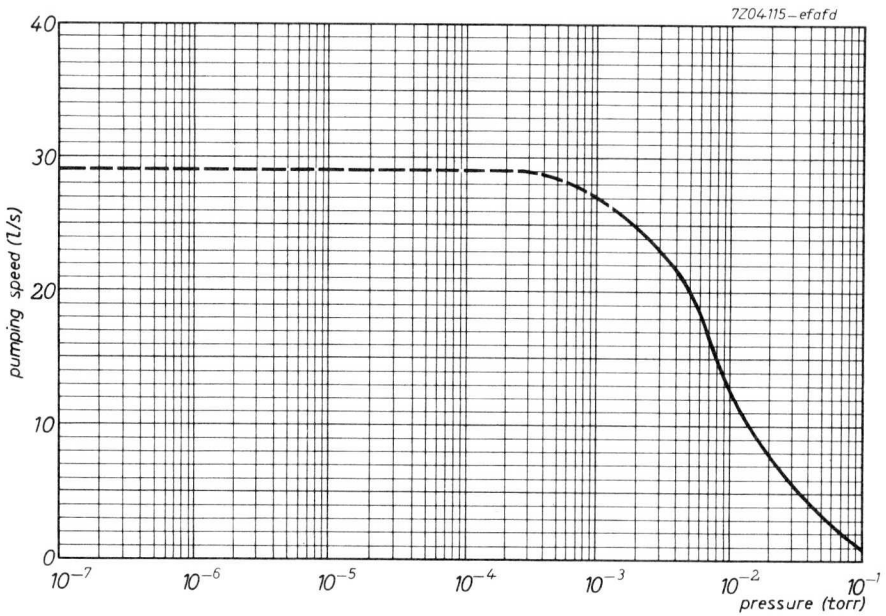


Pump type 56164





For water inlets and outlets use rubber tubing 8 x 12 mm.


7Z04115-efafd
40
30
20
10
0
pumping speed (l/s)
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
pressure (torr)

OIL DIFFUSION PUMP

250 litre/s, four-stage oil diffusion pump.
Pressure range 10^{-1} torr to 10^{-5} torr.
The pump has been designed to work with a backing pressure of < 0.2 torr.

CHARACTERISTICS

Pressure range	10^{-1} to 10^{-5}	torr
Pumping speed at 10^{-4} torr (see also page 2)	250	l/s
Backing pressure required for full capacity	< 0.2	torr
Oil content	150	cm^3 1)
Heater element	220 V, 420	W
Cooling water required	80	l/h
Warming-up and cooling-down time (cooling water circulating)	15	min
Weight	5	kg

LIMITING VALUES

Outlet temperature of cooling water	max. 25	°C

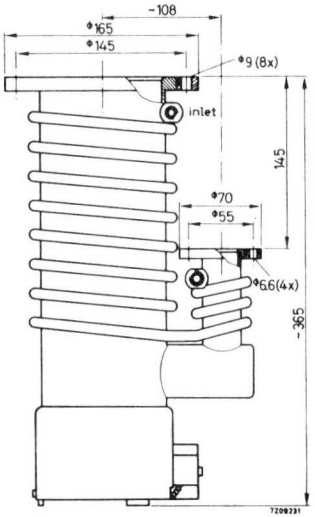
SPARE PARTS

Heater element	2422 528 00037
"0" ring for high vacuum side (d_{int} = 113.7 mm; s = 5.34 mm)	2622 080 31805

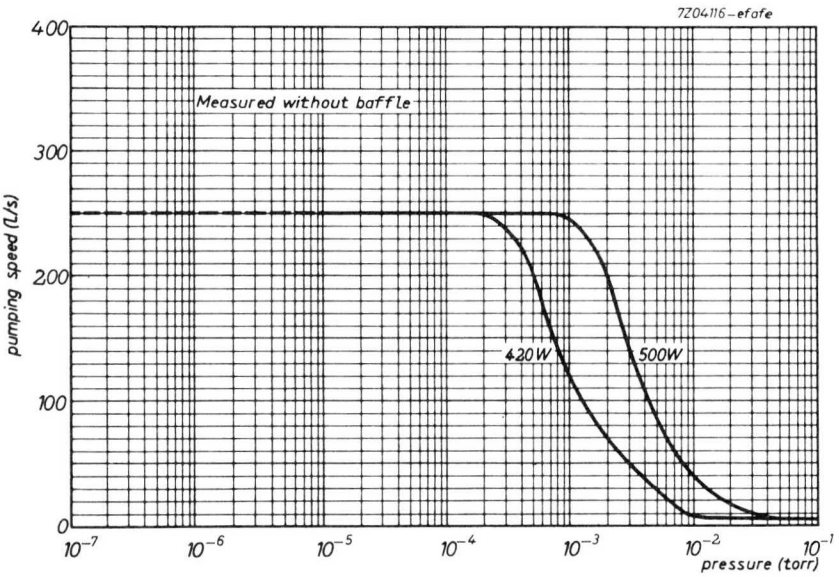
1) Dow Corning 702 or equivalent. The pump is supplied without oil.

DIMENSIONS AND CONNECTIONS

Dimensions in mm



For water inlet and outlet use rubber tubing of 8 x 12 mm.



OIL DIFFUSION PUMP

50 litre/s, two-stage fractionating oil diffusion pump.
Pressure range, water cooling only, 10^{-1} torr to 10^{-5} torr; when used in combination with appropriate liquid air or liquid nitrogen cooler 10^{-1} torr to $< 10^{-6}$ torr.
The pump has been designed to work with a backing pressure of < 0.2 torr and is provided with rotatable flanges in accordance with the ISO Recommendations.

CHARACTERISTICS

Pressure range: water cooling only	10^{-1} to 10^{-5}	torr
when used in combination with liquid air or liquid nitrogen cooler	10^{-1} to $<10^{-6}$	torr
Pumping speed at 10^{-4} torr (see also page 3)	50	l/s
Backing pressure required for full capacity	< 0.2	torr
Oil content	75	cm^3 [1]
Heater element	220 V, 250	W
Cooling water required	40	l/h
Warming-up and cooling-down time (cooling water circulating)	15	min
Weight	4	kg

LIMITING VALUES

Outlet temperature of cooling water	max.	25	°C

[1]) Dow Corning 705 or equivalent for lowest ultimate pressures, otherwise Dow Corning 702 or 704 or equivalent.
The pump is supplied without oil.

ASSOCIATED COMPONENTS

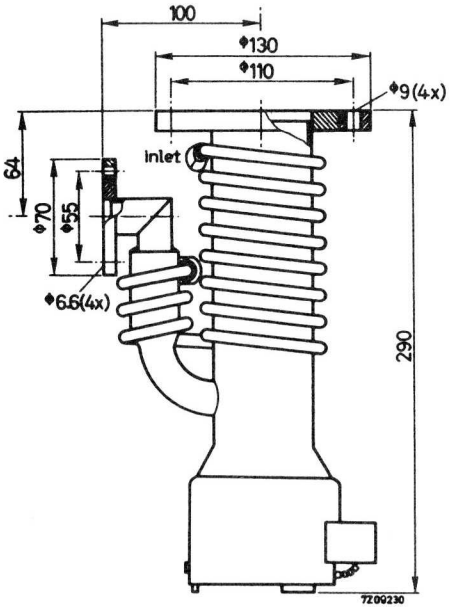
High vacuum tap	56540
Liquid air or liquid nitrogen cooler	56530
Chevron baffle	56520
Sealing ring:	
high vacuum side (nominal bore 63 mm)	7322 012 32940
fore vacuum side (nominal bore 25 mm)	7322 012 32500

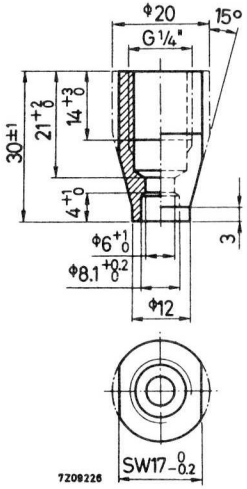
SPARE PARTS

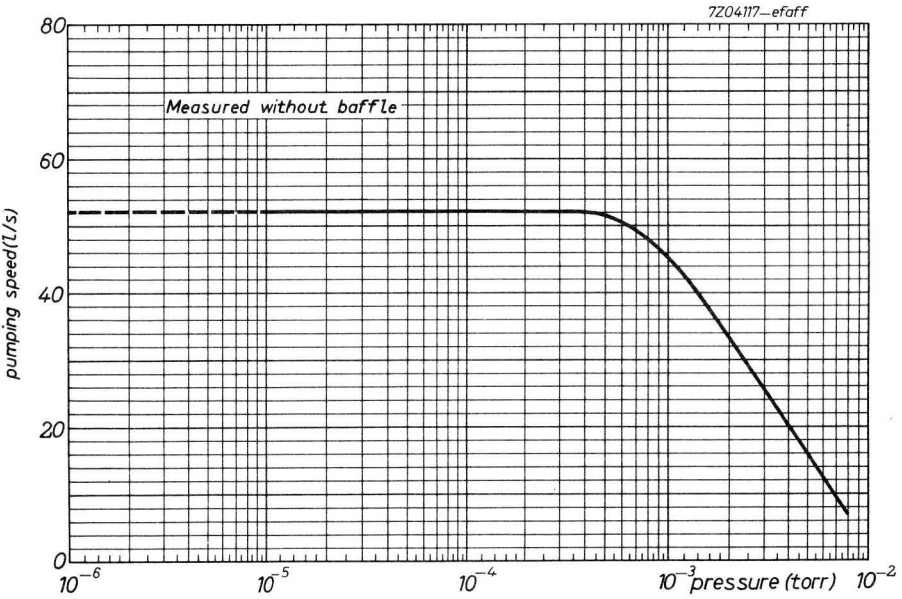
Heater element	7322 012 00590

DIMENSIONS AND CONNECTIONS

Dimensions in mm






7Z04117—efaff
Measured without baffle
pumping speed(l/s)
80
60
40
20
0
10^{-6}
10^{-5}
10^{-4}
10^{-3}
pressure (torr)
10^{-2}

OIL DIFFUSION PUMP

250 litre/s, three-stage fractionating oil diffusion pump. Pressure range, water cooling only, 10^{-1} torr to 10^{-6} torr; when used in combination with appropriate liquid-air or liquid-nitrogen cooler 10^{-1} torr to 10^{-8} torr. The pump has been designed to work with a backing pressure of < 0.4 torr and is provided with rotatable flanges in accordance with the ISO Recommendations.

APPLICATION

High speed vacuum pumping

CHARACTERISTICS

Pressure range: water cooling only	10^{-1} to 10^{-6}	torr
when used in combination with liquid-air or liquid-nitrogen cooler	10^{-1} to 10^{-8}	torr
Pumping speed at 10^{-4} torr (see also page 3)	300	l/s
Backing pressure required for full capacity	< 0.4	torr
Oil content	150	cm^3 1)
Heater element	220 V, 500	W
Cooling water required	60	l/h
Warming-up and cooling-down time (cooling water circulating)	20	min
Weight	9	kg

LIMITING VALUES

Outlet temperature of cooling water	max.	25	°C

1) Dow Corning 705 or equivalent for lowest ultimate pressures, otherwise Dow Corning 703 or equivalent. The pump is supplied without oil.

ASSOCIATED COMPONENTS

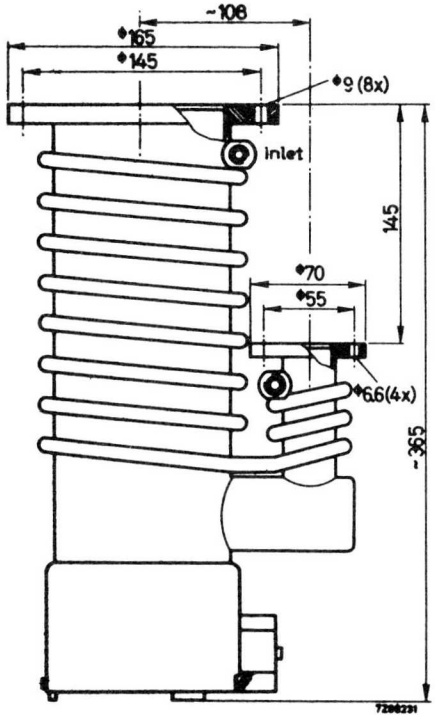
Liquid-air or liquid-nitrogen cooler	56531
Chevron baffle	56521
High vacuum tap	56541
Sealing ring:	
high vacuum side (nominal bore 100 mm)	7322 012 32470
fore vacuum side (nominal bore 25 mm)	7322 012 32500

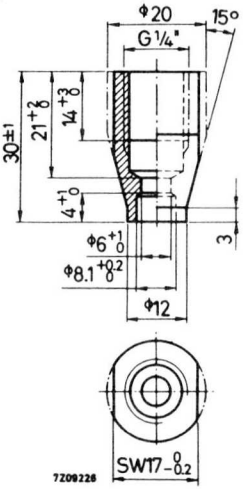
SPARE PARTS

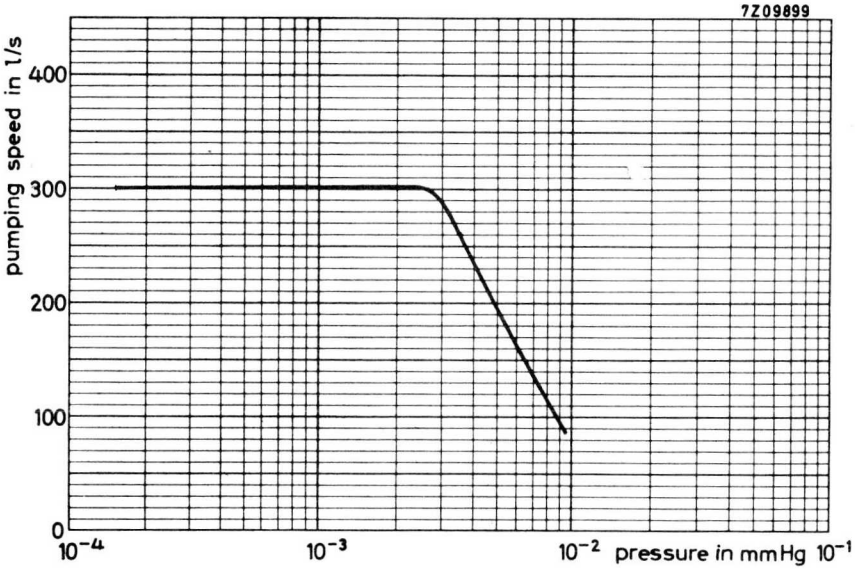
Heater element	2422 528 00038

DIMENSIONS AND CONNECTIONS

Dimensions in mm






7Z09899
pumping speed in l/s
400
300
200
100
0
10^{-4}
10^{-3}
10^{-2}
pressure in mmHg
10^{-1}

OIL DIFFUSION PUMP

500 litre/s, three-stage fractionating oil diffusion pump. Pressure range (water cooling only) 3.10^{-1} torr to 10^{-6} torr; when used in combination with appropriate liquid air or liquid nitrogen cooler 3.10^{-1} torr to $< 10^{-7}$ torr. The pump has been designed to work with a backing pressure of $< 3x10^{-1}$ torr and is provided with rotatable flanges in accordance with the ISO Recommendations.

APPLICATION

High speed vacuum pumping

CHARACTERISTICS

Pressure range, water cooling only	3.10^{-1} to 10^{-6}	torr
when used in combination with liquid air or liquid nitrogen cooler	3.10^{-1} to $<10^{-7}$	torr
Pumping speed (see also page 3)	500	l/s
Backing pressure required for full capacity	$<3x10^{-1}$	torr
Oil content	300	cm^3 1)
Heating element	220 V, 1000	W
Cooling water required	90	l/h
Warming-up and cooling-down time (cooling water circulating)	20	min
Weight	20	kg

LIMITING VALUES

Outlet temperature of cooling water	max.	25	°C

1) Dow Corning 705 or equivalent for lowest ultimate pressures, otherwise Dow Corning 703 or 704 or equivalent. The pump is supplied without oil.

ASSOCIATED COMPONENTS

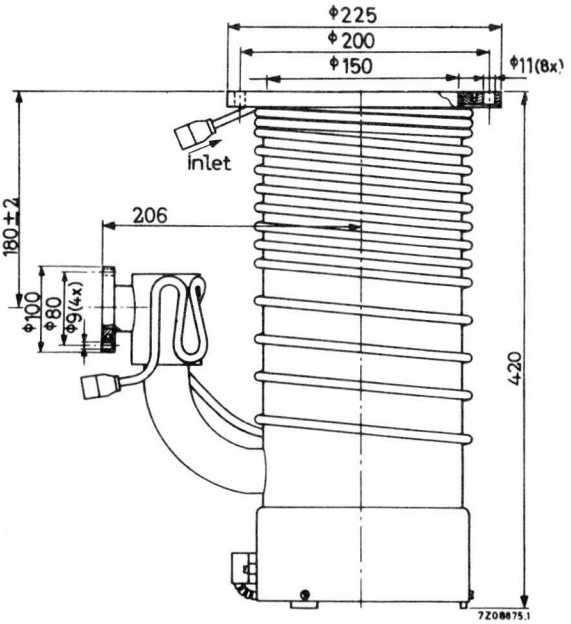
Liquid air or liquid nitrogen cooler	56532
High vacuum tap	56542
Chevron baffle	56522
Sealing ring,	
high vacuum side (nominal bore 160 mm)	7322 012 32950
fore vacuum side (nominal bore 40 mm)	7322 012 31580

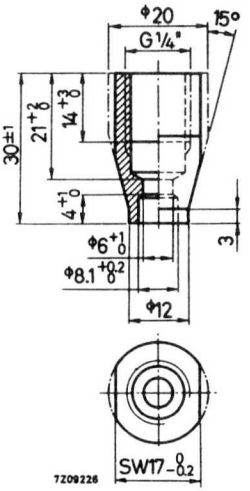
SPARE PARTS

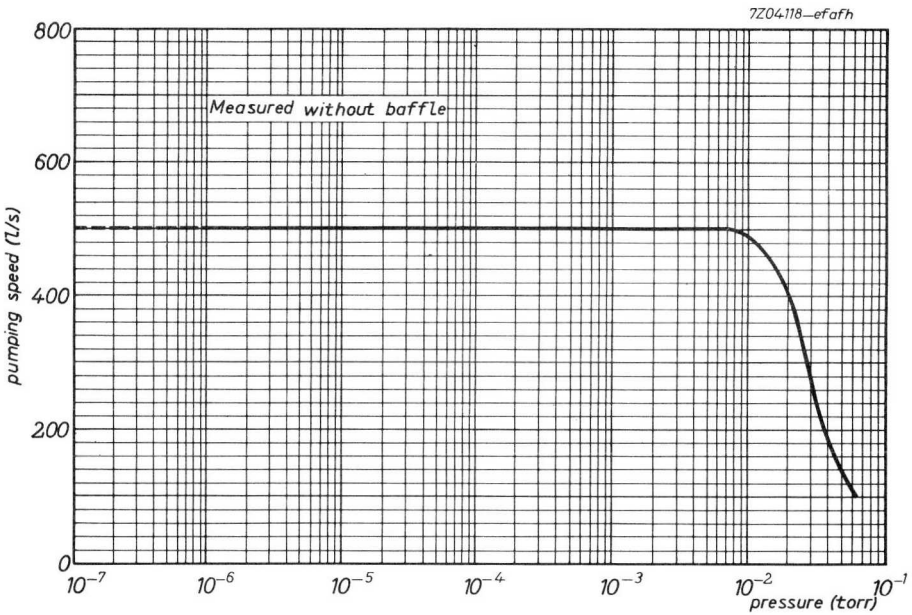
Heater element	2422 528 00044

DIMENSIONS AND CONNECTIONS

Dimensions in mm






7Z04118—efafh
800
600
400
200
0
Measured without baffle
pumping speed (l/s)
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
pressure (torr)

OIL DIFFUSION PUMP

1000 litre/s, four stage fractionating oil diffusion pump. Pressure range (water cooling only) 3.10^{-1} torr to 10^{-6} torr; when used in combination with appropriate liquid-air or liquid-nitrogen cooler 3.10^{-1} torr to $<10^{-7}$ torr.
The pump has been designed to work with a backing pressure of < 0.3 torr and is provided with rotatable flanges in accordance with the ISO Recommendations.

APPLICATION

High speed vacuum pumping.

CHARACTERISTICS

Pressure range: water cooling only	3.10^{-1} to 10^{-6}	torr
when used in combination with liquid-air or liquid-nitrogen cooler	3.10^{-1} to $<10^{-7}$	torr
Pumping speed (See also page 3)	1000	l/s
Backing pressure required for full capacity	< 0.3	torr
Oil content	500	cm^3 1)
Heater element	220 V, 1500	W
Cooling water required	120	l/h
Warming-up and cooling-down time (cooling water circulating)	20	min
Weight	36	kg

LIMITING VALUES

Outlet temperature of cooling water	max. 25	°C

ASSOCIATED COMPONENTS

Liquid-air or liquid-nitrogen cooler	56533
Water-cooled baffle	56523
High vacuum valve	56543
Sealing ring,	
high vacuum side (nominal bore 200 mm)	7322 012 31720
fore vacuum side (nominal bore 63 mm)	7322 012 32940

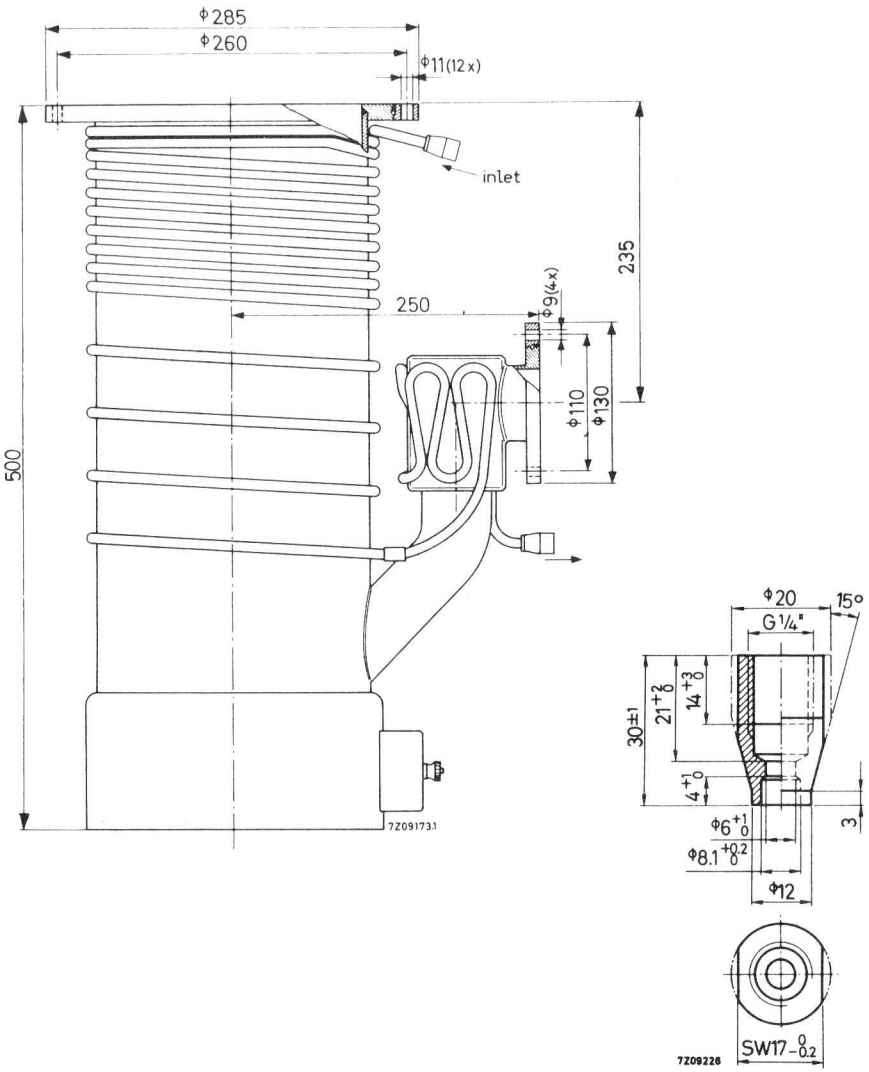
1) Dow corning 705 or equivalent for lowest ultimate pressures, otherwise Dow Corning 703 or 704 or equivalent. The pump is supplied without oil.

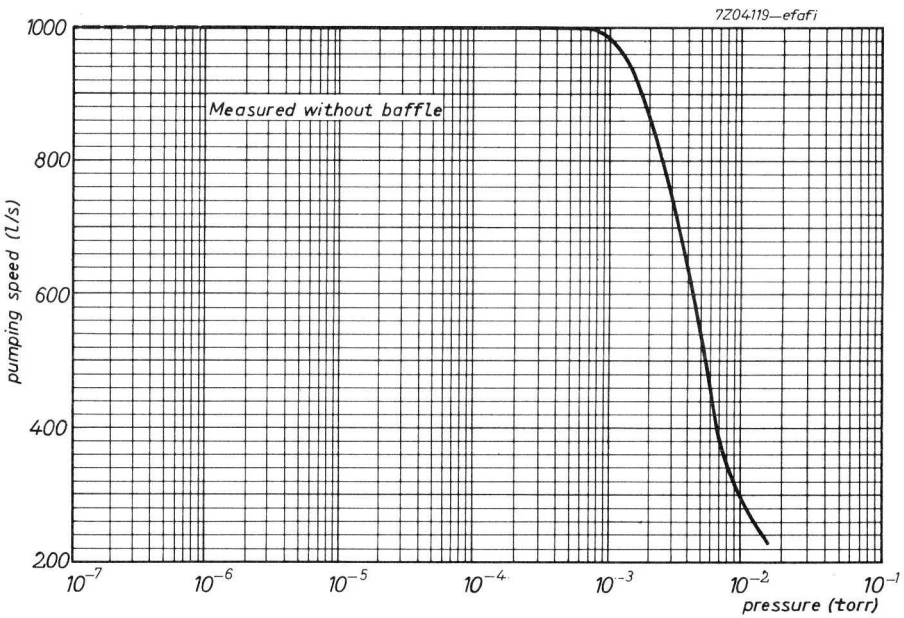
SPARE PARTS

Heater element 2422 528 00036

DIMENSIONS AND CONNECTIONS

Dimensions in mm



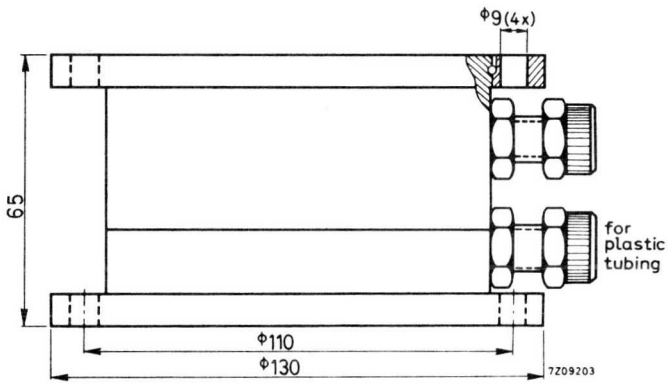

7Z04119—efafi
1000
800
600
400
200
Measured without baffle
pumping speed (l/s)
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
pressure (torr)

CHEVRON BAFFLE

Water-cooled chevron baffle with a nominal bore of 63 mm diameter intended for use with diffusion pumps to minimize back-diffusion of vapours.
The baffle is provided with flanges in accordance with the ISO Recommendations; the upper flange is rotatable.

DIMENSIONS

Dimensions in mm



ASSOCIATED COMPONENTS

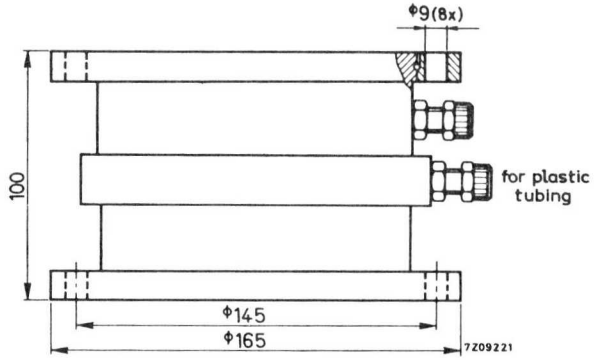
Sealing ring (nominal bore 63 mm)	7322 012 32940

CHEVRON BAFFLE

Water-cooled chevron baffle with a nominal bore of 100 mm diameter for use with diffusion pumps to minimize back-diffusion of vapours.
The baffle is provided with flanges in accordance with the ISO Recommendations; the upper flange is rotatable.

DIMENSIONS

Dimensions in mm



ASSOCIATED COMPONENTS

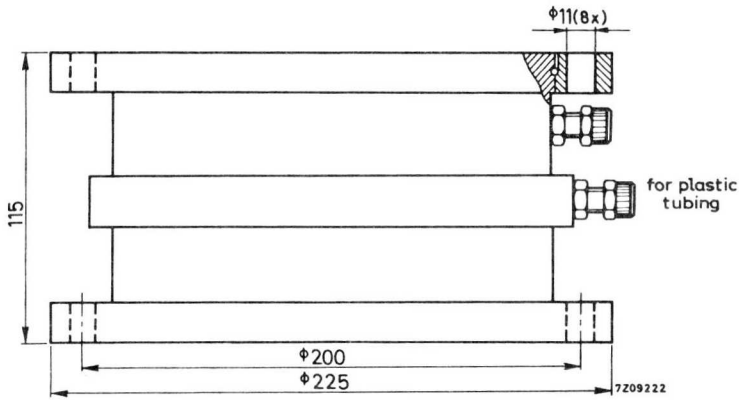
Sealing ring (nominal bore 100 mm)	7322 012 32470

CHEVRON BAFFLE

Water-cooled chevron baffle with a nominal bore of 160 mm diameter intended for use with diffusion pumps to minimize back-diffusion of vapours.
The baffle is provided with flanges in accordance with the ISO Recommendations; the upper flange is rotatable.

DIMENSIONS

Dimensions in mm



ASSOCIATED COMPONENTS

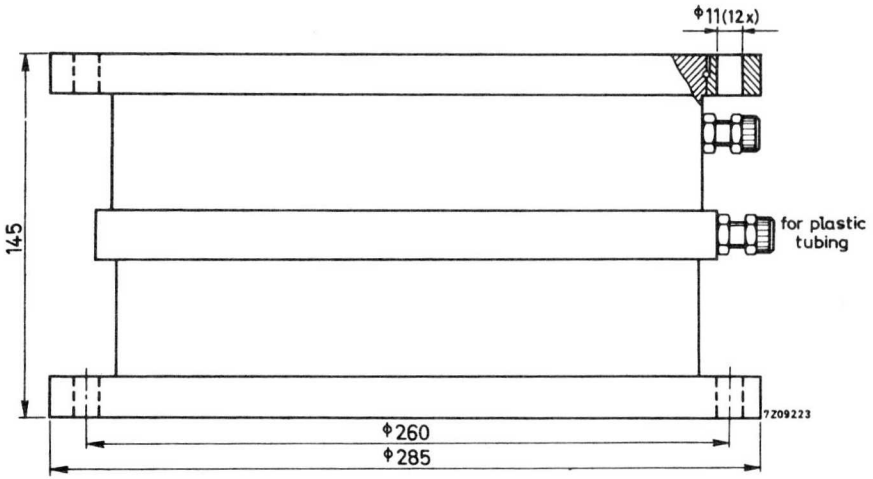
Sealing ring (nominal bore 160 mm)	7322 012 32950

CHEVRON BAFFLE

Water-cooled chevron baffle with a nominal bore of 200 mm diameter intended for use with diffusion pumps to minimize back-diffusion of vapours.
The baffle is provided with flanges in accordance with the ISO Recommendations; the upper flange is rotatable.

DIMENSIONS

Dimensions in mm



ASSOCIATED COMPONENTS

Sealing ring (nominal bore 200 mm)	7322 012 31720

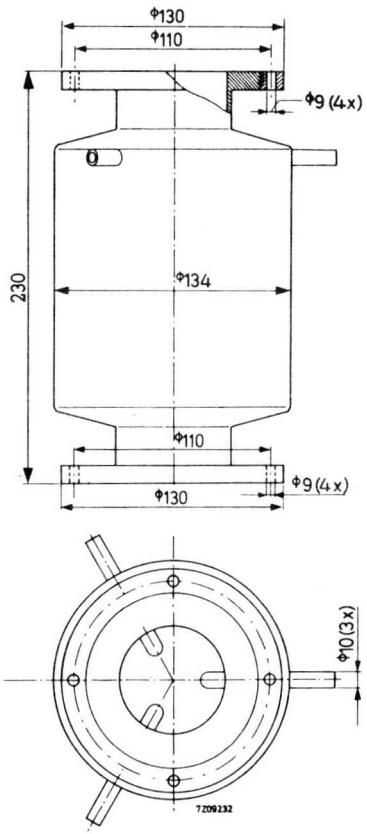
COOLER

Cooler for high vacuum oil diffusion pumps cooled by liquid air or liquid nitrogen. The cooler is provided with flanges in accordance with the ISO Recommendations. The upper flange is rotatable.

Initial loss	1 l nitrogen
Subsequently required	0.75 l nitrogen/h

DIMENSIONS

Dimensions in mm



ASSOCIATED COMPONENTS

Sealing ring (nominal bore 63 mm)	7322 012 32940

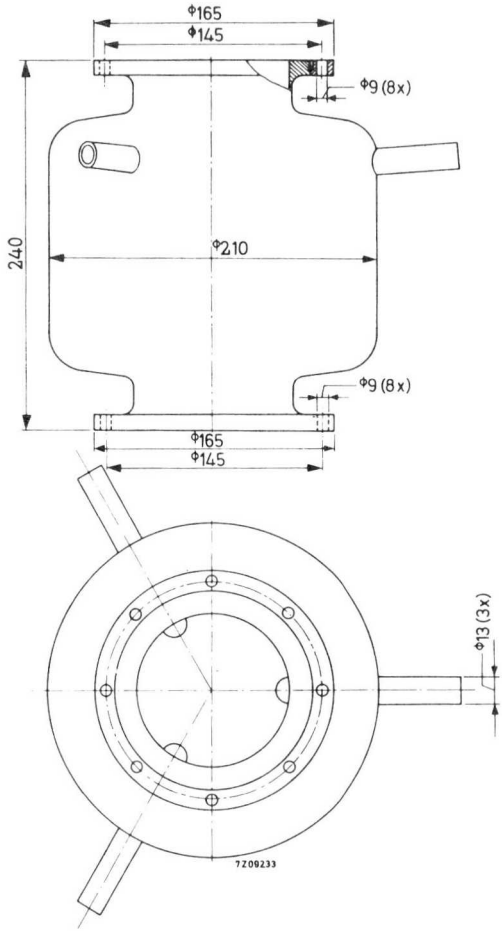
COOLER

Cooler for high vacuum oil diffusion pumps cooled by liquid air or liquid nitrogen. The cooler is provided with flanges in accordance with the ISO Recommendations. The upper flange is rotatable.

Initial loss	2 l nitrogen
Subsequently required	1 l nitrogen/h

DIMENSIONS

Dimensions in mm



ASSOCIATED COMPONENTS

Sealing ring (nominal bore 100 mm)	7322 012 32470

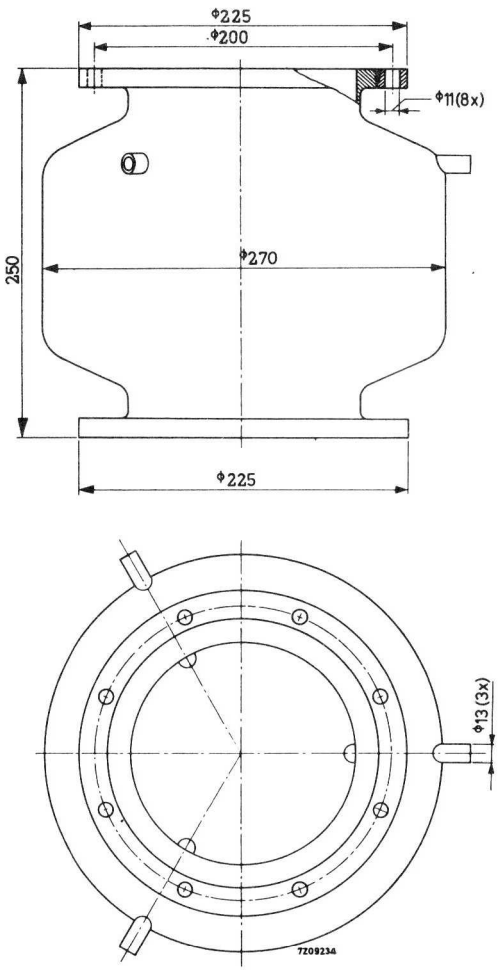
COOLER

Cooler for high vacuum oil diffusion pumps cooled by liquid air or liquid nitrogen. The cooler is provided with flanges in accordance with the ISO Recommendations. The upper flange is rotatable.

Initial loss	3	l nitrogen
Subsequently required	1.5	l nitrogen/h

DIMENSIONS

Dimensions in mm



ASSOCIATED COMPONENTS

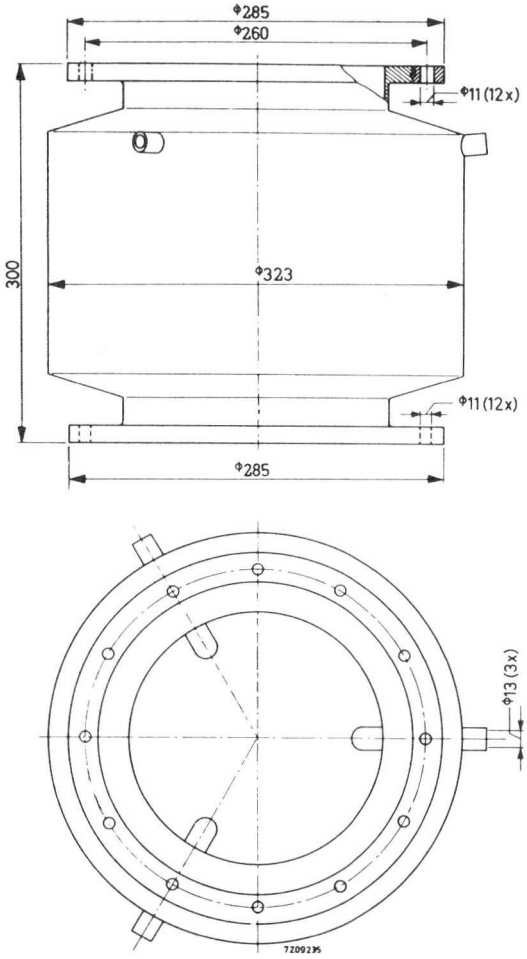
Sealing ring (nominal bore 160 mm)	7322 012 32950

COOLER

Cooler for high vacuum oil diffusion pumps cooled by liquid air or liquid nitrogen. The cooler is provided with flanges in accordance with the ISO Recommendations. The upper flange is rotatable.

Initial loss	4 l nitrogen
Subsequently required	2 l nitrogen/h

DIMENSIONS Dimensions in mm



ASSOCIATED COMPONENTS

Sealing ring (nominal bore 200 mm)	7322 012 31720

Gauge Heads

VACUUM GAUGE HEAD, PENNING TYPE

Glass envelope, high vacuum gauge head of the Penning type (cold-cathode, ionisation type). Pressure range 2×10^{-3} torr to 10^{-5} torr.

CHARACTERISTICS

Pressure range	2×10^{-3} to 10^{-5} torr
Sensitivity	see page 3

Notes:

1. The graph on page 3 is correct within a factor two for air, hydrogen, argon and carbon dioxide. The inaccuracy can be reduced to plus or minus 5% by calibrating for the gas composition in question.
2. Water vapour contamination of the gauge head may cause misreadings; in this case it is advisable to take readings some minutes after application of the anode supply voltage.

TYPICAL OPERATING CONDITIONS

CIG-22 combined with magnet type 95380

Anode supply voltage	V_{ba}	2000	V d.c.
Anode resistor	R_a	1	MΩ

LIMITING VALUES

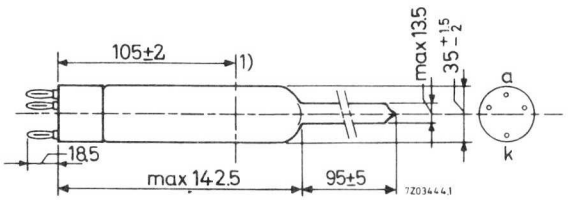
CIG-22 combined with magnet type 95380

Anode voltage	max.	2500	V
Anode current	max.	2	mA

MECHANICAL DATA

Dimensions in mm

Material of tubulation: 01 soft glass



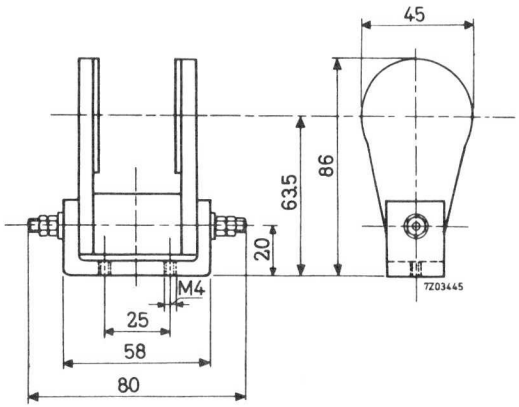
1) Line through the centres of the cathode plates and axis of the magnetic flux lines.

Mounting position: any

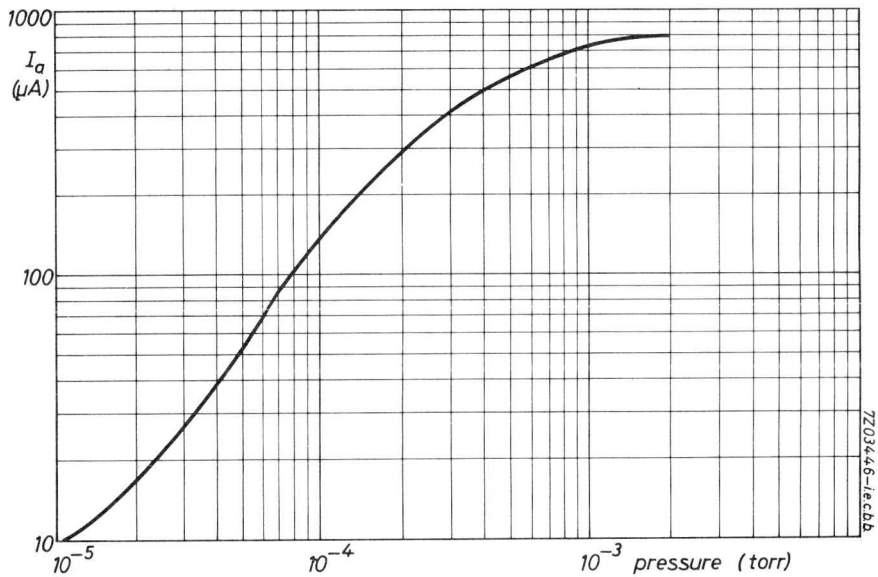
Note: When in operation the gauge has a pumping effect; to prevent misreadings due to pressure losses in the connecting tubulation, the connection to the vacuum chamber should be wide and short. Recommended dimensions are: diameter min. 10 mm and length max. 100 mm.

ASSOCIATED COMPONENTS

Magnet	95380
Socket, unshielded	40465
Socket, shielded	56060



Magnet type 95380

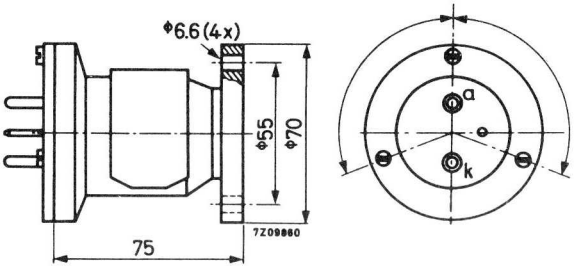

1000
I_a
(μA)
100
10
10^{-5}
10^{-4}
10^{-3}
pressure (torr)
7Z03446-iec.bb

VACUUM GAUGE HEAD, PENNING TYPE

All-metal, high vacuum gauge head of the Penning type (cold-cathode, ionization type). Pressure range 2 x 10^{-3} torr to 10^{-5} torr.
The head is provided with a flange in accordance with the ISO recommendations.

FOR THE ELECTRICAL DATA SEE TYPE CIG-22

MECHANICAL DATA Dimensions in mm



Mounting position	any

ASSOCIATED COMPONENTS

Sealing ring (nominal bore 25 mm)	7322 012 32500
Socket, unshielded	40465
Socket, shielded	56060

SPARE PARTS

Electrode system	56178

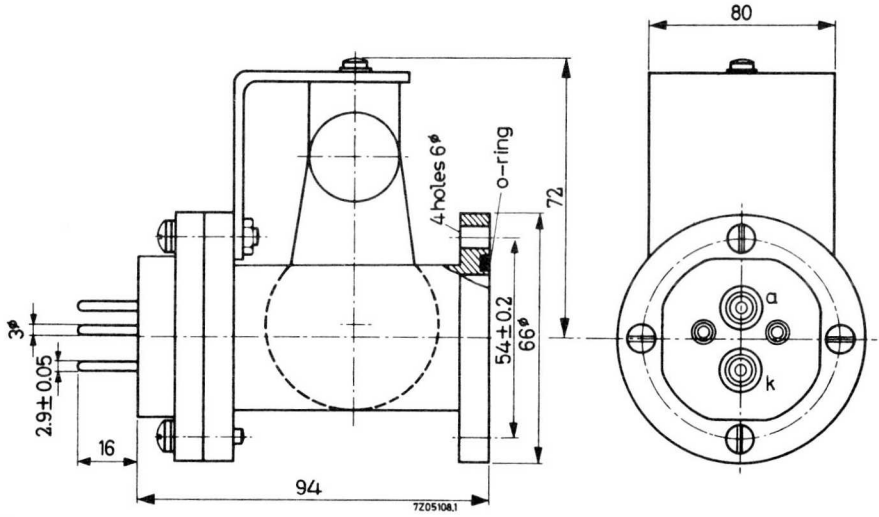
VACUUM GAUGE HEAD, PENNING TYPE

All-metal, high vacuum gauge head of the Penning type (cold-cathode, ionisation type). Pressure range 2 x 10^{-3} torr to 10^{-5} torr.

FOR THE ELECTRICAL DATA SEE TYPE CIG-22 (9532 2)

MECHANICAL DATA

Dimensions in mm



Mounting position	any

ASSOCIATED COMPONENTS

Socket, unshielded	40465
Socket, shielded	56060

SPARE PARTS

Electrodes	56088
"0" ring (d_{int} = 37.69 mm; s = 2.62 mm)	2622 080 31746
Glass protection tube	7322 012 08021

VACUUM GAUGE HEAD, PENNING TYPE

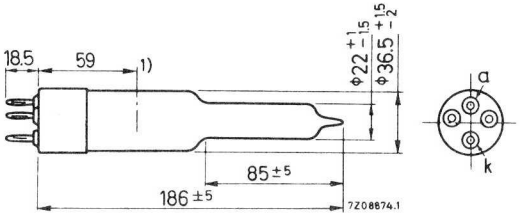
Glass envelope, high vacuum gauge head of the Penning type (cold-cathode, ionisation type). Pressure range 2 x 10^{-3} torr to 10^{-5} torr.

FOR THE ELECTRICAL DATA SEE TYPE CIG-22

MECHANICAL DATA

Dimensions in mm

Material of tubulation: G28 hard glass



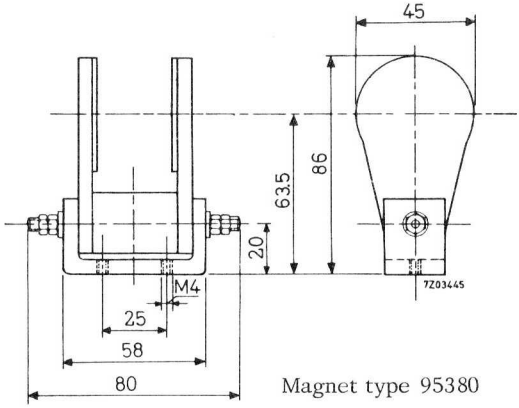
1) Direction of magnetic flux.

Mounting position: any

Note: When in operation the gauge has a pumping effect; to prevent misreadings due to pressure losses in the connecting tubulation, the connection to the vacuum chamber should be wide and short. Recommended dimensions are: diameter min. 10 mm and length max. 100 mm.

ASSOCIATED COMPONENTS

Magnet	95380
Socket, unshielded	40465
Socket, shielded	56060



Magnet type 95380

VACUUM GAUGE HEAD, PENNING TYPE EXTRA SENSITIVE

Glass envelope, high vacuum gauge head of the Penning type (cold-cathode, ionization type). Pressure range 10^{-4} torr to 5 x 10^{-8} torr.

CHARACTERISTICS

Pressure range	10^{-4} to 5 x 10^{-8} torr
Sensitivity	see page 3

Notes:

1. The graph on page 3 is correct within a factor two for air, hydrogen, argon and carbon dioxide. The inaccuracy can be reduced to plus or minus 5 % by calibrating for the gas composition in question.
2. Water vapour contamination of the gauge head may cause misreadings; in this case it is advisable to take readings some minutes after application of the anode supply voltage.

TYPICAL OPERATING CONDITIONS

CIG-82 combined with magnet type 95380

Anode voltage	V_{ba}	2000	V d.c.
Anode resistor	R_a	1	MΩ

LIMITING VALUES

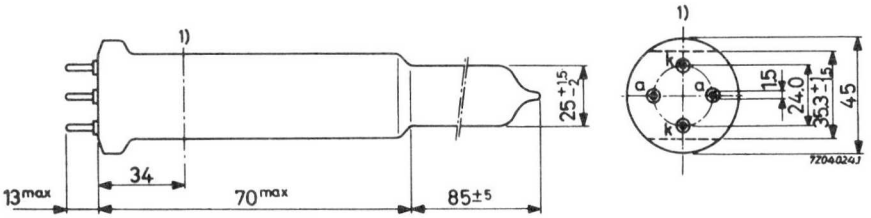
CIG-82 combined with magnet type 95380

Anode supply voltage	max.	2500	V
Anode current	max.	2	mA

MECHANICAL DATA

Dimensions in mm

Material of tubulation: G28 hard glass

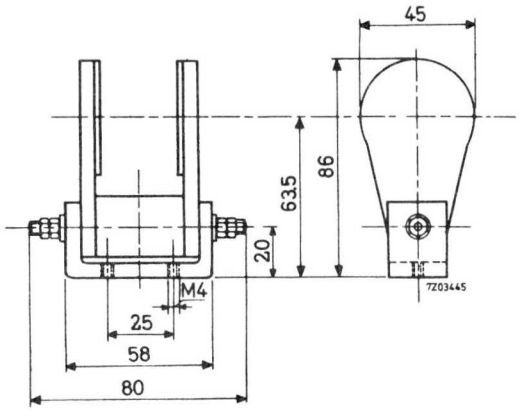


Mounting position: any

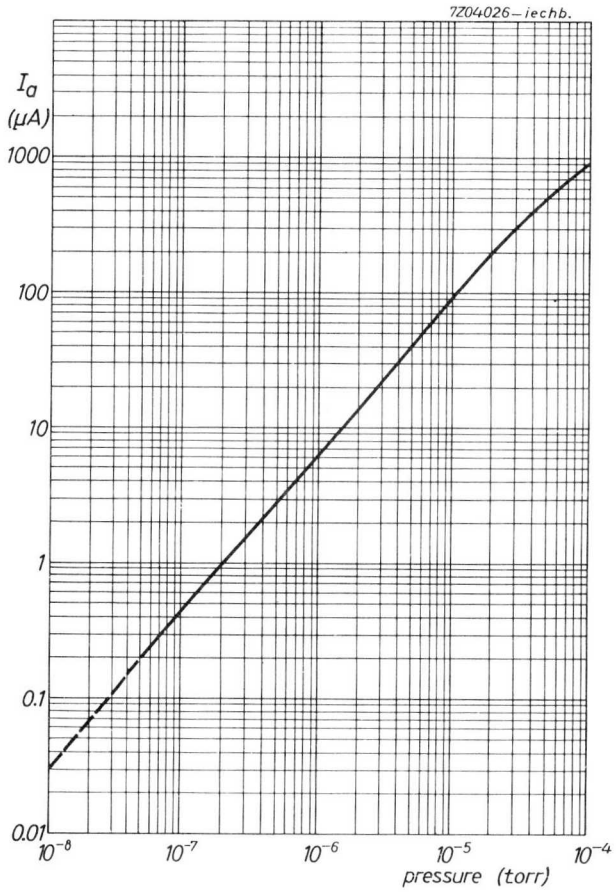
Note: When in operation the gauge has a pumping effect; to prevent misreadings due to pressure losses in the connecting tubulation, the connection to the vacuum chamber should be wide and short. Recommended dimensions are diameter min. 10 mm and length max. 100 mm.

ASSOCIATED COMPONENTS

Magnet	95380
Socket, shielded	56061



Magnet type 95380


7Z04026-iechb.
I_a
(μA)
1000
100
10
1
0.1
0.01
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
pressure (torr)

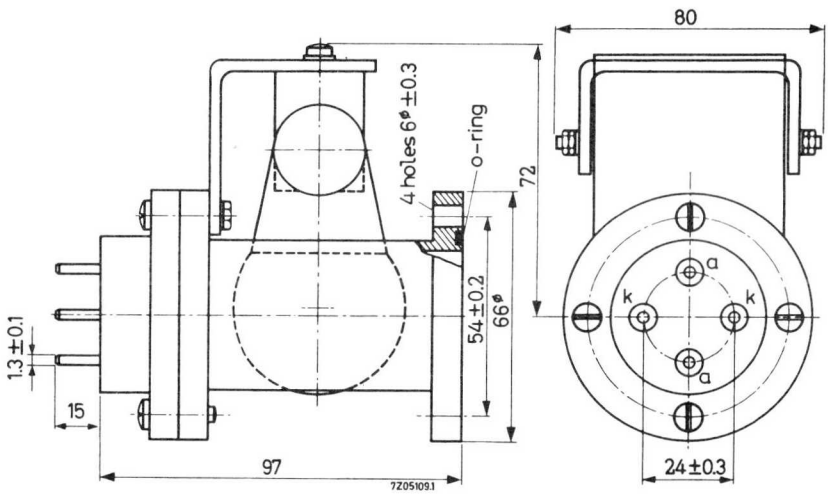
VACUUM GAUGE HEAD, PENNING TYPE EXTRA SENSITIVE

All-metal, high vacuum gauge head of the Penning type (cold-cathode, ionisation type). Pressure range 10^{-4} torr to 5×10^{-8} torr.

FOR THE ELECTRICAL DATA SEE TYPE CIG-82

MECHANICAL DATA

Dimensions in mm



Mounting position	any

ASSOCIATED COMPONENTS

Socket, shielded	56061

SPARE PARTS

Electrodes	56089
"0" ring (d_{int} = 39.69 mm; s = 2.62 mm)	2622 080 31748

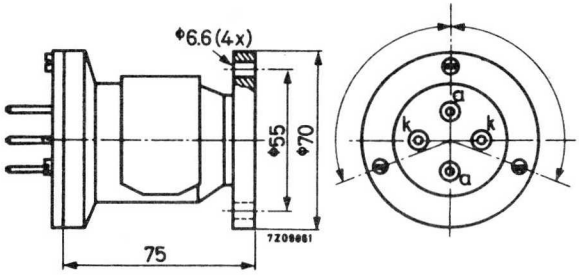
VACUUM GAUGE HEAD, PENNING TYPE EXTRA SENSITIVE

All-metal, high vacuum gauge head of the Penning type (cold-cathode, ionization type). Pressure range 10^{-4} torr to 5×10^{-8} torr.
The head is provided with a flange in accordance with the ISO recommendations.

FOR THE ELECTRICAL DATA SEE TYPE CIG-82

MECHANICAL DATA

Dimensions in mm



Mounting position	any

ASSOCIATED COMPONENTS

Sealing ring (nominal bore 25 mm)	7322 012 32500
Socket, shielded	56061

SPARE PARTS

Electrode system	56179

VACUUM GAUGE HEAD , BAYARD-ALPERT TYPE

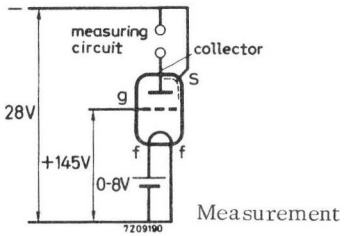
Glass envelope, ultra-high vacuum gauge head of the Bayard-Alpert type. Measuring range 10^{-3} torr to 10^{-10} torr; sensitivity approx. 12 per torr.

The gauge head is provided with an electrically conductive layer deposited on the inside of the glass envelope. By applying a fixed potential to the layer, excess primary electrons are attracted directly to the envelope rather than oscillating around the collector thereby leading to very stable measurements of low pressure.
Moreover the gauge head features a low thermal inertia and a low filament power consumption.

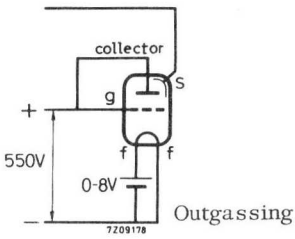
CHARACTERISTICS

Pressure range	10^{-3} to 10^{-10}	torr
Sensitivity (for nitrogen)	approx. 12 per	torr
Emission current range	1 μA to 75	mA
Filament characteristics	see page 3	
Insulation resistance		
Collector to other electrodes	min. 10^{14}	Ω
Grid to other electrodes	min. 10^{12}	Ω

TYPICAL OPERATING CONDITIONS



Measurement



Outgassing

Emission current (see also page 3)

measurement	100 μA, 1 mA or 10	mA
outgassing	75	mA

(56/50)

LIMITING VALUES

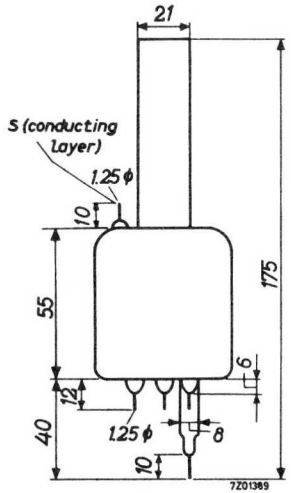
Pressure (filament litt)	max.	10^{-3}	torr
Filament voltage	max.	8	V
Emission current	max.	75	mA
Grid input power	max.	40	W
Bulb temperature during operation	max.	100	°C
Bake-out temperature	max.	450	°C

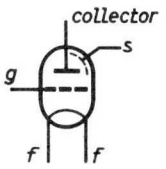
MECHANICAL DATA

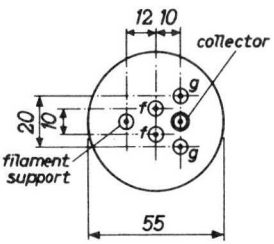
Dimensions in mm

Material tubulation G28 glass

Filament Tungsten



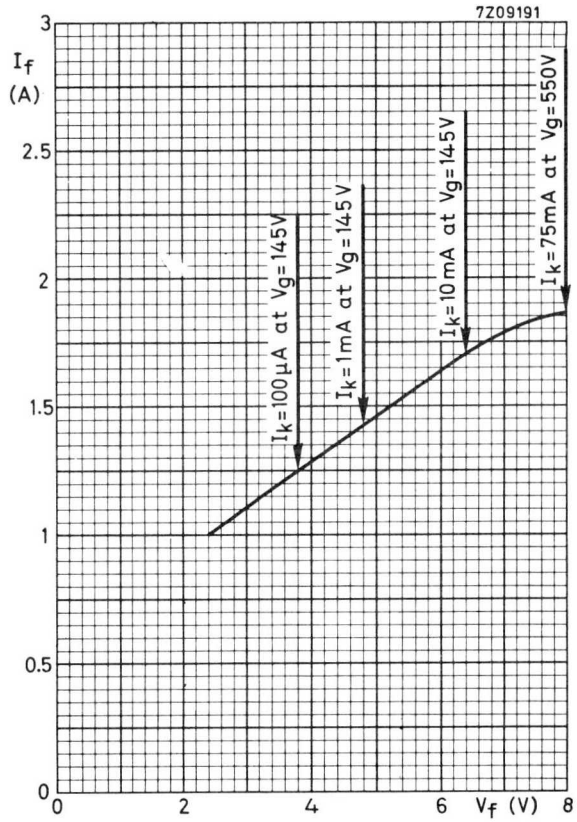




Mounting position: any

ASSOCIATED EQUIPMENT

Gauge control unit	GCU-1 or GCU-2


7Z09191
I_f (A)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
V_f (V)
8
I_k=100µA at V_g=145V
I_k=1mA at V_g=145V
I_k=10mA at V_g=145V
I_k=75mA at V_g=550V

VACUUM GAUGE HEAD, BAYARD-ALPERT TYPE

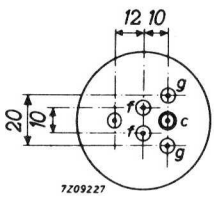
Nude, ultra-high vacuum gauge head of the Bayard-Alpert type.
Measuring range 10^{-3} torr to 10^{-10} torr; sensitivity approx. 12 per torr.
Type IOG-13 has a fernico skirt, prepared for easy welding.
Type IOG-13NF has a flange.
The gauge head features a low thermal inertia and a low filament power consumption.

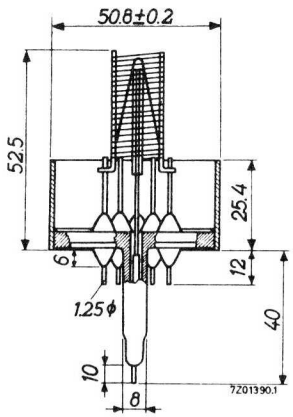
FOR THE ELECTRICAL DATA SEE TYPE IOG-12

MECHANICAL DATA Dimensions in mm

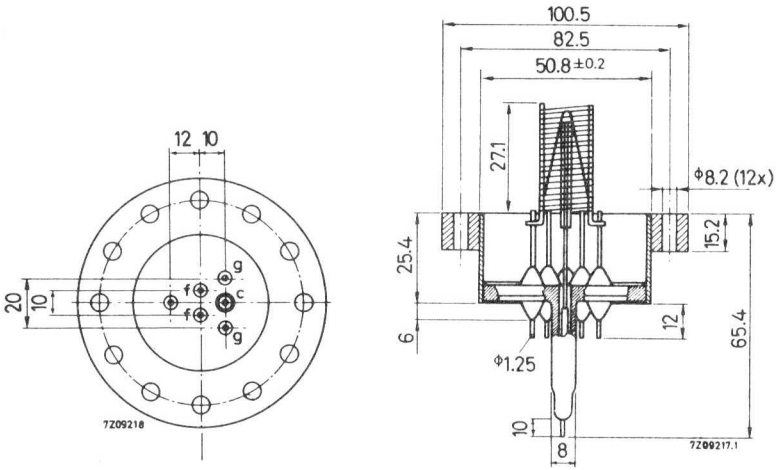
Material	
Filament	Tungsten
Skirt	Fernico
Flange (with type IOG-13NF)	Stainless steel to EN58, forged plate

Type IOG-13





Type IOG-13NF



Mounting position: any

ASSOCIATED EQUIPMENT AND COMPONENTS

Gauge control unit	GCU-1 or GCU-2
For type IOG-13NF only:	
Mating flange	VMF-51 series
Set of nuts, bolts, washers and studding	V-1019

VACUUM GAUGE HEAD, PIRANI/IONIZATION TYPE

Wide range, ultra-high vacuum gauge head, consisting of a Bayard-Alpert ionization gauge and a Pirani gauge, contained in one glass envelope. Overall measuring range 1 torr to 10^{-10} torr.
The Pirani gauge is designed to operate at a constant filament supply voltage over its measuring range.
The ionization gauge permits stable measurements of low pressures to be made thanks to an electrically conductive layer deposited on the inside of the envelope. This layer attracts excess primary electrons which would otherwise be oscillating around the collector.
The gauge head may be outgassed by electron bombardment.

CHARACTERISTICS

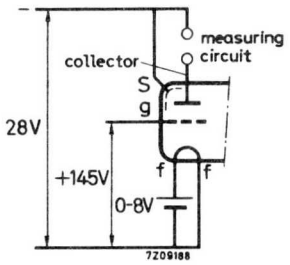
Pirani section		
Pressure range	1 to 10^{-4}	torr
Filament resistance at a pressure of 10^{-3} torr	27	Ω
Ionization section		
Pressure range	10^{-3} to 10^{-10}	torr
Sensitivity (for nitrogen)	approx. 12	per torr
Emission current range	1 μA to 75	mA
Filament characteristics	see page 4	
Insulation resistance		
Collector to other electrodes	min. 10^{14}	Ω
Grid to other electrodes	min. 10^{12}	Ω

TYPICAL OPERATING CONDITIONS

Measuring

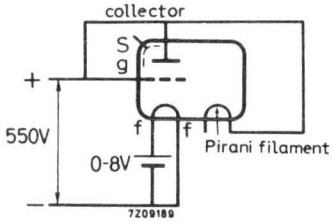
Pirani section		
Filament supply voltage	1.66	V d.c.

Ionization section



Emission current (see also page 4)	100 μA, 1 mA or 10	mA

Outgassing



Emission current (see also page 4)		75	mA

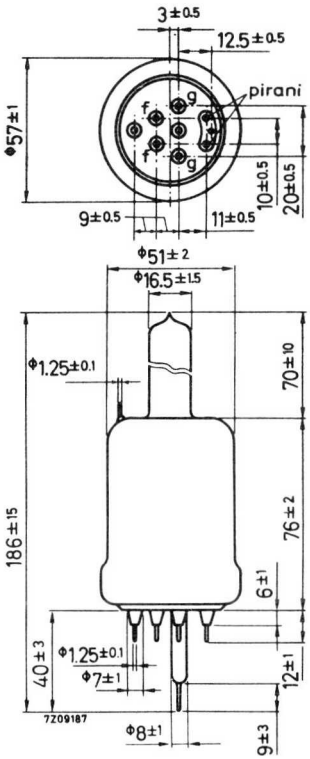
LIMITING VALUES

Pressure at which the ionization gauge filament may be operated	max.	10^{-3}	torr
Ionization gauge filament voltage	max.	8	V
Emission current	max.	75	mA
Grid input power	max.	30	W
Bulb temperature during operation	max.	100	°C
Bake-out temperature	max.	450	°C

MECHANICAL DATA

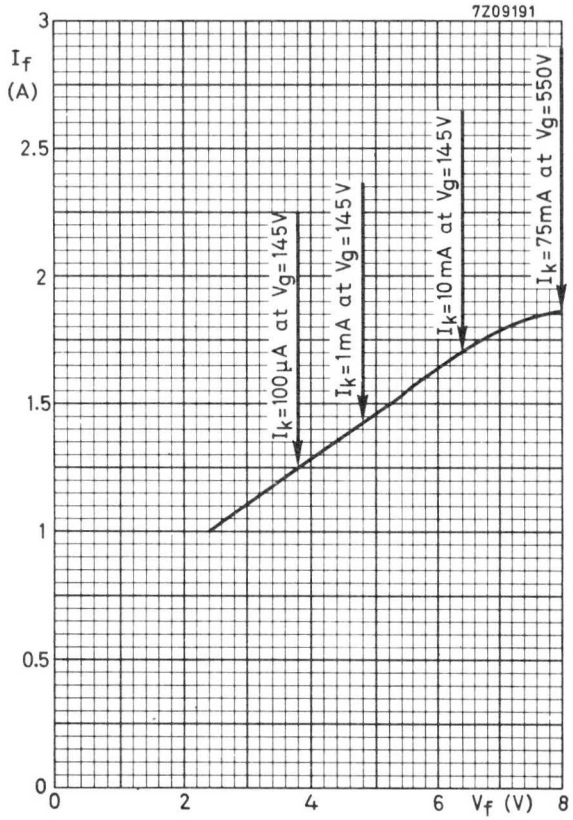
Dimensions in mm

Material W1 glass



ASSOCIATED EQUIPMENT

Gauge control unit GCU-1


7Z09191
I_f (A)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
V_f (V)
I_k=100µA at Vg=145V
I_k=1mA at Vg=145V
I_k=10mA at Vg=145V
I_k=75mA at Vg=550V

VACUUM GAUGE HEAD , BAYARD-ALPERT TYPE

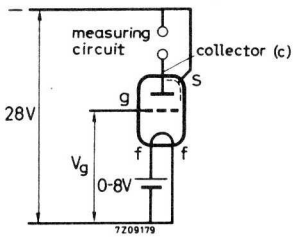
Glass envelope, ultra-high vacuum gauge head of the Bayard-Alpert type. Measuring range 10^{-3} torr to 10^{-10} torr; sensitivity approx. 12 per torr.

The gauge head is provided with two filaments, one of tungsten and one of lanthanum hexaboride.

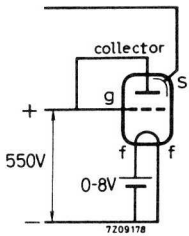
CHARACTERISTICS

Pressure range	10^{-3} to 10^{-10}	torr
Sensitivity (for nitrogen)	approx. 12	per torr
Emission current range	1 μA to 75	mA
Filament characteristics	see page 3	
Insulation resistance		
collector to other electrodes	min. 10^{14}	Ω
grid to other electrodes	min. 10^{12}	Ω

TYPICAL OPERATING CONDITIONS



Measurement



Outgassing

Grid voltage, in combination with fil. 1	V_g +145	V
in combination with fil. 2	+178	V
Emission current (see also page 3)		
measurement	100 μA, 1 mA or 10	mA
outgassing	75	mA

LIMITING VALUES

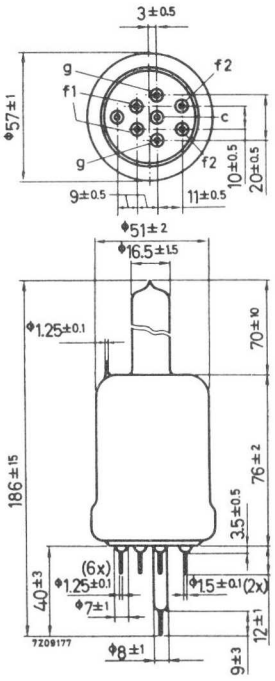
Pressure (filament litt)	max.	10^{-3}	torr
Filament voltage	max.	8	V
Emisssion current	max.	75	mA
Grid input power	max.	40	W
Bulb temperature during operation	max.	100	°C
Bake-out temperature	max.	450	°C

MECHANICAL DATA

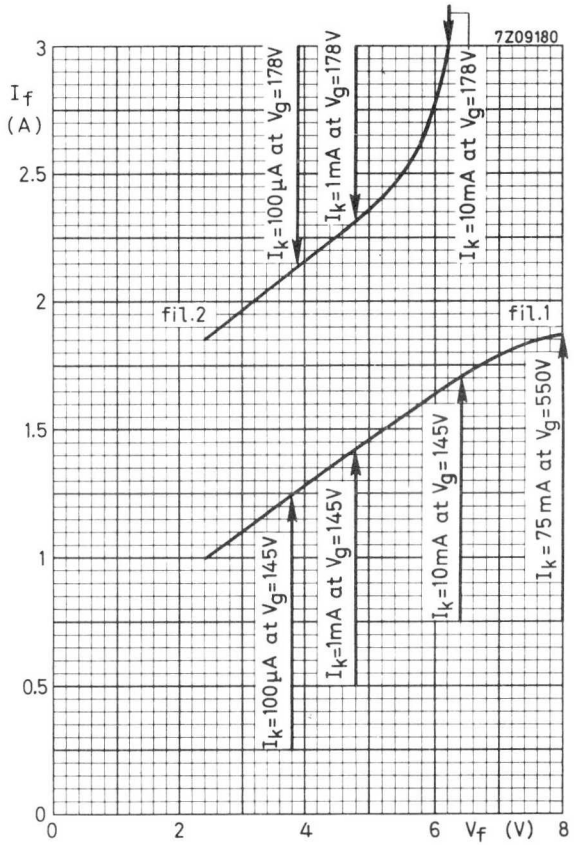
Dimensions in mm

Material

Tubulation	W1 glass
Filament 1	Tungsten
Filament 2	Lanthanum hexaboride (La Br 6)



Mounting position: any


7Z09180
I_f (A)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
V_f (V)
fil.2
fil.1
I_k=100µA at V_g=178V
I_k=1mA at V_g=178V
I_k=10mA at V_g=178V
I_k=100µA at V_g=145V
I_k=1mA at V_g=145V
I_k=10mA at V_g=145V
I_k=75mA at V_g=550V

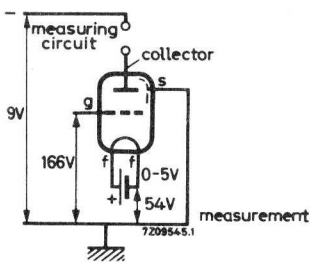
VACUUM GAUGE HEAD, BAYARD-ALPERT TYPE

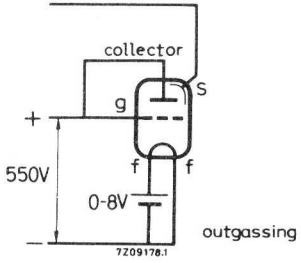
Ultra-high vacuum gauge head of the Bayard-Alpert type. Measuring range 10^{-3} torr to 4×10^{-11} torr; sensitivity approx. 12 per torr.
Type IOG-18 has a glass envelope.
Type IOG-18N has a fernico skirt, prepared for easy welding.
Type IOG-18NF has a flange.
The head with a glass envelope are provided with an electrically conductive layer on the inside of the envelope. By applying a fixed potential to the layer, excess primary electrons are attracted directly to the envelope rather than oscillating around the collector thereby leading to very stable measurements of low pressure.
Moreover the gauge head features a low thermal inertia and a low filament power consumption.

CHARACTERISTICS

Pressure range	10^{-3} to 4×10^{-11}	torr
Sensitivity (for nitrogen)	approx. 12	per torr
Emission current range, type IOG-18	1 μA to 50	mA
all other types	1 μA to 30	mA
Filament characteristics	see page 4	
Insulation resistance		
Collector to other electrodes	min. 10^{14}	Ω
Grid to other electrodes	min. 10^{12}	Ω

TYPICAL OPERATING CONDITIONS





Emission current (see also page 4)		
measurement	100 μA, 1 mA or 10	mA
outgassing, type IOG-18	50	mA
all other types	30	mA

Data based on pre-production devices.

LIMITING VALUES

Pressure (filament litt)	max.	10^{-3}	torr
Filament voltage	max.	8	V
Emission current	max.	50	mA
Grid input power, type IOG-18	max.	30	W
all other types	max.	20	W
Bulb temperature during operation	max.	100	°C
Bake-out temperature	max.	450	°C

MECHANICAL DATA

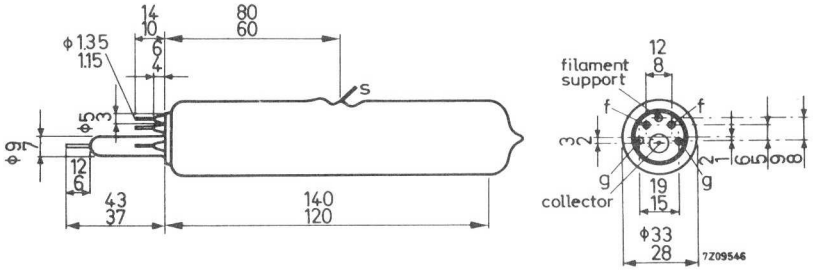
Dimensions in mm

Material

Filament	Tungsten
Tubulation (with type IOG-18)	Kodial
Skirt (with type IOG-18N)	Fernico
Flange (with type IOG-18NF)	Stainless steel to EN 58, forged plate

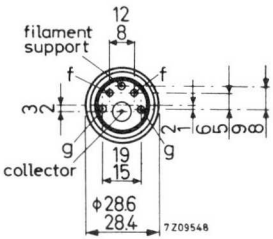
Mounting position: any

IOG-18

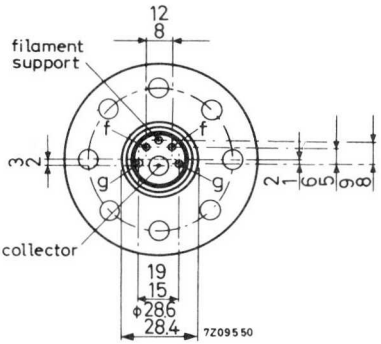


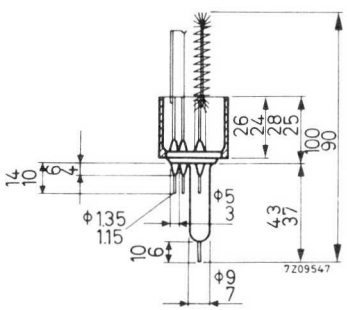
MECHANICAL DATA (continued)

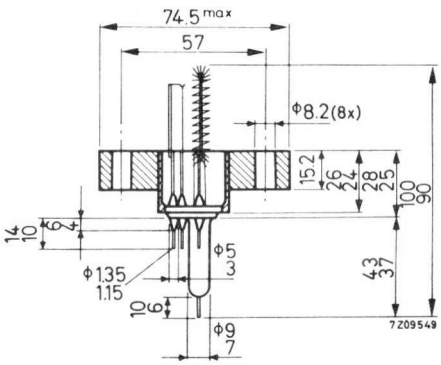
IOG-18N



IOG-18NF

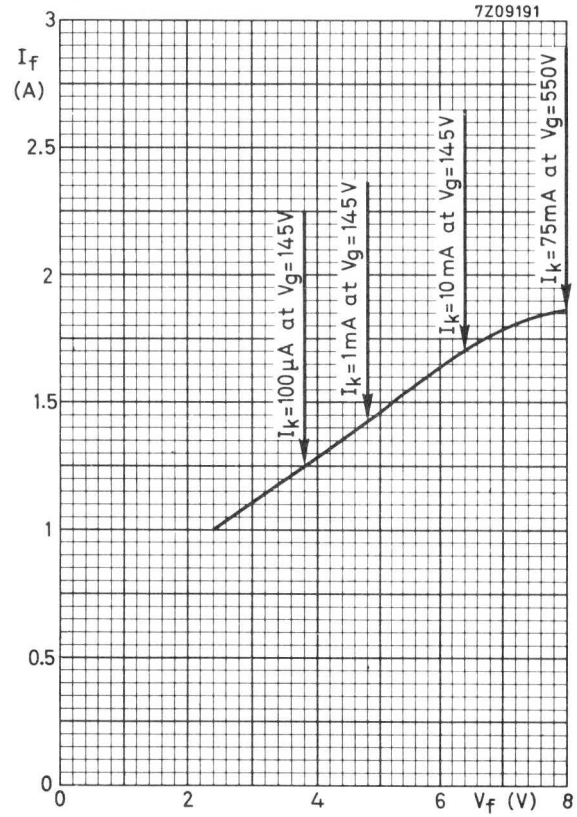






ASSOCIATED EQUIPMENT AND COMPONENTS

Gauge control unit	GCU-1 or GCU-2
For type IOG-18NF only	
Mating flange	VMF-25 series
Set of nuts, bolts washers and studding	V-1019


7Z09191
I_f (A)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
V_f (V)
I_k=100µA at V_g=145V
I_k=1mA at V_g=145V
I_k=10mA at V_g=145V
I_k=75mA at V_g=550V

VACUUM GAUGE HEAD, BAYARD-ALPERT TYPE

Ultra-high vacuum gauge head of the Bayard-Alpert type. Measuring range 10^{-3} torr to 4×10^{-11} torr; sensitivity approx. 12 per torr.
Type IOG-19 has a glass envelope.
Type IOG-19N has a fernico skirt, prepared for easy welding.
Type IOG-19NF has a flange.
The head with a glass envelope are provided with an electrically conductive layer on the inside of the envelope. By applying a fixed potential to the layer, excess primary electrons are attracted directly to the envelope rather than oscillating around the collector thereby leading to very stable measurements of low pressure.
Moreover the gauge head features a low thermal inertia and a low filament power consumption.

FOR THE ELECTRICAL DATA SEE TYPE IOG-18

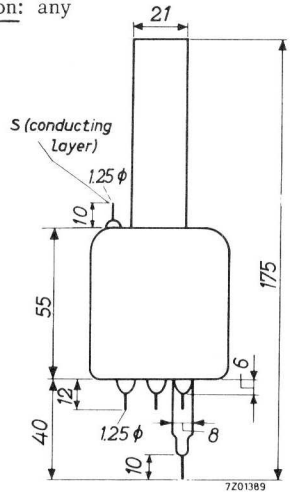
MECHANICAL DATA

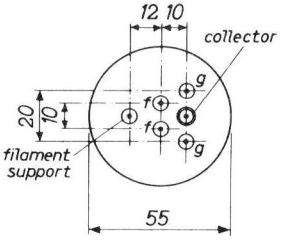
Material

Filament	Tungsten
Tubulation (with type IOG-19)	G28
Skirt (with type IOG-19N)	Fernico
Flange (with type IOG-19NF)	Stainless steel to EN58, forged plate

Mounting position: any

IOG-19

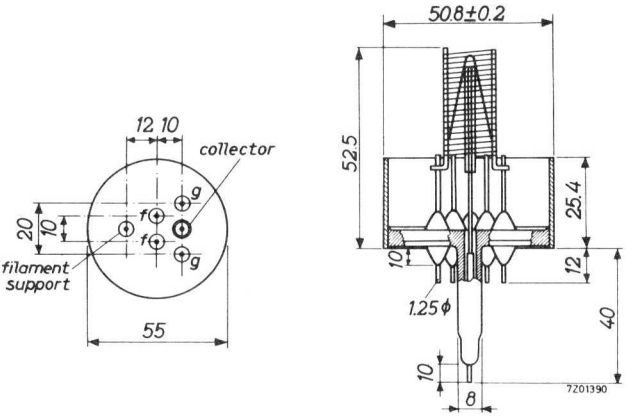




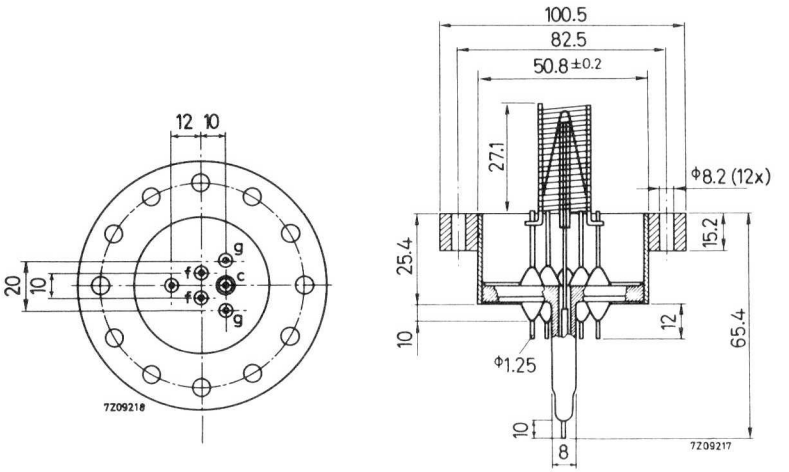
Data based on pre-production devices.

MECHANICAL DATA (continued)

IOG-19N



IOG-19NF



ASSOCIATED EQUIPMENT AND COMPONENTS

Gauge control unit	GCU-1 or GCU-2
For type IOG-19NF only	
Mating flange	VMF-51 series
Set of nuts, bolts washers and studding	V-1019

VACUUM GAUGE HEAD, BAYARD-ALPERT TYPE

Ultra-high vacuum gauge head of the Bayard-Alpert type; provided with a modulator electrode. Measuring range 10^{-3} torr to 10^{-12} torr; sensitivity approx. 20 per torr

Type IOG-20N has a fernico skirt, prepared for easy welding.

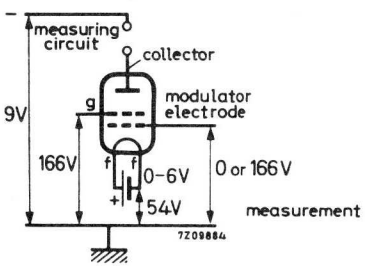
Type IOG-20NF has a flange

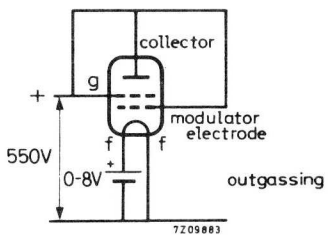
The gauge head features a low thermal inertia and a low filament power consumption.

CHARACTERISTICS

Pressure range	10^{-3} to 10^{-12}	torr
X-ray limit	2.5×10^{-11}	torr
Modulator factor (α)	0.6 to 0.7	
Sensitivity (for nitrogen)	approx. 20	$torr^{-1}$
Emission current range	0.1 to 100	mA
Filament characteristic	see page 3	

TYPICAL OPERATING CONDITIONS





Emission current (see also page 3)

measurement	0.1, 1 or 10 mA
outgassing	100 mA

LIMITING VALUES

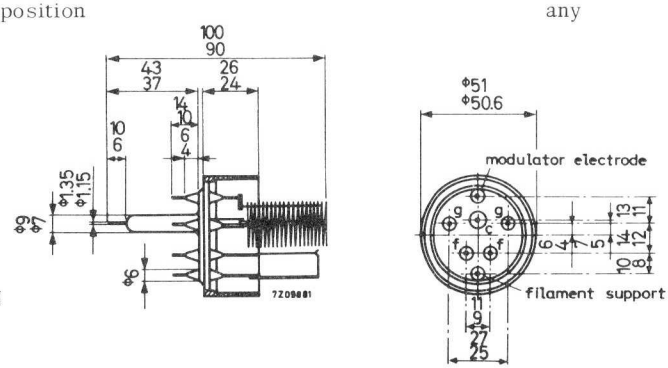
Pressure (filament alite)	max.	10^{-3}	torr
Filament voltage	max.	8	V
Emission current	max.	100	mA
Grid input power	max.	55	W
Skirt temperature during operation	max.	100	°C
Bake-out temperature	max.	450	°C

MECHANICAL DATA

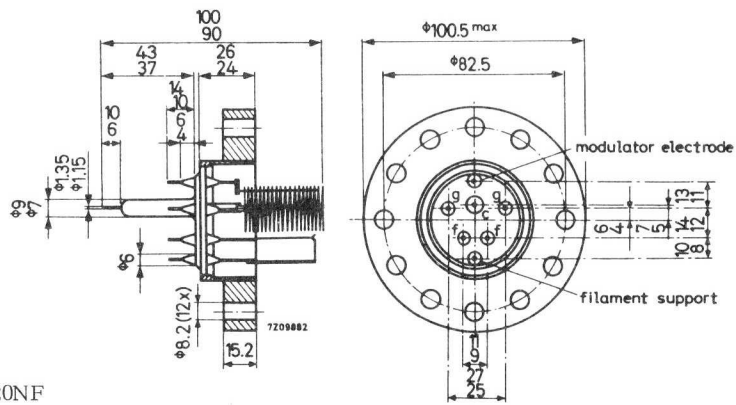
Material

Filament	tungsten
Skirt (with type IOG-20N)	Fernico
Flange (with type IOG-20NF)	Stainless steel to EN58

Mounting position: any



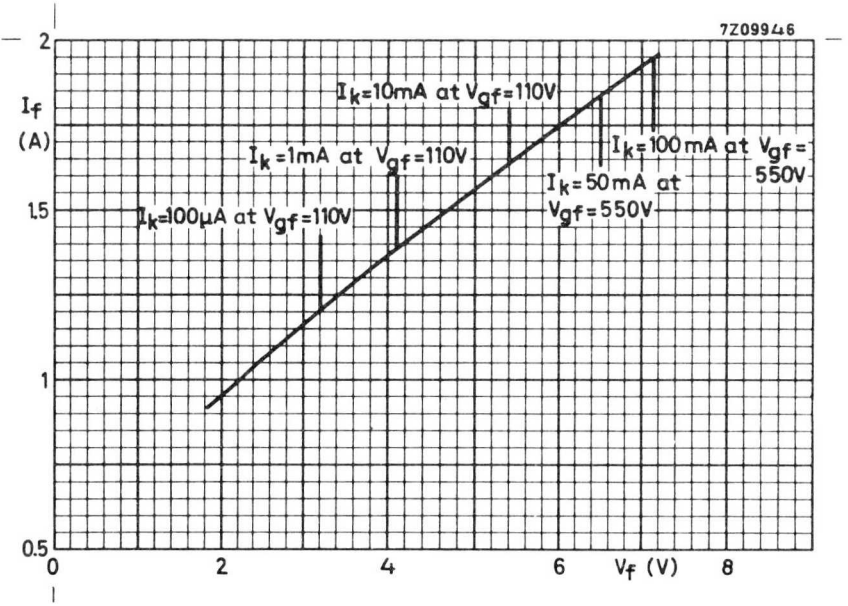
IOG 20N



IOG 20NF

ASSOCIATED EQUIPMENT AND COMPONENTS

Gauge control unit	GCU-2
For type IOG-20NF only:	
Mating flange	VMF-51 series
Set of bolds, nuts, washers; studding	V-1019



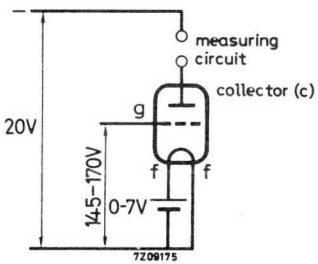
VACUUM GAUGE HEAD, TRIODE TYPE

Glass envelope, high vacuum gauge head of the triode type (hot-cathode, ionisation type). Measuring range 10^{-3} to 5 x 10^{-8} torr, sensitivity 20 per torr.

CHARACTERISTICS

Pressure range	10^{-3} to 5 x 10^{-8} torr
Sensitivity (for dry air)	20 per torr

TYPICAL OPERATING CONDITIONS



Grid current

above 10^{-4} torr	5	mA
below 10^{-4} torr	10	mA

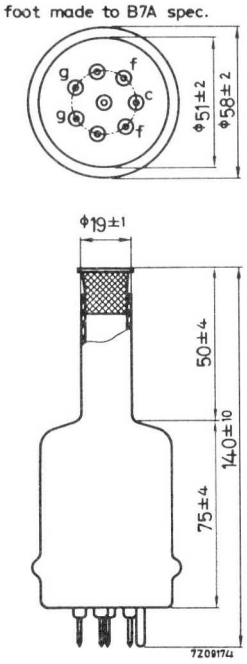
LIMITING VALUES

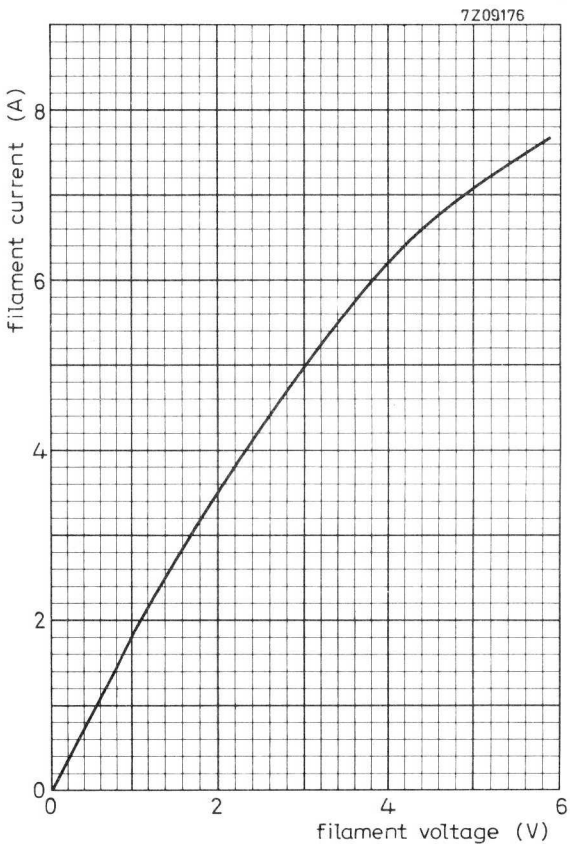
Pressure (filament litted)	max.	5 x 10^{-3}	torr
Filament voltage	max.	10	V
Bake-out temperature	max.	450	°C

MECHANICAL DATA

Dimensions in mm

Material: W1 glass




7Z09176
filament current (A)
0
2
4
6
8
0
2
4
6
filament voltage (V)

VACUUM GAUGE HEAD, PIRANI/CONVECTION TYPE

Wide range, high vacuum gauge head based on the combined use of the thermal conductivity principle and the thermal convection principle.

Pressure range 760 torr to approx. 10^{-4} torr.

The gauge is designed to operate at a constant filament temperature and hence a constant filament resistance over the measuring range, the filament supply voltage thus varying with pressure.

CHARACTERISTICS

Pressure range		760 to 10^{-4}	torr
Filament characteristics (see also page 2)			
Resistance at 20 °C	approx.	30	Ω
Temperature coefficient of resistance		0.162	% per °C

TYPICAL OPERATING CONDITIONS

Filament temperature			
during measuring	approx.	350	°C
filament resistance at this temperature	approx.	46	Ω
during outgassing (duration max. 5 s)	approx.	800	°C
filament resistance at this temperature	approx.	65	Ω

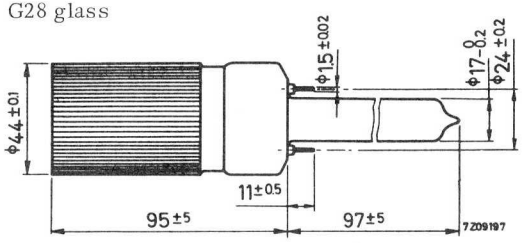
LIMITING VALUES

Filament temperature	max.	800	°C

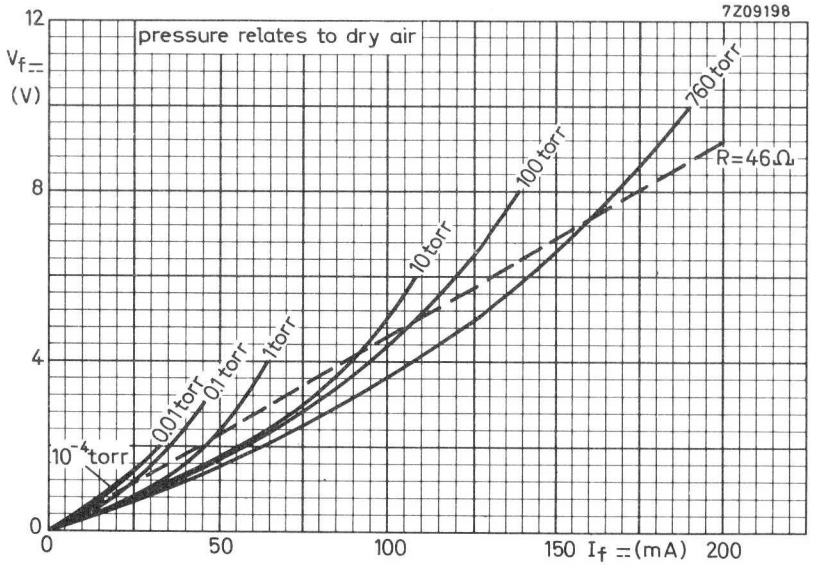
MECHANICAL DATA

Dimensions in mm

Material,
housing: O.F.H.C. copper, chemically blackened
connection tube: G28 glass



Mounting position: Vertical, connection tube down; housing to be mounted in free air.


7Z09198
pressure relates to dry air
12
$V_{f=}$
(V)
8
4
0
0
50
100
150 $I_{f=}$(mA) 200
760 torr
R=46Ω
100 torr
10 torr
1 torr
0.1 torr
0.01 torr
10^{-4} torr

VACUUM GAUGE HEAD, THERMO-COUPLE TYPE

Vacuum gauge head of the thermo-couple type.

Pressure range 1 torr to 10^{-2} torr.

CHARACTERISTICS

Pressure range		1 to 10^{-2} torr
E.M.F. of the thermo-element at a filament supply voltage of 1 V a.c.		see page 2
Filament resistance	R_f	approx. 70 Ω
Resistance of thermo-element		approx. 6 Ω
~~Insulation resistance between filament and thermo-element~~		~~min. 150 MΩ~~

Filament and thermoelement interconnected!

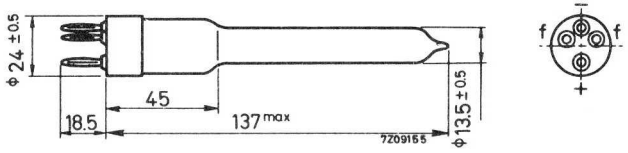
LIMITING VALUES

Filament current	I_f	max. 20 mA

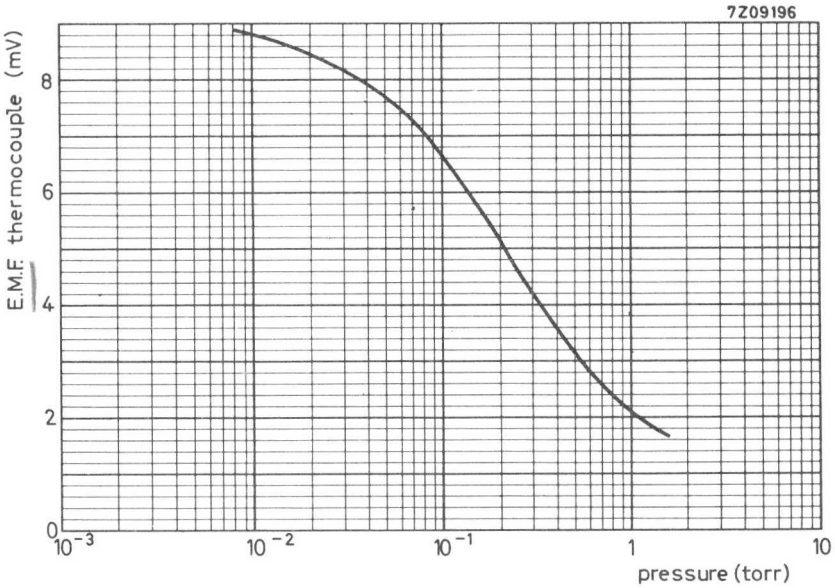
MECHANICAL DATA

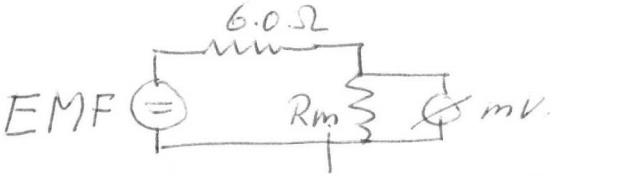
Dimensions in mm

Material of connection tube 03 soft glass



Mounting position: Any





Rm = meter resistance

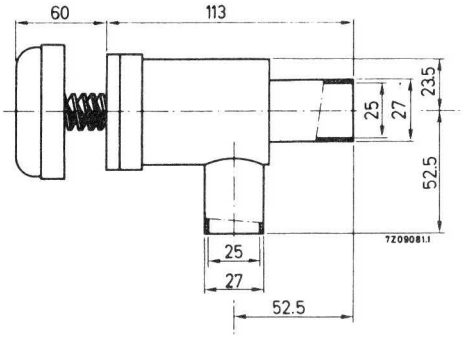
Taps

VITON/METAL TAP

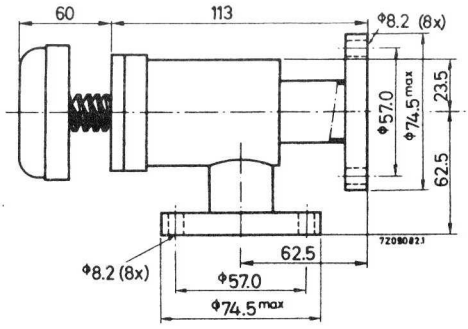
Viton/metal tap for ultra-high vacuum systems with a nominal bore of 1" (approx. 25 mm).

Type VT-25 has stainless steel tubulations
Type VT-25F has metal flanges

MECHANICAL DATA Dimensions in mm



VT-25



VT-25F

Mounting position: any

LIMITING VALUES

Bake-out temperature	max. 200 °C

ASSOCIATED COMPONENTS

For VT-25F: Mating flange	VMF-25 series
Gold wire seal	VMS-25 series
Set of nuts, bolts, washers and studding	V-1019

SPARE PARTS

"0" Ring	V-1015
"0" Ring gasket	V-1017

ULTRA-HIGH VACUUM TAP

All-metal tap for ultra-high vacuum systems with a nominal bore of 1/4 " (6 mm). Open conductance is above 1/4 litre per second and the closed conductance is below 10^{-13} atmospheric litre per second. The tap is bakeable at 450 °C in open and at 400 °C in closed position.

Type VTB-6 has stainless steel tubulations
Type VTB-6K has Kodial glass tubulations
Type VTB-6P has Pyrex glass tubulations

CHARACTERISTICS

Closed leak conductance	$< 10^{-13}$ l/s
Open conductance	> 0.25 l/s
Closing torque initial to produce a closed leak conductance of 10^{-13} l/s	2 Nm (0.2 mkg)

LIMITING VALUES

Closing torque	max. 4 Nm (0.4 mkg)
Bake-out temperature, open	max. 450 °C
closed	max. 400 °C

MECHANICAL DATA

Dimensions	see Fig. 1 and 2
Mounting position	any

ASSOCIATED COMPONENTS

Mounting support	V-1010 (see Fig. 3)

VTB-6

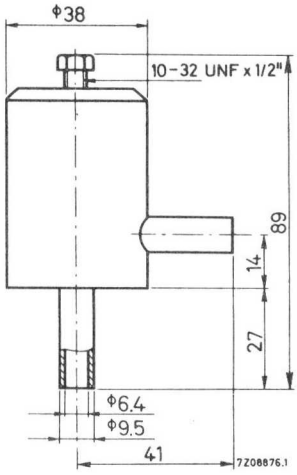


Fig. 1

VTB-6K
VTB-6P

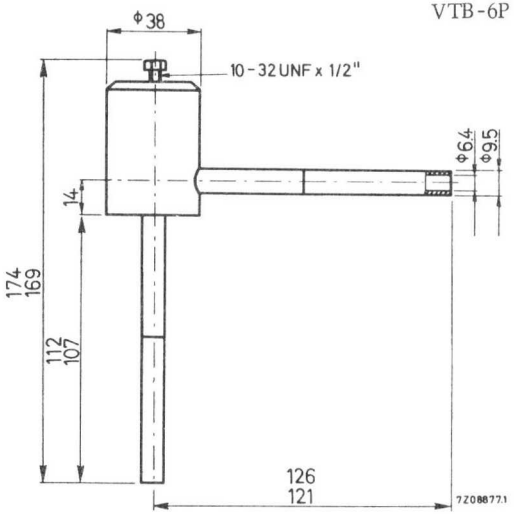
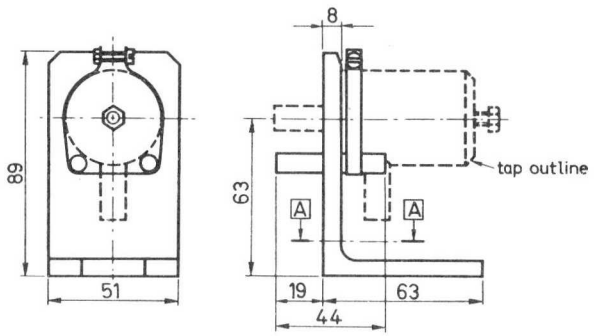
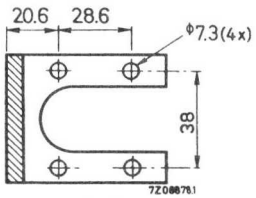


Fig. 2





A-A

V-1010

Fig. 3

ULTRA-HIGH VACUUM TAP

All-metal tap for ultra-high vacuum systems with a nominal bore of 3/4 " (approx. 19 mm). Open conductance is above 3 litres per second and the closed conductance is below 10^{-14} atmospheric litre per second.
The tap is bakeable at 450 °C in open or closed position.

Type VTB-18 has stainless steel tubulations
Type VTB-18F has metal flanges
Type VTB-18K has Kodial glass tubulations
Type VTB-18P has Pyrex glass tubulations

CHARACTERISTICS

Closed leak conductance	$< 10^{-14}$	l/s
Open conductance (see also page 3)	> 3	l/s
Closing torque initial to produce a closed leak conductance of 10^{-14} l/s	11	Nm (1.1 mkg)

LIMITING VALUES

Closing torque	max. 22	Nm (2.2 mkg)
Bake-out temperature	max. 450	°C

MECHANICAL DATA

Dimensions	see Figs 1, 2 and 3
Mounting position	any [1]

ASSOCIATED COMPONENTS

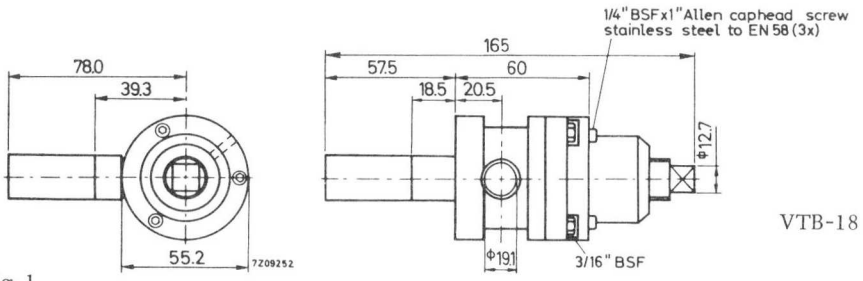
For VTB-18F: Mating flange	VMF-18 series
Gold wire seal	VMS-18 series
Set of nuts, bolts, washers and studding	V-1018
For all types: Mounting support	V-1011 (see Fig. 4)

SPARE PARTS

Seal pad	V-1007

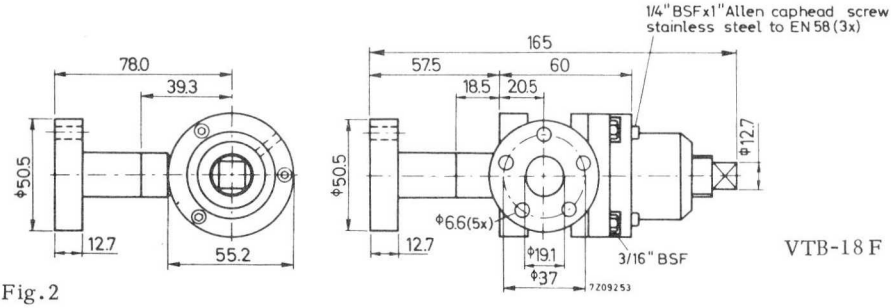
[1] The body of the tap may be turned through 90° or 180° on the support bracket to accommodate alternative lay-outs.

Dimensions in mm



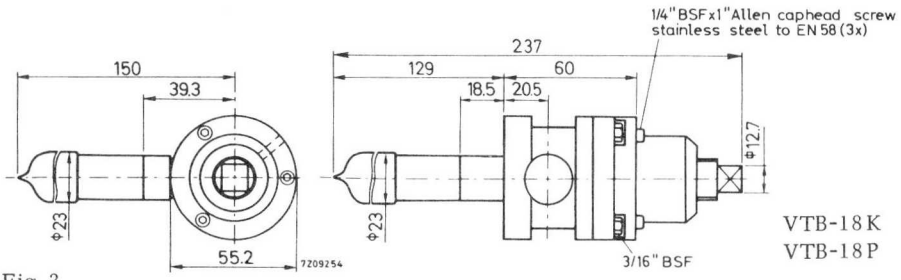
VTB-18

Fig.1



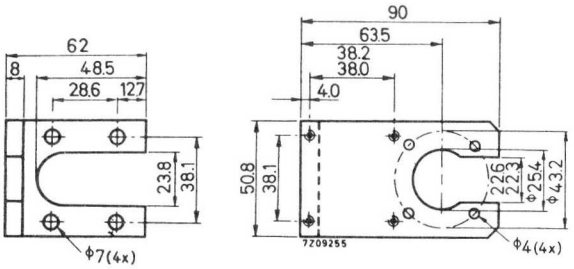
VTB-18F

Fig.2



VTB-18K
VTB-18P

Fig.3



V-1011

Fig.4


7Z09251
tap conductance (l/s)
6
4
2
0
0
1
2
3
4
opening in mm from fully closed position

ULTRA-HIGH VACUUM TAP

All-metal tap for ultra-high vacuum systems with a nominal bore of 1" (approx. 25 mm). Open conductance is above 21 litres per second and the closed conductance is below 10^{-14} atmospheric litre per second. The tap is bakeable at 450 °C in open and at 400 °C in closed position.

Type VTB-25 has stainless steel tubulations
Type VTB-25F has metal flanges
Type VTB-25K has Kodial glass tubulations
Type VTB-25P has Pyrex glass tubulations

CHARACTERISTICS

Closed leak conductance	$< 10^{-14}$ l/s
Open conductance	> 21 l/s
Closing torque initial to produce a closed leak conductance of 10^{-14} l/s	11 Nm (1.1 mkg)

LIMITING VALUES

Closing torque	max. 22 Nm (2.2 mkg)
Bake-out temperature: open	max. 450 °C
closed	max. 400 °C

MECHANICAL DATA

Dimensions	see Figs 1, 2 and 3
Mounting position	any

ASSOCIATED COMPONENTS

For VTB-25F: Mating flange	VMF-25 series
Gold wire seal	VMS-25 series
Set of nuts, bolts, washers and studding	V-1019
For all types: Mounting support	V-1012 (see Fig. 4)

SPARE PARTS

Seal pad	V-1008

Dimensions in mm

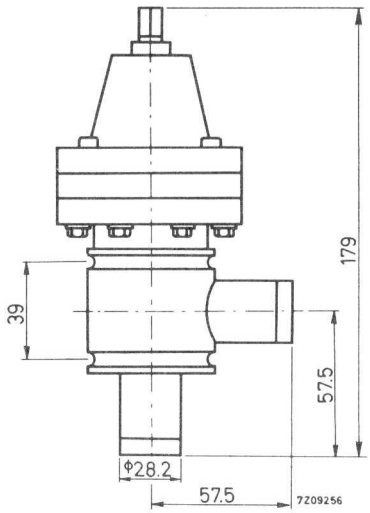


Fig.1 VTB-25

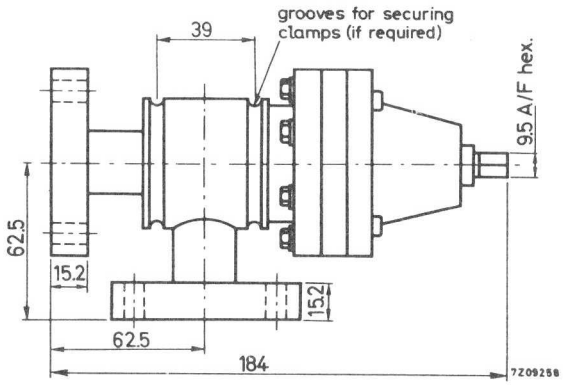
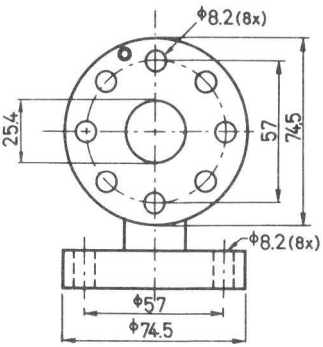
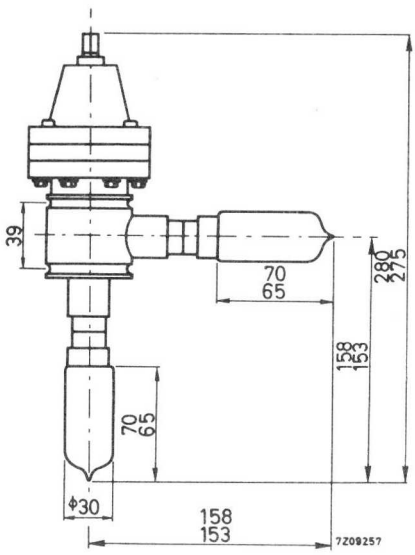


Fig.2



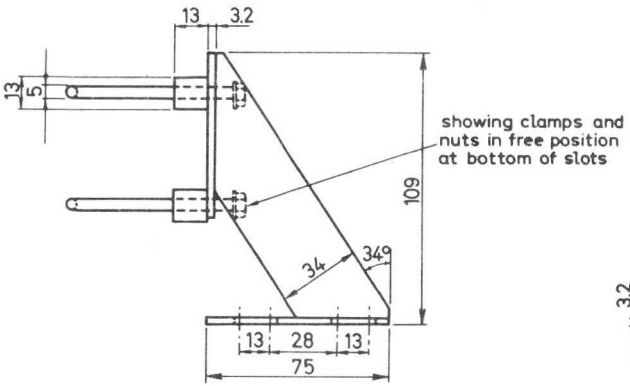
VTB-25 F

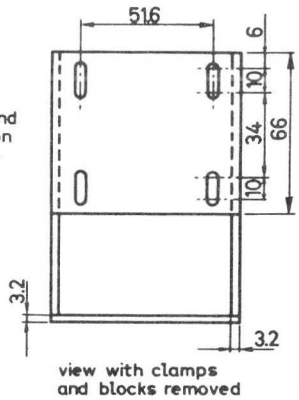
Dimensions in mm

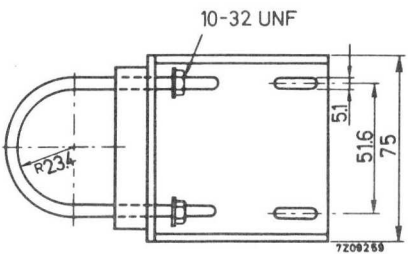


VTB-25 K
VTB-25 P

Fig.3







V-1012

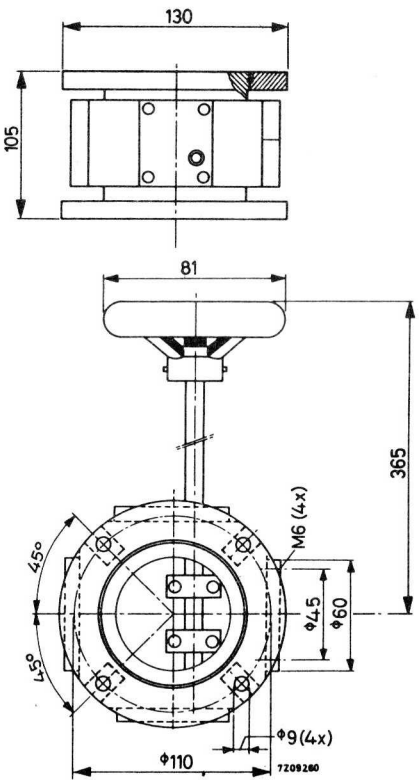
Fig.4

HIGH VACUUM TAP

Stainless steel high vacuum tap with a nominal bore of 60 mm diameter. On two opposite sides facilities are provided for mounting manifolds or taps e.g. for backing pressure connection. The tap is provided with flanges in accordance with the ISO Recommendations; one is rotatable.

DIMENSIONS

Dimensions in mm



ASSOCIATED COMPONENTS

Sealing ring:

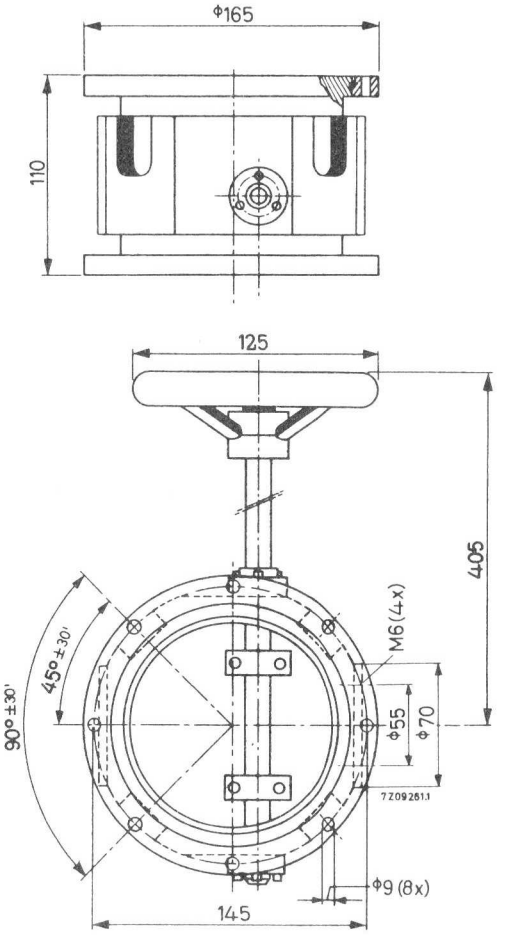
for main flanges (nominal bore 63 mm)	7322 012 32940

HIGH VACUUM TAP

Stainless steel high vacuum tap with a nominal bore of 100 mm diameter. On two opposite sides facilities are provided for mounting manifolds or taps e.g. for backing pressure connection. The tap is provided with flanges in accordance with the ISO Recommendations; one is rotatable.

DIMENSIONS

Dimensions in mm



ASSOCIATED COMPONENTS

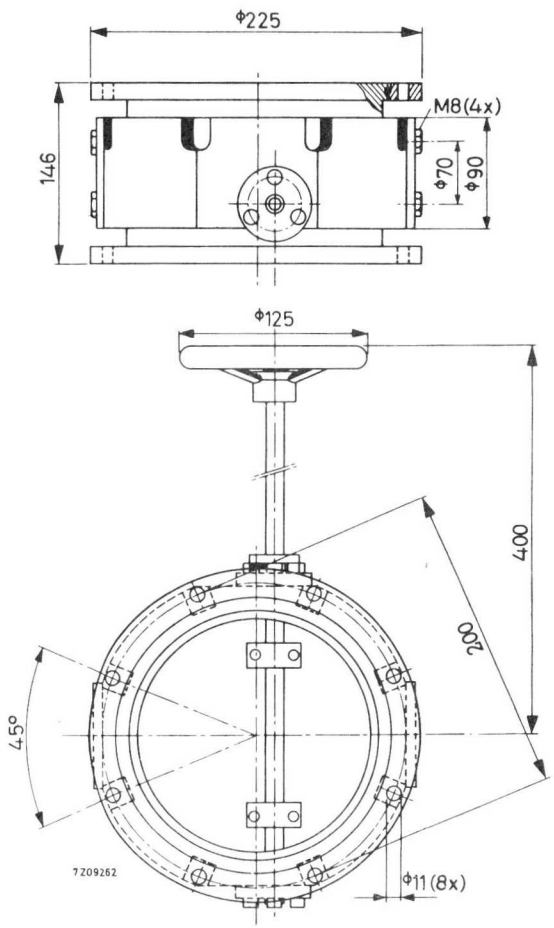
Sealing ring:
for main flanges (nominal bore 100 mm) 7322 012 32470

HIGH VACUUM TAP

Stainless steel high vacuum tap with a nominal bore of 150 mm diameter. On two opposite sides facilities are provided for mounting manifolds or taps e.g. for backing pressure connection. The tap is provided with flanges in accordance with the ISO Recommendations; one is rotatable.

DIMENSIONS

Dimensions in mm



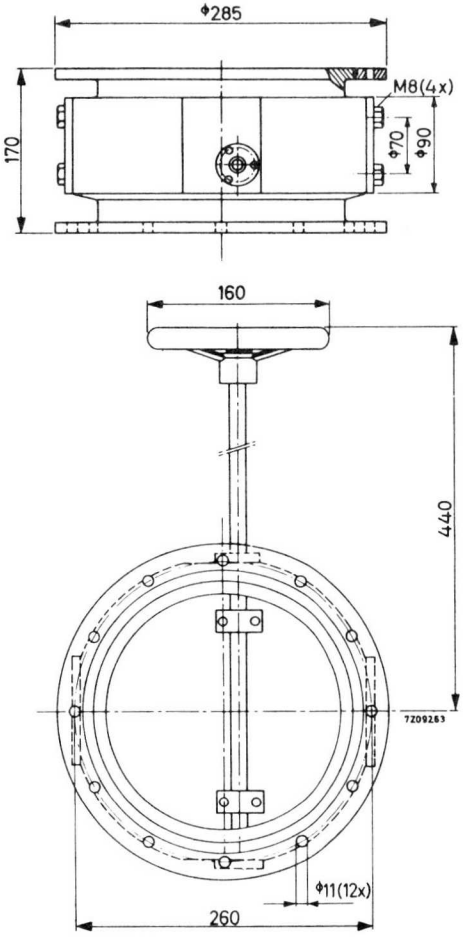
ASSOCIATED COMPONENTS

Sealing ring:
for main flanges (nominal bore 160 mm) 7322 012 32950

HIGH VACUUM TAP

Stainless steel high vacuum tap with a nominal bore of 200 mm diameter. On one side facilities are provided for mounting manifolds or taps e.g. for backing pressure connection. The handwheel together with the driving shaft can easily be mounted on the opposite side of the tap. The tap is provided with flanges in accordance with the ISO Recommendations; one is rotatable.

DIMENSIONS Dimensions in mm



ASSOCIATED COMPONENTS

Sealing ring:
for mains flanges (nominal bore 200 mm) 7322 012 31720

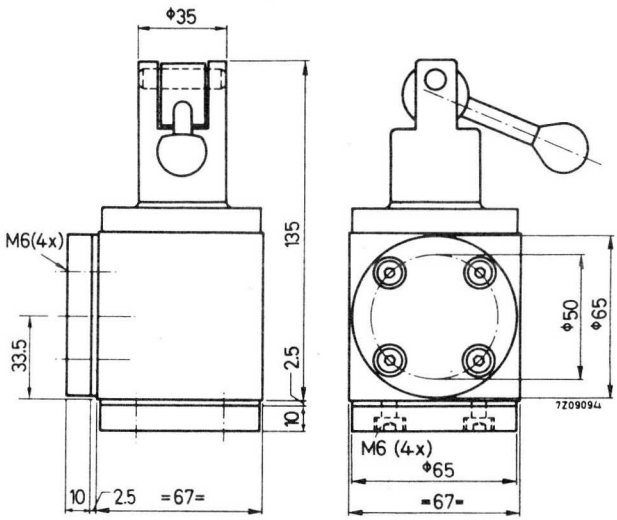
FORE VACUUM TAP

Fore vacuum tap with a nominal bore of 20 mm.

The tap is provided with blank flanges in accordance with the ISO Recommendations.
The traveling way of the valve stem is adjustable.

DIMENSIONS

Dimensions in mm



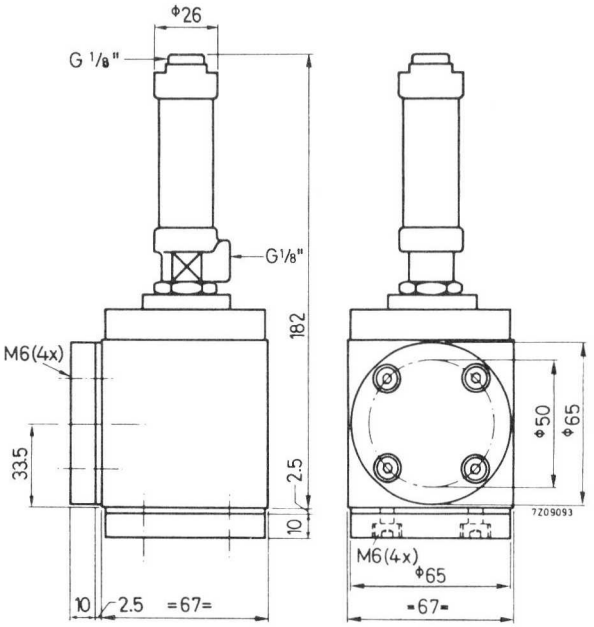
FORE VACUUM TAP

Pneumatically operated fore vacuum tap with a nominal bore of 20 mm.

The tap is provided with blank flanges in accordance with the ISO Recommendations.

DIMENSIONS

Dimensions in mm



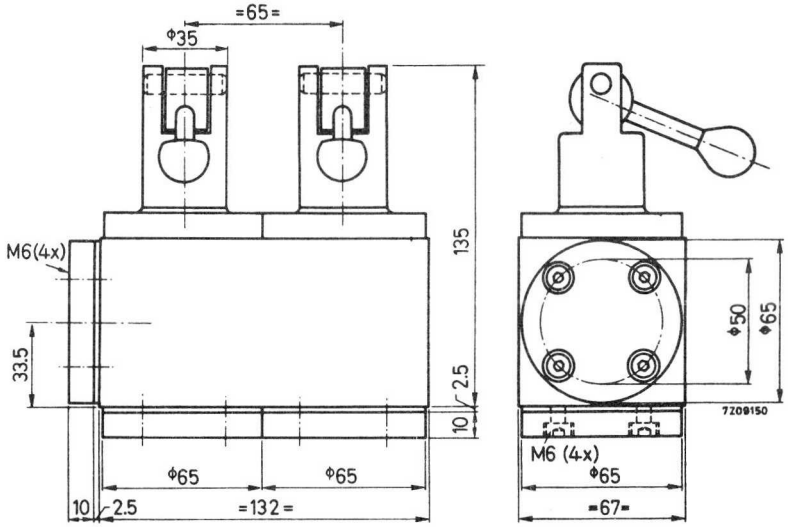
DOUBLE FORE VACUUM TAP

Double fore vacuum tap with a nominal bore of 20 mm.

The tap is provided with blank flanges in accordance with the ISO Recommendations. The traveling way of each valve stem is adjustable.

DIMENSIONS

Dimensions in mm



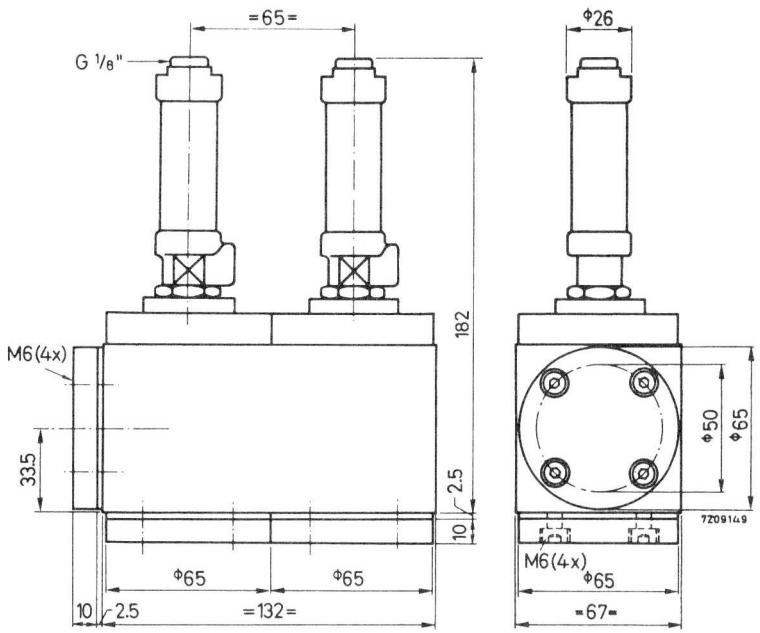
DOUBLE FORE VACUUM TAP

Pneumatically operated, double fore vacuum tap with a nominal bore of 20 mm.

The tap is provided with blank flanges in accordance with the ISO Recommendations.

DIMENSIONS

Dimensions in mm



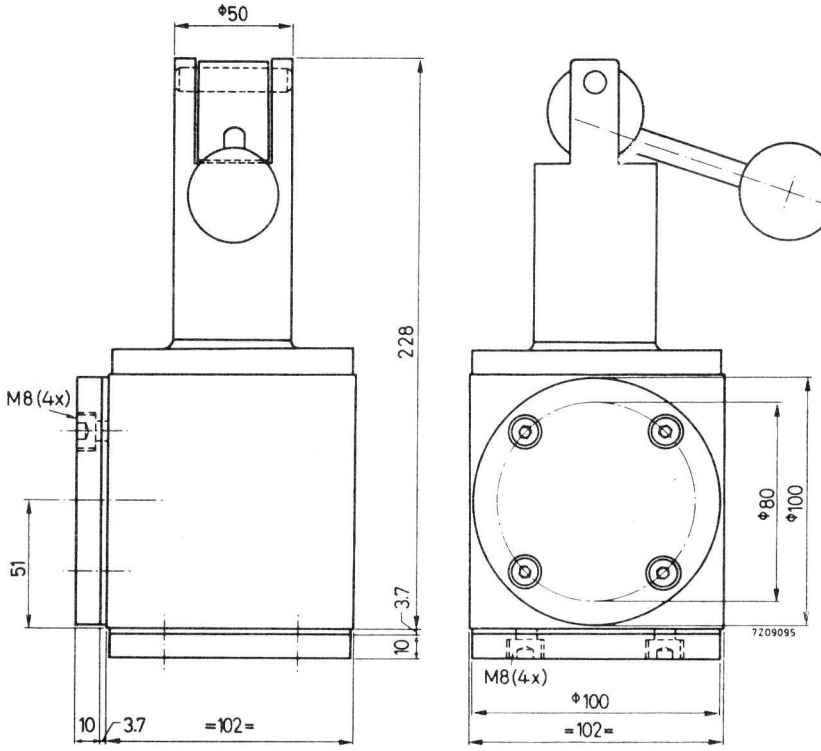
FORE VACUUM TAP

Fore vacuum tap with a nominal bore of 40 mm.

The tap is provided with blank flanges in accordance with the ISO Recommendations. The traveling way of the valve stem is adjustable.

DIMENSIONS

Dimensions in mm



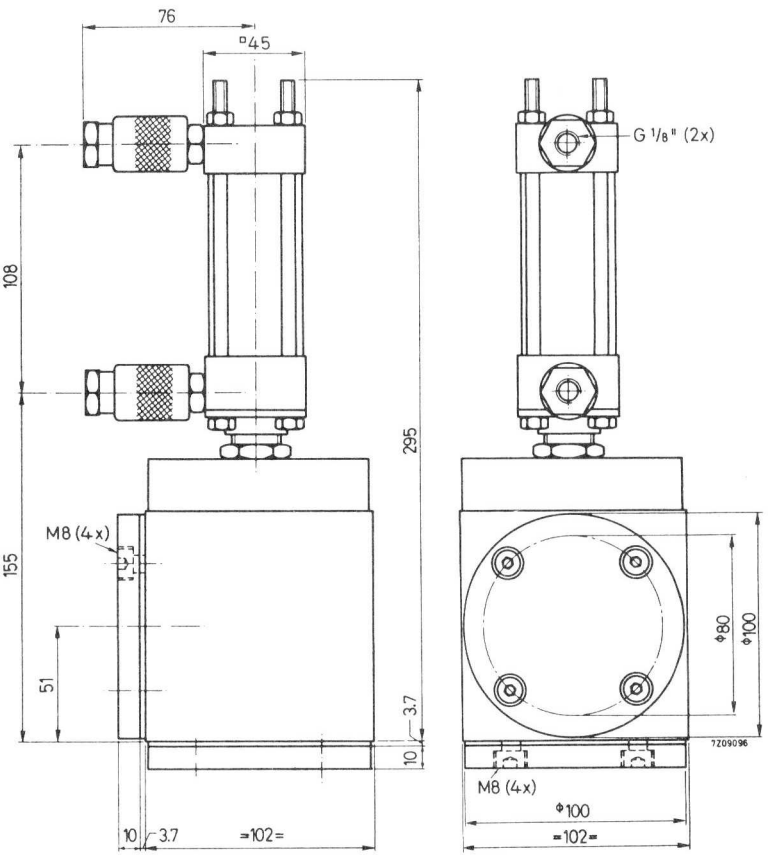
FORE VACUUM TAP

Pneumatically operated fore vacuum tap with a nominal bore of 40 mm.

The tap is provided with blank flanges in accordance with the ISO Recommendations. The traveling speed of the valve stem is adjustable by means of two throttle values.

DIMENSIONS

Dimensions in mm



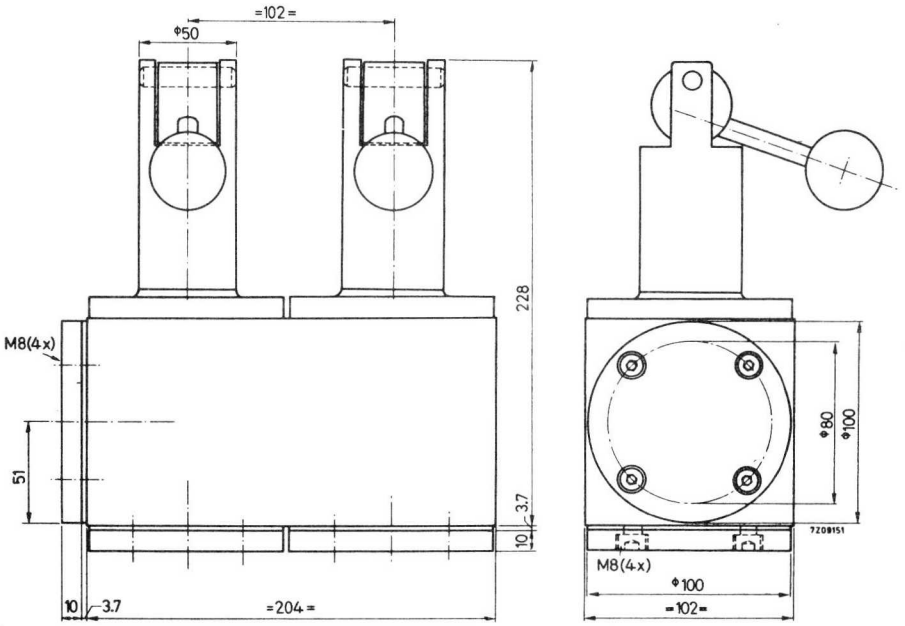
DOUBLE FORE VACUUM TAP

Double fore vacuum tap with a nominal bore of 40 mm.

The tap is provided with blank flanges in accordance with the ISO Recommendations. The traveling way of each valve stem is adjustable.

DIMENSIONS

Dimensions in mm



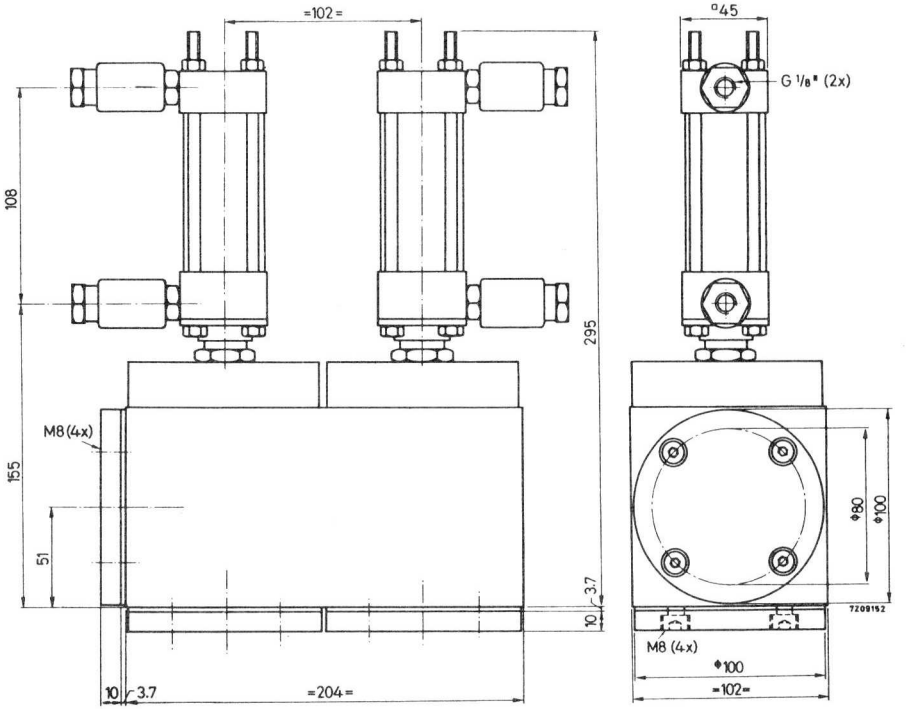
DOUBLE FORE VACUUM TAP

Pneumatically operated, double fore vacuum tap with a nominal bore of 40 mm.

The tap is provided with blank flanges in accordance with the ISO Recommendations. The traveling speed of each valve stem is adjustable by means of two throttle valves.

DIMENSIONS

Dimensions in mm



Fittings

CONNECTORS

Stainless steel connectors for ultra-high vacuum systems.

The range comprises the following types:

VC-300 to VC-305	right-angle connectors
VC-310 to VC-315	cross connectors
VC-320 to VC-325	T connectors
VC-330 to VC-335	flexible connectors
VC-340 to VC-344	reducing connectors

The connectors are manufactured from low vapour pressure metal to ensure minimum contamination and will not be affected by contaminations often met in high vacuum systems, such as silicone grease, molybdenum disulphide, diffusion pump oils and mercury vapours.

CHARACTERISTICS

Material — stainless steel to EN58

Dimensions — see table below

Type number	Fig.	Internal dia (nom) (mm)	Dimension a (nom) (mm)	Flange type
VC-300	1	19	63.5	VMF-18
VC-301	1	25	76	VMF-25
VC-302	1	38	82.5	VMF-38
VC-303	1	48	89	VMF-51
VC-304	1	70	134	VMF-75
VC-305	1	94	157	VMF-100
VC-310	2	19	63.5	VMF-18
VC-311	2	22	76	VMF-25
VC-312	2	35	82.5	VMF-38
VC-313	2	48	89	VMF-51
VC-314	2	73	120.5	VMF-75
VC-315	2	98	133.5	VMF-100

Type number	Fig.	Internal dia (nom) (mm)	Dimension a (nom) (mm)	Flange type
VC-320	3	19	63.5	VMF-18
VC-321	3	22	76	VMF-25
VC-322	3	35	82.5	VMF-38
VC-323	3	48	89	VMF-51
VC-324	3	73	120.5	VMF-75
VC-325	3	98	133.5	VMF-100
VC-330	4	13	80	VMF-18
VC-331	4	25	85	VMF-25
VC-332	4	34	86	VMF-38
VC-333	4	44	86	VMF-51
VC-334	4	67	110	VMF-75
VC-335	4	93	110	VMF-100
VC-340	5	25/16	85	VMF-25/VMF-18
VC-341	5	38/25	90	VMF-38/VMF-25
VC-343	5	75/48	115	VMF-75/VMF-51
VC-344	5	100/70	115	VMF-100/VMF-75

ASSOCIATED COMPONENTS

Gold wire seals	VMS-18 to VMS-100
Set of nuts, bolts, washers and studding	
for VMF-18 flanges	V-1018
VMF-25, VMF-38 and VMF-51 flanges	V-1019
VMF-75 and VMF-100 flanges	V-1020

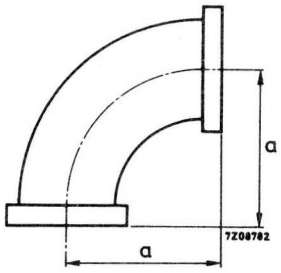


Fig.1

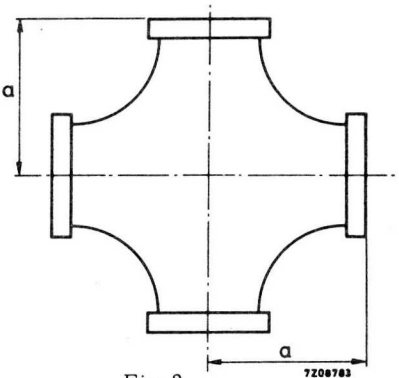


Fig.2

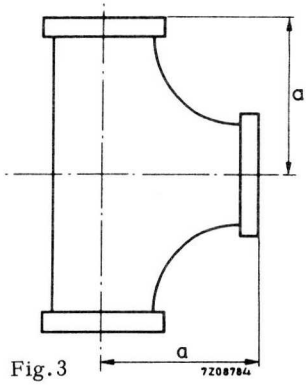


Fig.3

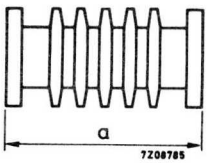


Fig.4

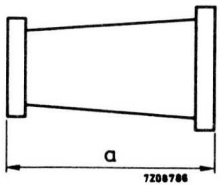


Fig.5

VIEWING PORTS

Viewing ports for ultra-high vacuum systems. The ports are bakeable to 400 °C and are mounted on flanges.

Type number	Port diameter mm (approx.)	Port diameter in	Flange type
VC-350	25	1	VMF-25
VC-351	38	1.5	VMF-38
VC-352	51	2	VMF-51
VC-353	76	3	VMF-75
VC-354	100	4	VMF-100

ASSOCIATED COMPONENTS

	For VMF-25 flanges	For VMF-38 flanges	For VMF-51 flanges	For VMF-75 flanges	For VMF-100 flanges
Gold wire seals	VMS-25	VMS-51	VMS-51	VMS-75	VMS-100
Set of bolts, nuts, washers and studding	V-1019	V-1019	V-1019	V-1020	V-1020

7Z2 9176

LINEAR DRIVE, MICROMETER TYPE

Linear drive of the micrometer type; overall movement 1 in (25.4 mm) with an accuracy of 0.001 in (approx. 0.03 mm).
The drive, except for the micrometer head, is bakeable to 450 °C; the micrometer head can be removed easily without affecting the sealing of the system.

CHARACTERISTICS

Overall movement	1 in (25.4 mm)
Accuracy	±0.001 in (approx. 0.03 mm)

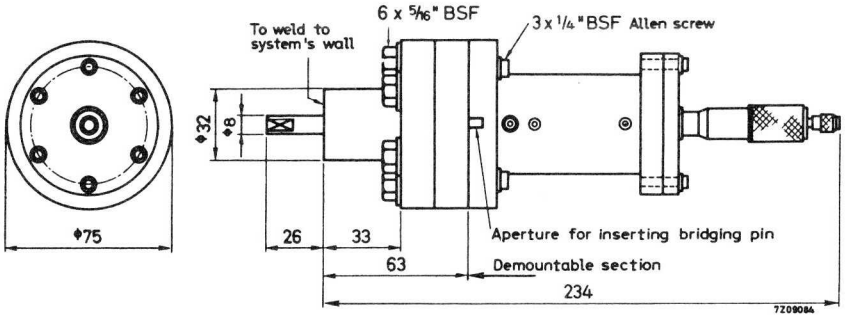
LIMITING VALUES

Bake-out temperature (micrometer head removed)	max. 450 °C

MECHANICAL DATA

Dimensions in mm

Material: stainless steel to EN 58



LINEAR DRIVE

Linear drive with an overall movement of 1 in.
The drive is bakeable to 450 °C

CHARACTERISTICS

Overall movement	1 in (25.4 mm)

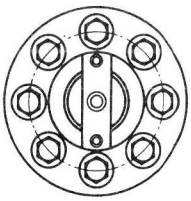
LIMITING VALUES

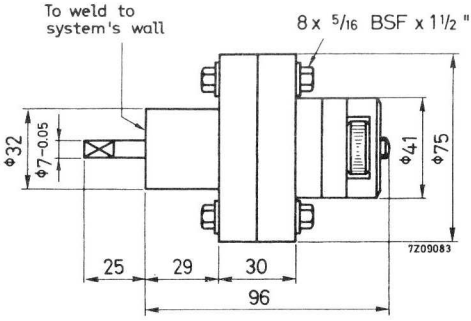
Bake-out temperature	max. 450 °C

MECHANICAL DATA

Dimensions in mm

Material: stainless steel to EN 58





ELECTRICAL FEED-THROUGHS

Electrical feed-throughs for ultra-high vacuum systems.
The feed-throughs are made in metal-ceramic or in metal-glass construction.
The range comprises the following types:
VC-721 to VC-734 feed-throughs welded into flanges
Glass feed-throughs can be delivered with a skirt instead of a flange. Add suffix SK to type number

CHARACTERISTICS AND LIMITING VALUES

Type No.	Material	Fig.	No. of pins	Max. voltage (kV)	Max. current (A)	Flange
VC-721	glass	1	9	5	5	VMF-25
VC-723	ceramic	2	1	3	50	VMF-25
VC-724	ceramic	3	1	3	200	VMF-25
VC-725	ceramic	4	1	12	10	VMF-25
VC-726	ceramic	5	10	5	1	VMF-51
VC-727	ceramic	6	3	1	30	VMF-25
VC-728	glass	7	14	5	2 pins "E": 12 12 pins "H": 7	VMF-51
VC-729	glass	8	6	8	7	VMF-51
VC-730	glass	9	6	1 pin "J": 12 5 pins "H": 8	1 pin "J": 12 5 pins "H": 5	VMF-51
VC-731	glass	10	7	1 pin "H": 12 6 pins "J": 8	1 pin "H": 12 6 pins "J": 7	VMF-51
VC-732	glass	11	9	1 pin "J": 12 8 pins "H": 8	1 pin "J": 12 8 pins "H": 7	VMF-51
VC-733	glass	12	9	1 pin "H": 12 8 pins "J": 5	5	VMF-25
VC-734	ceramic	13	2	5	12	VMF-25

Maximum operating temperature at full ratings,	
for glass insulated components	20 °C
for ceramic insulated components	450 °C
Maximum bake-out temperature	450 °C

ASSOCIATED COMPONENTS

	For VMF-25 flanges	For VMF-51 flanges
Gold wire seals	VMS-25	VMS-51
Set of bolts, nuts, washers and studding	V-1019	V-1019

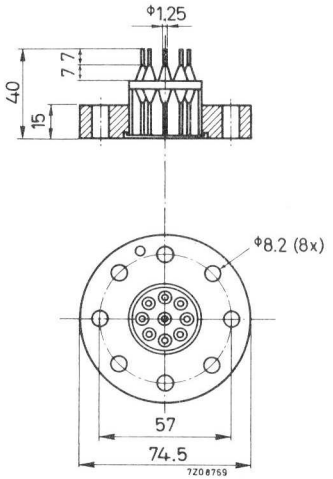


Fig. 1

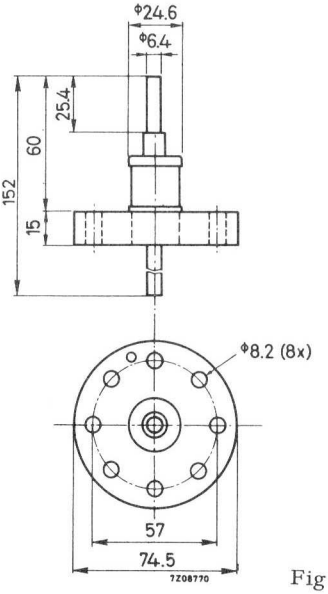


Fig. 2

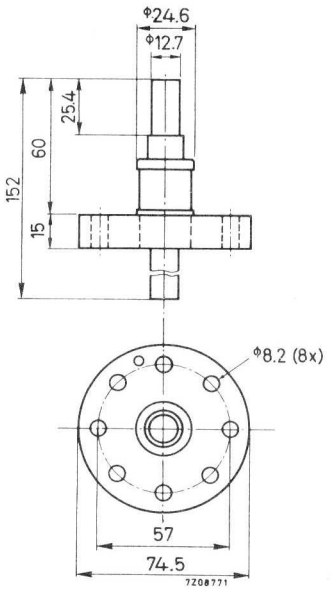


Fig. 3

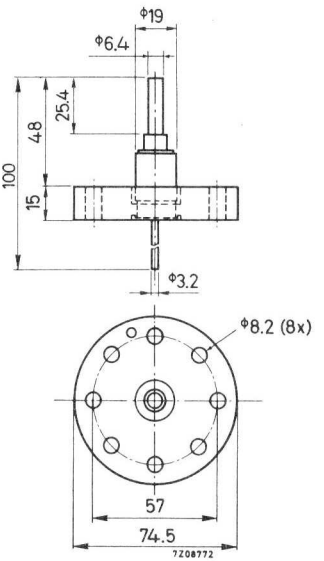


Fig. 4

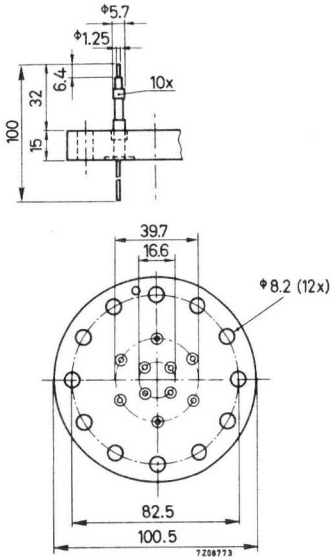


Fig. 5

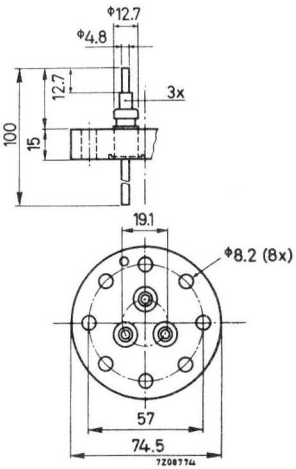


Fig. 6

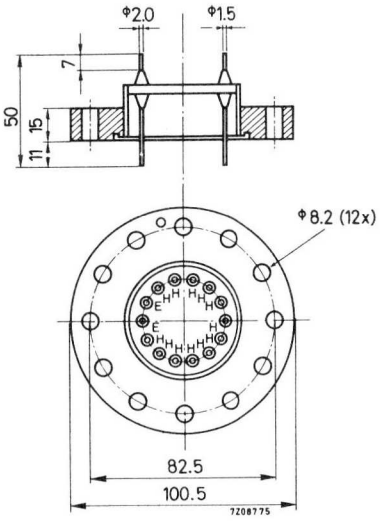


Fig. 7

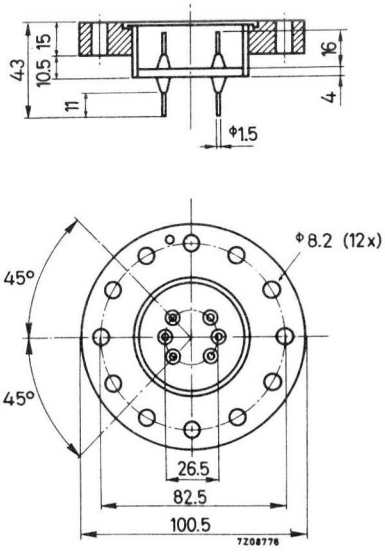


Fig. 8

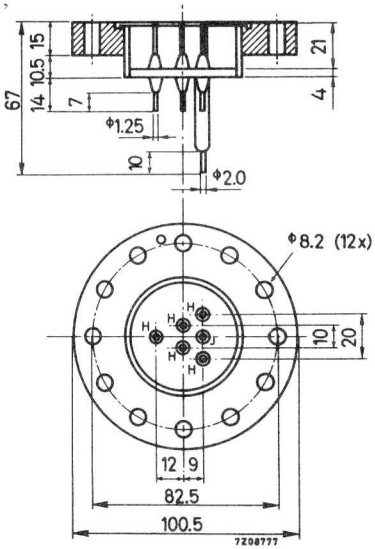


Fig. 9

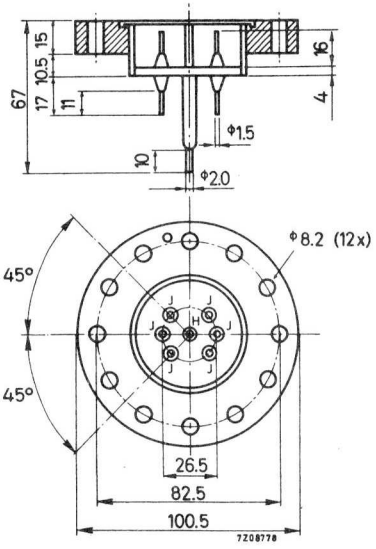


Fig. 10

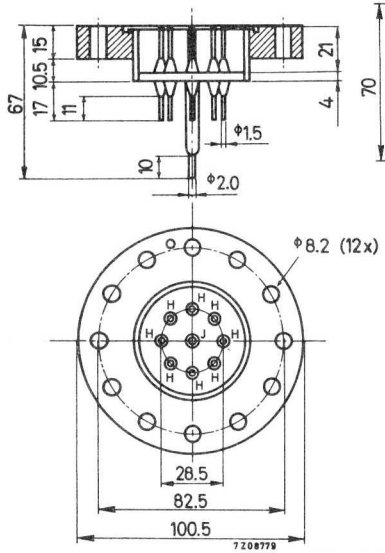


Fig. 11

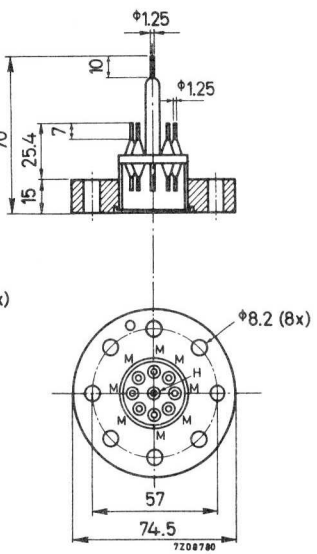


Fig. 12

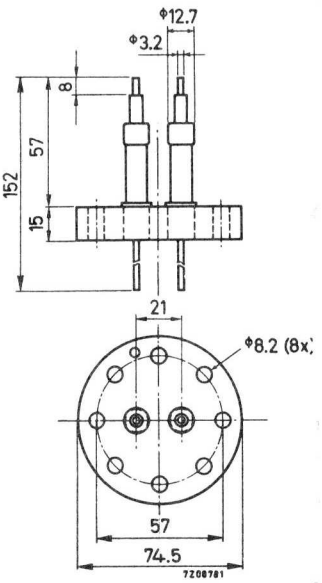


Fig. 13

FLANGES

Ultra-high vacuum flanges designed for use with gold wire seals.

The range comprises the following types:

VMF-18 to VMF-150	plain flanges
VMF-18B to VMF-150B	blanking flanges
VMF-18K to VMF-100K	flanges with Kodial glass tubulation
VMF-18P to VMF-100P	flanges with Pyrex glass tubulation
VMF-18S to VMF-100S	flanges with stainless steel tubulation

The flanges are manufactured from low vapour pressure metal to ensure minimum contamination and will not be affected by contaminations often met in high vacuum systems, such as silicone grease, molybdenum disulphide, diffusion pump oils and mercury vapours.

The plain flanges are provided with a recess in the seal face, so a tubulation can be welded to the flange without affecting the seal face.

CHARACTERISTICS

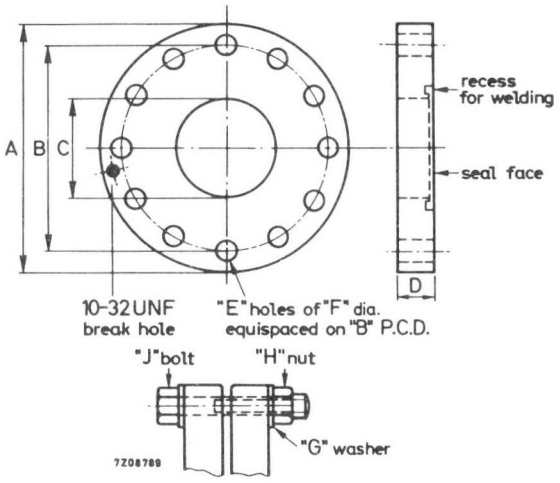
Material	flanges		stainless steel to EN58, forged plate
	tubulation	"K" series	Kodial glass
		"P" series	Pyrex glass
		"S" series	stainless steel to EN58
Dimensions		see pages 2 and 3	

ASSOCIATED COMPONENTS

Gold wire seals	VMS-18 to VMS-150
Set of bolts, nuts, washers and studding	
for VMF-18 series	V-1018
VMF-25, VMF-38 and VMF-51 series	V-1019
VMF-75 and VMF-100 series	V-1020
VMF-125 and VMF-150 series	V-1021

FLANGES

Dimensions in mm unless otherwise stated.

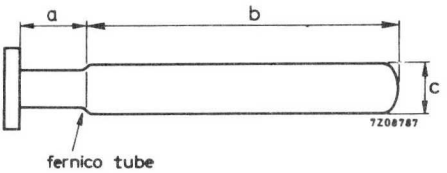


Type Number	Dimension								
	A	B	C	D	E No. off	F dia.	G	H BSF	J BSF H/HD
VMF-18	50.5	37.0	18.81	12.8	5	6.6	1/4"	1/4"	1/4" x 1 1/4"
VMF-38	100.5	82.5	40.81	15.2	12	8.2	5/16"	5/16"	5/16" x 1 1/2"
VMF-51	100.5	82.5	50.51	15.2	12	8.2	5/16"	5/16"	5/16" x 1 1/2"
VMF-75	125.5	106.5	75.51	20.2	12	9.7	3/8"	3/8"	3/8" x 2"
VMF-100	152.5	133.5	99.01	20.2	16	9.7	3/8"	3/8"	3/8" x 2"
VMF-125	185.0	165.0	123.02	25.2	20	9.7	3/8"	3/8"	3/8" x 2 1/2"
VMF-150	227.5	208.0	150.62	25.2	24	9.7	3/8"	3/8"	3/8" x 2 1/2"

BLANKING FLANGES

Dimensions as "Flanges" but without hole C.

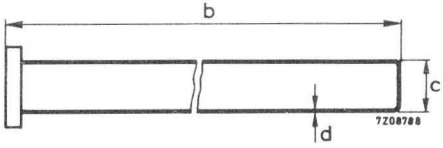
FLANGES WITH GLASS TUBULATION



Type Number		Internal Diameter nom. (mm)	Dimension		
Kodial Glass	Pyrex Glass		a	b	c
VMF-18K	VMF-18P	18	28	100	20 to 22.5
VMF-25K	VMF-25P	25	51	100	28 to 30
VMF-38K	VMF-38P	38	55	110	40 to 42
VMF-51K	VMF-51P	48	50	130	50 to 55
VMF-75K	VMF-75P	70	60	135	75 to 80
VMF-100K	VMF-100P	96	75	135	100 to 108

For dimensions of the flange see under "FLANGES"

FLANGES WITH STAINLESS STEEL TUBULATION



Type Number	Internal Diameter nom.	Dimension		
		b	c	d
VMF-18S	16	250	19.1	1.6
VMF-25S	25	250	28.6	1.6
VMF-38S	38	250	41.3	1.6
VMF-51S	48	250	50.8	1.6
VMF-75S	70	300	76.2	3.2
VMF-100S	96	350	101.6	3.2

For dimensions of the flange see under "FLANGES"

GOLD WIRE SEALS

Gold wire seals for ultra-high vacuum systems.

The range comprises the following types:

VMS-... series	0.5 mm gold wire seals with stainless steel spider
VMS-...R series	0.5 mm gold wire seals without spider

The stainless steel spider gives both correct location in the flange and the correct compression needed for a positive seal eliminating compression gauging or torque measurement.

Type number	Flange port size (approx.)	For flange type number
VMS-18	19 mm 0.75 in	VMF-18
VMS-25	25 mm 1 in	VMF-25
VMS-51	38 mm 1.5 in	VMF-38
	and	
	51 mm 2 in	VMF-51
VMS-75	76 mm 3 in	VMF-75
VMS-100	100 mm 4 in	VMF-100
VMS-150	150 mm 6 in	VMF-150

Apparatus

PIRANI/IONIZATION GAUGE CONTROL UNIT

In combination with the gauge head type IOG-15 the unit constitutes a combined Pirani/Ionization manometer with an overall measuring range of 1 torr to 10^{-10} torr. Used with a plain ionization gauge head the unit constitutes an ionization manometer enabling pressure measurements down to 5×10^{-11} torr. Suitable heads are, for example, the types IOG-12, IOG-13, IOG-13 NF, IOG-17 and the gauge section of the evaporation ion pump type EIP-12; with these heads the measuring range is 10^{-3} to 10^{-10} torr.

The filament supply voltage for the Pirani gauge is kept constant over the measuring range the temperature thus the resistance varying with pressure.
The pressure is read directly in torr from the meter.

The ionization section provides three stabilized emission currents, viz. 100 μA, 1 mA, and 10 mA.
The pressure measuring range is automatically switched to suit the selected emission current.
The measuring range is shown by numerical indicator tubes.
The filament of the ionization gauge can be operated only below a pressure of 10^{-3} torr; moreover the filament supply will be interrupted if the pressure rises by 50% above the range set.
A spare contact of the protecting relay is brought out.

A facility for outgassing the gauge head is provided.
In addition a zero suppress control is incorporated in order that the unit may be used as a leak detector.

The unit is suitable for rack mounting.

CHARACTERISTICS

Pressure range		
with gauge head type IOG-15		
Pirani section	1 to 10^{-4}	torr
Ionization section	10^{-3} to 10^{-10}	torr
with gauge head type IOG-12, IOG-13, IOG-13NF or IOG-17		
Ionization section only	10^{-3} to 10^{-10}	torr
Stabilization time when switching from one range to another	250	ms
Measuring conditions		
Pirani section		
Filament supply voltage	1.66	Vdc
Ionization section		
Collector voltage	-9	V
Cathode voltage	54	V
Grid voltage	166	V
Emission current, stabilized	100	μA
	1	mA
	10	mA
Amplifier is adjustable to a gauge sensitivity of 8 to 20 $torr^{-1}$		
Outgassing conditions		
Filament voltage	0 to 9	V
Power	max. 45	W
Grid, collector and Pirani voltage	550	V
Auxiliary output terminal	0 to 10	mV
Dimensions (h x w x d)	132 x 482 x 203	mm

ASSOCIATED COMPONENTS

Pirani/Ionization gauge head	IOG-15
Ionization gauge head	IOG-12, IOG-13, IOG-13NF, IOG-17

IONIZATION GAUGE CONTROL UNIT

In combination with a gauge head this unit constitutes an ionization manometer. Its switching facilities are such that it can operate both plain gauge heads and those provided with a modulator electrode.

Gauge heads with a modulator electrode, such as the IOG-20N and IOG-20NF, provide a measuring range from 10^{-3} torr to 10^{-12} torr. Used with plain gauge heads, for example the IOG-18 and IOG-19 series, the unit's measuring range is limited at the lower end by the X-ray limit of the gauge head (4×10^{-11} torr for the IOG-18 and IOG-19).

Three stabilized emission currents, 100 μA, 1 mA and 10 mA are supplied by the gauge control unit, depending on the position of a selector switch on the front panel. A toggle switch permits direct reading of the selected current on the pressure indicating meter.

The pressure measuring range is automatically switched to suit the selected emission current.

The measuring range is shown by numerical indicator tubes.

The filament supply will be interrupted if the pressure rises by 50% above the range set. A spare contact of the protecting relay is brought out.

A facility for outgassing the gauge head is provided. The outgassing current, which is continuously variable, is indicated on the meter. In addition a zero suppress control is incorporated in order that the unit may be used as a leak detector.

The unit is suitable for rack mounting.

CHARACTERISTICS

Pressure range		
with gauge head IOG-20N or IOG-20NF	10^{-3} to 10^{-12}	torr
with a gauge head out of the IOG-18 or IOG-19 series	10^{-3} to $4x10^{-11}$	torr
Stabilization time when switching from one range to another	250	ms
Measuring conditions		
Collector voltage	-9	V
Cathode voltage	+54	V
Grid voltage	+166	V
Modulator electrode voltage	0 or +166	V
Emission current	100	μA
	1	mA
	10	mA
Amplifier adjustable to a gauge sensitivity of	8 to 21	$torr^{-1}$
Outgassing conditions		
Filament voltage	0 to 9	V
Power	max. 55	W
Grid, collector and modulator electrode	550	V
Auxiliary output terminal	0 to 10	mV
Dimensions (h x w x d)	132 x 482 x 203	mm

ASSOCIATED COMPONENTS

Ionization gauge head	IOG-18 series
	IOG-19 series
	IOG-20 series

WIDE RANGE PENNING GAUGE CONTROL UNIT

In combination with the appropriate gauge heads the unit constitutes a Penning manometer with an overall measuring range of 10^{-1} torr to 10^{-7} torr, subdivided into three subranges.

To cover the measuring range mentioned, two gauge heads have to be applied, viz. a standard Penning gauge head (for example type CIG-22, CIG-75 or CIG-77) and an extra sensitive Penning gauge head (for example type CIG-82 or CIG-84).

Besides a μA-meter a glow-discharge column indicator is provided for a rough indication of the pressure.
The meter circuit can be short-circuited to prevent overloading at pressures above the measuring range.

The unit is mounted in a bench cabinet.

CHARACTERISTICS

Pressure range (appropriate gauge heads being used)	10^{-1} to 10^{-7}	torr
Selector switch at position "1000"	10^{-1} to 5.10^{-3}	torr
Selector switch at position "2000"	2.10^{-3} to 10^{-5}	torr
Selector switch at position "2000G"	10^{-4} to 10^{-7}	torr
Measuring conditions		
Anode voltage,		
selector switch at position "1000"	1000	V
selector switch at positions "2000" and "2000G"	2000	V
Mains voltage (40 to 60 Hz)	110 or 220	V
Dimensions (h x w x d)	240 x 360 x 180	mm
Weight	approx. 8	kg

ASSOCIATED COMPONENTS

Penning gauge head	CIG-22, CIG-75 or CIG-77
Extra sensitive Penning gauge head	CIG-82 or CIG-84

PENNING GAUGE CONTROL UNIT

In combination with an appropriate gauge head the unit constitutes a Penning manometer with a measuring range of 10^{-1} torr to 10^{-5} torr.
The unit is designed for the application of a standard Penning gauge head (for example type CIG-22, CIG-75 or CIG-77).

Besides a μA-meter, giving a direct reading of the pressure in torr, a glow-discharge column indicator is provided for a rough indication of the pressure.
The meter circuit can be short-circuited to prevent overloading at pressures above the measuring range.

The unit is mounted in a bench cabinet.

CHARACTERISTICS

Pressure range (appropriate gauge head being used)	10^{-1} to 10^{-5} torr
Selector switch at position " x 10 "	10^{-1} to 5.10^{-3} torr
Selector switch in position " x 1 "	2.10^{-3} to 10^{-5} torr
Measuring conditions	
Anode voltage	
selector switch at position " x 10 "	1000 V
selector switch at position " x 1 "	2000 V
Mains voltage (40 to 60 Hz)	110 or 220 V
Dimensions (h x w x d)	230 x 230 x 140 mm
Weight	approx. 5 kg

ASSOCIATED COMPONENTS

Penning gauge head	CIG-22, CIG-75 or CIG-77

PIRANI/CONVECTION GAUGE CONTROL UNIT

In combination with the appropriate gauge head the unit constitutes a high vacuum manometer with a measuring range of 760 torr to 2 x 10^{-4} torr.
The resistance of the filament is kept constant over the measuring range by the unit, the filament supply power varying with pressure. To this end the gauge filament is taken up in a Wheatstone bridge, the filament supply power being controlled to that level at which the resistance of the filament brings the bridge in equilibrium.
The pressure can be read direct from the meter in torr, the corresponding scale being calibrated for dry air. It may also be derived by means of a calibration curve, five voltage measuring ranges being available, viz. 20, 5, 2, 0.5 and 0.2 volts.

The unit can serve two Pirani gauge heads type PIG-1.
For both inputs separate calibrations are provided on the front panel; selection is by means of a switch also situated on the front panel.

A facility for outgassing the filament of the gauge head is provided.

The unit is mounted is a bench cabinet; appropriate cables are supplied with the unit.

CHARACTERISTICS

Pressure range, when used with gauge head PIG-1		760 to 2 x 10^{-4}		torr
Output voltages:				
Filament supply voltage	approx.	1 to	20	$V_{d.c.}$
Recorder output (source resistance 50 Ω)		0 to	10	mV
Bridge equilibrium resistance				
during measuring	approx.		45	Ω
during outgassing	approx.		65	Ω
Mains voltage (40 Hz to 60 Hz)			220	V ±10%
Dimensions (h x w x d)		240 x 230 x 180		mm
Weight	approx.		5.5	kg

ASSOCIATED COMPONENTS

Pirani gauge head	PIG-1

THERMO-COUPLE GAUGE CONTROL UNIT

In combination with the appropriate gauge head type TH-1/00 the unit constitutes a thermo-couple manometer with an overall measuring range of 1 torr to 10^{-2} torr.

The unit is mounted in a bench cabinet.

CHARACTERISTICS

Pressure range	1 to 10^{-2}	torr
Measuring conditions		
Filament supply voltage	approx. 0.8 to 1	V_{ac}
Mains voltage (40 to 60 Hz)	220	V
Dimensions (h x w x d)	225 x 158 x 140	mm
Weight	approx. 5	kg

POWER SUPPLY

Power supply designed for operation of the sputter ion pump type VKP-1.

The unit incorporates an overload protection circuit, which if the pressure in the pump rises above 10^{-4} torr either switches off the high tension supply to the pump (position "Protect" of the selector switch) or gives an alarm signal only, the high tension supply remaining on (position "Alarm" of the selector switch).

The circuit moreover operates a relay, the contacts of which are brought out for external functions.

The power supply has facilities for pressure measurements in the range 10^{-4} torr to 10^{-7} torr and is provided with a recorder output.

The unit is housed in a metal cabinet for rack mounting.

CHARACTERISTICS

D.C. output voltage at open circuit	4.9	kV
Pressure measuring range (logaritmic scale)	10^{-4} to 10^{-7}	torr
Recorder output voltage	0 to 10	mV
Trip-relay contact ratings	2 A, 250	V
Mains voltage (50 Hz)	Mains transformer provided with tappings	
Line current (at 220 V)	max. 3	A
Dimensions (h x w x d)	222 x 482 x 201	mm
Net weight	14.5	kg

LIMITING VALUES

Ambient temperature h.t. lead	max. 250	°C

SPARE PARTS

High tension lead	V-1000

POWER SUPPLY

Power supply designed for operation of the sputter ion pump type VKP-8.

The unit incorporates an overload protection circuit, which if the pressure in the pump rises above 10^{-4} torr either switches off the high tension supply to the pump (position "Protect" of the selector switch) or gives an alarm signal only, the high tension supply remaining on (position "Alarm" of the selector switch).

The circuit moreover operates a relay, the contacts of which are brought out for external functions.

The power supply has facilities for pressure measurements in the range 10^{-4} torr to 10^{-8} torr and is provided with a recorder output.

The unit is housed in a metal cabinet for rack mounting.

CHARACTERISTICS

D.C. output voltage at open circuit	4.9	kV
Pressure measuring range (logaritmic scale)	10^{-4} to 10^{-8}	torr
Recorder output voltage	0 to 10	mV
Trip-relay contact ratings	2 A, 250	V
Mains voltage (50 Hz)	Mains transformer provided with tappings	
Line current (at 220 V)	max. 3	A
Dimensions (h x w x d)	222 x 482 x 201	mm
Net weight	21	kg

LIMITING VALUES

Ambient temperature h.t. lead	max. 250	°C

SPARE PARTS

High tension lead	V-1000

POWER SUPPLY

Power supply designed for operation of the sputter ion pump type VKP-15.

The unit incorporates an overload protection circuit, which if the pressure in the pump rises above 10^{-4} torr either switches off the high tension supply to the pump (position "Protect" of the selector switch) or gives an alarm signal only, the high tension supply remaining on (position "Alarm" of the selector switch).

The circuit moreover operates a relay, the contacts of which are brought out for external functions.

The power supply has facilities for pressure measurements in the range 10^{-4} torr to 10^{-8} torr and is provided with a recorder output.

The unit is housed in a metal cabinet for rack mounting.

CHARACTERISTICS

D.C. output voltage at open circuit	4.9	kV
Pressure measuring range (logaritmic scale)	10^{-4} to 10^{-8}	torr
Recorder output voltage	0 to 10	mV
Trip-relay contact ratings	2 A, 250	V
Mains voltage (50 Hz)	Mains transformer provided with tappings	
Line current (at 220 V)	max. 5	A
Dimensions (h x w x d)	222 x 482 x 201	mm
Net weight	24.5	kg

LIMITING VALUES

Ambient temperature h.t. lead	max. 250	^{o}C

SPARE PARTS

High tension lead	V-1000

POWER SUPPLY

Power supply designed for operation of the sputter ion pump type VKP-50.

The unit incorporates an overload protection circuit, which if the pressure in the pump rises above 10^{-4} torr either switches off the high tension supply to the pump (position "Protect" of the selector switch) or gives an alarm signal only, the high tension supply remaining on (position "Alarm" of the selector switch).

The circuit moreover operates a relay, the contacts of which are brought out for external functions.

The power supply has facilities for pressure measurements in the range 10^{-4} torr to 5×10^{-9} torr and is provided with a recorder output.

The unit is housed un a metal cabinet for rack mounting.

CHARACTERISTICS

D.C. output voltage at open circuit	4.9	kV
Pressure measuring range (logaritmic scale)	10^{-4} to 5×10^{-9}	torr
Recorder output voltage	0 to 10	mV
Trip-relay contact ratings	2 A, 250	V
Mains voltage (50 Hz)	Mains transformer provided with tappings.	
Line current (at 220 V)	max. 5	A
Dimensions (h x w x d)	222 x 482 x 201	mm
Net weight	24.5	kg

LIMITING VALUES

Ambient temperature h.t. lead	max. 250	°C

SPARE PARTS

High tension lead	V-1000

POWER SUPPLY

Power supply designed for operation of the sputter ion pump type VKP-100.

The unit incorporates an overload protection circuit, which if the pressure in the pump rises above 10^{-4} torr either switches off the high tension supply to the pump (position "Protect" of the selector switch) or gives an alarm signal only, the high tension supply remaining on (position "Alarm" of the selector switch).

The circuit moreover operates a relay, the contacts of which are brought out for external functions.

The power supply has facilities for pressure measurements in the range 10^{-4} torr to 2×10^{-9} torr and is provided with a recorder output.

The unit is housed in a metal cabinet for rack mounting.

CHARACTERISTICS

D.C. output voltage at open circuit	4.9	kV
Pressure measuring range (logaritmic scale)	10^{-4} to 2×10^{-9}	torr
Recorder output voltage	0 to 10	mV
Trip-relay contact ratings	2 A, 250	V
Mains voltage (50 Hz)	Mains transformer provided with tappings	
Line current (at 220 V)	max. 13	A
Dimensions (h x w x d)	267 x 482 x 306	mm
Net weight	50	kg

LIMITING VALUES

Ambient temperature h.t. lead	max. 250	°C

SPARE PARTS

High tension lead	V-1000

POWER SUPPLY

Power supply designed for operation of the sputter ion pump type VKP-150.

The unit incorporates an overload protection circuit, which if the pressure in the pump rises above 10^{-4} torr either switches off the high tension supply to the pump (position "Protect" of the selector switch) or gives an alarm signal only, the high tension supply remaining on (position "Alarm" of the selector switch).

The circuit moreover operates a relay, the contacts of which are brought out for external functions.

The power supply has facilities for pressure measurements in the range 10^{-4} torr to 10^{-9} torr and is provided with a recorder output.

The unit is housed in a metal cabinet for rack mounting.

CHARACTERISTICS

D.C. output voltage at open circuit	4.9	kV
Pressure measuring range (logaritmic scale)	10^{-4} to 10^{-9}	torr
Recorder output voltage	0 to 10	mV
Trip-relay contact ratings	2 A, 250	V
Mains voltage (50 Hz)	Mains transformer provided with tappings	
Line current (at 220 V)	max. 13	A
Dimensions (h x w x d)	267 x 482 x 306	mm
Net weight	50	kg

LIMITING VALUES

Ambient temperature h.t. lead	max. 250	°C

SPARE PARTS

High tension lead	V-1000

POWER SUPPLY

Power supply designed for operation of the sputter ion pump type VKP-200.

The unit incorporates an overload protection circuit, which if the pressure in the pump rises above 10^{-4} torr either switches off the high tension supply to the pump (position "Protect" of the selector switch) or gives an alarm signal only, the high tension supply remaining on (position "Alarm" of the selector switch).

The circuit moreover operates a relay, the contacts of which are brought out for external functions.

The power supply has facilities for pressure measurements in the range 10^{-4} torr to 10^{-9} torr and is provided with a recorder output.

The unit is housed in a metal cabinet for rack mounting.

CHARACTERISTICS

D.C. output voltage at open circuit	4.9	kV
Pressure measuring range (logaritmic scale)	10^{-4} to 10^{-9}	torr
Recorder output voltage	0 to 10	mV
Trip-relay contact ratings	2 A, 250	V
Mains voltage (50 Hz)	Mains transformer provided with tappings	
Line current (at 220 V)	max. 13	A
Dimensions (h x w x d)	267 x 482 x 306	mm
Net weight	50	kg

LIMITING VALUES

Ambient temperature	max. 250	°C

SPARE PARTS

High tension lead	V-1000

POWER SUPPLY

Power supply designed for operation of the sputter ion pump type VKP-400.

The unit incorporates an overload protection circuit, which if the pressure in the pump rises above 10^{-4} torr either switches off the high tension supply to the pump (position "Protect" of the selector switch) or gives an alarm signal only, the high tension supply remaining on (position "Alarm" of the selector switch).

The circuit moreover operates a relay, the contacts of which are brought out for external functions.

The power supply has facilities for pressure measurements in the range 10^{-4} torr to 10^{-9} torr and is provided with a recorder output.

The unit is housed in a metal cabinet for rack mounting.

CHARACTERISTICS

D.C. output voltage at open circuit	4.9	kV
Pressure measuring range (logaritmic scale)	10^{-4} to 10^{-9}	torr
Recorder output voltage	0 to 10	mV
Trip-relay contact ratings	2 A, 250	V
Mains voltage (50 Hz)	Mains transformer provided with tappings	
Line current (at 220 V)	max. 28	A
Dimensions (h x w x d)	267 x 482 x 482	mm
Net weight	72	kg

LIMITING VALUES

Ambient temperature h.t. lead	max. 250	°C

SPARE PARTS

High tension lead	V-1000

POWER SUPPLY

Power supply designed for operation of the sputter ion pump type VKP-500.

The unit incorporates an overload protection circuit, which if the pressure in the pump rises above 10^{-4} torr either switches off the high tension supply to the pump (position "Protect" of the selector switch) or gives an alarm signal only, the high tension supply remaining on (position "Alarm" of the selector switch).

The circuit moreover operates a relay, the contacts of which are brought out for external functions.

The power supply has facilities for pressure measurements in the range 10^{-4} torr to 10^{-9} torr and is provided with a recorder output.

The unit is housed in a metal cabinet for rack mounting.

CHARACTERISTICS

D.C. output voltage at open circuit	4.9	kV
Pressure measuring range (logaritmic scale)	10^{-4} to 10^{-9}	torr
Recorder output voltage	0 to 10	mV
Trip-relay contact ratings	2 A, 250	V
Mains voltage (50 Hz)	Mains transformer provided with tappings	
Line current (at 220 V)	max. 28	A
Dimensions (h x w x d)	267 x 482 x 482	mm
Net weight	72	kg

LIMITING VALUES

Ambient temperature h.t. lead	max. 250	^{o}C

SPARE PARTS

High tension lead	V-1000

POWER SUPPLY

Power supply designed for operation of the sputter ion pump type VKP-1000.

The unit incorporates an overload protection circuit, which if the pressure in the pump rises above 10^{-4} torr either switches off the high tension supply to the pump position "Protect" of the selector switch) or gives an alarm signal only, the high tension supply remaining on (position "Alarm" of the selector switch).

The circuit moreover operates a relay, the contacts of which are brought out for external functions.

The power supply has facilities for pressure measurements in the range 10^{-4} torr to 10^{-9} torr and is provided with a recorder output.

The unit is housed in a metal cabinet for rack mounting.

CHARACTERISTICS

D.C. output voltage at open circuit	4.9	kV
Pressure measuring range (logaritmic scale)	10^{-4} to 10^{-9}	torr
Recorder output voltage	0 to 10	mV
Trip-relay contact ratings	2 A, 250	V
Mains voltage (50 Hz)	Mains transformer provided with tappings	
Line current (at 220 V)	max. 28	A
Dimensions (h x w x d)	267 x 482 x 482	kg
Net weight	72	kg

LIMITING VALUES

Ambient temperature h.t. lead	max. 250	°C

SPARE PARTS

High tension lead	V-1000

LEAK DETECTOR, MASS SPECTROMETER TYPE

Automatic, helium mass spectrometer leak detector for use in continuous process control, batch analysis or precision laboratory measurements. Minimum detectable leak is 10^{-14} atmospheric litres of helium per second.

The leak detection is carried out by a 180^{o} mass spectrometer.
The size of the leak is indicated on a separately housed meter, allowing the meter to be placed in the most convenient position. On special order, an acoustical signal unit can be provided.

In order to ensure that the correct mass number is detected, that is to say that a maximum output signal is obtained, the mass peak can be scanned. The mass spectrometer head is fabricated of stainless steel and is readily accessible for demounting at, for instance, periodic cleaning. The filament of the head is protected against operation above a pressure of 3×10^{-4} torr by the built-in Penning manometer.

The component under test is evacuated automatically in two stages: to approximately 2×10^{-2} torr by a two-stage rotary pump of 150 litres/min; from approximately 2×10^{-2} torr onwards by either an air-cooled, three-stage, oil diffusion pump of 60 litres/s (for type LD-3), or a water-cooled, three-stage, oil diffusion pump of 50 litres/s (for type LD-3NL), both backed by a second rotary pump of 35 litres/min. For reducing the back diffusion of oil vapour, a liquid nitrogen cooler is provided.

The apparatus comprises two test ports, one on the top of the unit and one at the side. The ports are fitted with Viton-sealed flanges and the top port is fitted with a flanged, quick-fit 25 mm connector as standard.

The operation of the apparatus within the automatic operation mode is controlled by means of a three-position switch, having the following positions:"Stand-by", "Test" and "Vent".
Alternatively complete manual operation can be selected.

The apparatus is provided with a worktable top to accommodate the components to be tested or to position auxiliary instruments.

CHARACTERISTICS

Detectable leak	min. 10^{-14}	atm. l/s of helium
Leak indication	uncalibrated meter	1)
Mass spectrometer head		
Accelerator voltage	0 to 100	$V_{d.c.}$
Ionizing current	0 to 1.0	mA
Amplifier range factors	1, 3, 10, 100, 300 and 1000	
Zero drift	< 1.0	% per hour
Measuring system		
Pirani manometer, measuring range	1 atm to 10^{-3}	torr
Penning manometer, measuring range	$5x10^{-3}$ to 10^{-5}	torr
Pumping systems		
For type LD-3	two-stage, rotary, oil-sealed, roughing pump of 150 l/min air-cooled, three-stage, oil-diffusion pump of 60 l/s double-stage, rotary, oil-sealed, backing pump of 35 l/min	
For type LD-3NL	two-stage, rotary, oil-sealed, roughing pump of 150 l/min water-cooled, three-stage, oil-diffusion pump of 50 l/s double-stage, rotary, oil-sealed, backing pump of 35 l/min	
Mains supply (50 Hz)	200 to 250	V, max. 13 A

MECHANICAL DATA

Dimensions of worktable	580 x 680	mm
Height	990	mm
Weight	210	kg

ASSOCIATED COMPONENTS

Calibrated leak	V-1030
Acoustical signal unit	V-1043
Helium needle probe	V-1045
Helium sniffer kit	V-1046

SPARE PARTS

Set of 3 filaments for mass spectrometer head	V-1029

1) An acoustical signal unit can be provided on special order; see under "ASSOCIATED COMPONENTS".

LEAK DETECTOR, MASS SPECTROMETER TYPE

Mobile, helium mass spectrometer leak detector for batch analysis and precision laboratory testing. Minimum dectectable leak is 10^{-14} atmospheric litres of helium per second.

The leak detection is carried out by a 180° mass spectrometer. The size of the leak is indicated on a separately housed meter, allowing the meter to be placed in the most convenient position. On special order, an acoustical signal unit can be provided. The mass spectrometer head is fabricated of stainless steel and is readily accessible for demounting at, for instance, periodic cleaning. The filament of the head is protected against operation above a pressure of 3×10^{-4} torr by the built-in Penning manometer.

For evacuating the component under test and the mass spectrometer head, type LD-4 comprises an oil diffusion pump of 60 litres/s and a rotary pump of 35 litres/min. With type LD-4/150 the pre-evacuation of the test piece is carried out by an additional rotary pump of 150 litres/min.
For reducing the back diffusion of oil vapour, a liquid nitrogen cooler is provided in both types.

The apparatus is provided with a worktable top to accommodate the components to be tested or to position auxiliary instruments.

CHARACTERISTICS

Detectable leak	min. 10^{-14} atm. l/s of helium	
Leak indication	uncalibrated meter [1]	
Mass spectrometer head		
Accelerator voltage	0 to 100	$V_{d.c.}$
Ionizing current	0 to 1.0	mA
Amplifier range factors	1, 3, 10, 100, 300 and 1000	
Zero drift	< 1.0	% per hour

[1]) An acoustical signal unit can be provided on special order; see under "ASSOCIATED COMPONENTS".

Measuring system		
For type LD-4		
Penning manometer, measuring range	5×10^{-3} to 10^{-5}	torr
For type LD-4/150		
Pirani manometer, measuring range	1 atm to 10^{-3}	torr
Penning manometer, measuring range	5×10^{-3} to 10^{-5}	torr

Pumping system	
For type LD-4	air-cooled, three-stage, oil diffusion pump of 60 l/s
	double-stage, rotary, oil-sealed, backing pump of 35 l/min
For type LD-4/150	two-stage, rotary, oil-sealed, roughing pump of 150 l/min
	air-cooled, three-stage, oil diffusion pump of 60 l/s
	double-stage, rotary, oil-sealed, backing pump of 35 l/min

Mains supply (50 Hz)	200	to 250	V
	max.	13	A

MECHANICAL DATA

Dimensions (h x w x d)	865 x 815 x 560	mm
Weight	132	kg

ASSOCIATED COMPONENTS

Calibrated leak	V-1030
Acoustical signal unit	V-1043
Helium needle probe	V-1045
Helium sniffer kit	V-1046

SPARE PARTS

Set of 3 filaments for mass spectrometer head	V-1029

LEAK DETECTOR, ION-PUMP TYPE

Portable ion-pump type leak detector; minimum detectable leak 10^{-14} atmospheric litres per second.

The leak detector senses the small change of ion pump current when the air passing through a leak in a vacuum system is replaced by a search gas, such as helium, argon or oxygen. In order to obtain a sufficiently large and stable reading, the applied voltage is stabilized and the pump current is "backed off".

The pump current changes are displayed on a centre zero meter. This meter permits the use of search gases which either raise or lower the pump current, thus increasing the speed and accuracy of measuring (twin-gas probe operation).

A 16 stage increase/decrease sensitivity switch and a recorder output are provided.

The unit can accept voltages between 3 kV and 8 kV, positive as well as negative to earth.

The apparatus is mounted in a bench cabinet.

CHARACTERISTICS

Detectable leak	min.	10^{-14}	atm l/s
Working range high-tension supply voltage		3 to 8	kV
Recorder output		0 to 10	mV

LIMITING VALUES

High-tension supply voltage	max.	8	kV
High-tension supply current	max.	1	mA
Ambient temperature, during operation	max.	45	°C

MECHANICAL DATA

Dimensions (h x w x d)	191 x 318 x 203	mm
Weight	3	kg

LIQUID NITROGEN REPLENISHER

The liquid nitrogen replenisher is designed to control the level of liquid nitrogen in vapour traps. It consists of a heat-operated liquid-gas pumping system controlled by a level sensing thermistor circuit.

DESCRIPTION

The system consists of a sensor head, a transfer head and a control unit.

Sensor head

The sensor head comprises two thermistor sensors; either one or both can be used in the control action.
If one sensor is applied, a signal is provided to the control unit when the liquid nitrogen level falls below the sensor, the signal disappearing when the level again comes above the sensor.
With this method of operation adopted the level is kept within 1 mm.

Another method of operation, which is more economical as to the liquid nitrogen consumption, is obtained by putting both sensors into use. With this method a signal is provided to the control unit when the nitrogen level falls below the lowest sensor, the signal disappearing when the level has reached the highest sensor.
With this method of operation the level fluctuates over 50 mm.

Transfer head

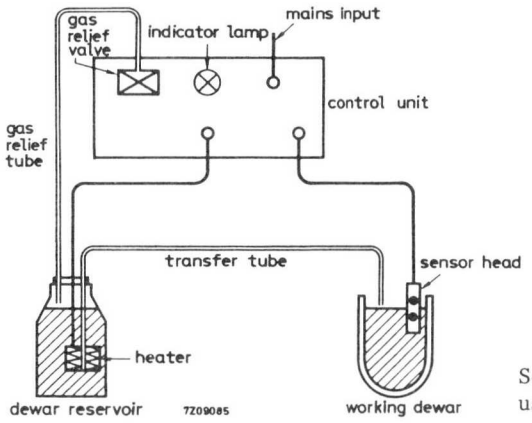
The unit is comprised of a cap to fit the liquid nitrogen reservoir, a transfer tube with a heater attached and a gas relief tube connection. When the sensor head provides a signal indicating that the level is low, the heater in the liquid nitrogen reservoir is switched on and a valve in the gas relief tube is closed. This valve is incorporated in the control unit. The resultant build-up of pressure causes the transfer of liquid nitrogen.
When the level has risen sufficiently, the heater is switched off and the gas valve is opened; the transfer thus ceases.
The transfer head should be ordered separately (see page 3).

DESCRIPTION (continued)

Control unit

This unit supplies the power necessary for the heater within the transfer head and comprises the gas valve and the circuitry allowing either one or two sensors to control the level of the liquid nitrogen. Moreover it comprises an alarm circuit, which supervises the liquid nitrogen level in the reservoir. When the reservoir is nearly empty an indicating lamp in the control unit starts flashing.
The gas relief tube to be connected to the transfer head is delivered with the unit.

Mains supply: 200 to 250 V a.c.; 1 A.



Set up of a system using the VC-601

DIMENSIONS

Control unit	152 mm wide, 102 mm high, 114		mm deep
Length of heater lead	approx.	1.8	m
Length of sensor head lead	approx.	1.8	m
Length of gas tube	approx.	1.8	m
Length of transfer tube	approx.	1.8	m [1]

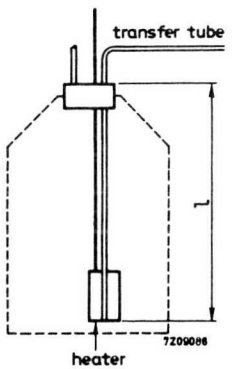
[1] If required, greater lengths can be applied; however, the length should not exceed 3 m.

TRANSFER HEADS (to be ordered separately)

The following type numbers are for the transfer tube, heater and dewar reservoir adaptor to suit particular dewar reservoirs.

Type number	Max. length ℓ of transfer tube from top of fitting (see drawing)	Fitting for dewar reservoir
V-1024	670 mm	1" Withworth
V-1025	510 mm	2" stopper
V-1026	510 mm	$1\frac{11}{16}$" stopper
V-1027	485 mm	$1\frac{1}{2}$" stopper
V-1028	865 mm	$1\frac{1}{2}$" Withworth

Outside diameter of transfer pipe	7.0 mm
Diameter of heater	max. 12.7 mm



SPARE PARTS

Heater	V-1035
Sensor head	V-1036

SOME GENERAL DATA ON TYPES OF GLASS

	Type of glass	Description	Specific gravity	Expansion coefficient (cn /°C)	Annealing temperature (°C)	To be fused with
soft glass	01	lead glass	3.05	92×10^{-7}	400 to 426	01 and 156 glass
	156	lime glass	2.55	102×10^{-7}	480 to 505	156 and 01 glass
hard glass	Kodial, G28	borosilicate glass	2.25	48×10^{-7}	468 to 496	Kodial and G28 glass
	W1, B37	borosilicate glass	2.25	37×10^{-7}	525 to 550	W1, B37 and Pyrex glass
	Pyrex	borosilicate glass	2.2	32×10^{-7}	520 to 555	Pyrex, W1 and B37 glass

INDEX OF TYPE NUMBERS

Type No.	Section
CIG-22	G
CIG-75	G
CIG-76	G
CIG-77	G
CIG-82	G
CIG-83	G
CIG-84	G
EIP-12	P
GCU-1	A
GCU-2	A
GCU-11	A
GCU-12	A
GCU-13	A
GCU-14	A
IOG-12	G
IOG-13	G
IOG-13NF	G
IOG-15	G
IOG-17	G
IOG-18	G
IOG-18N	G
IOG-18NF	G
IOG-19	G
IOG-19N	G
IOG-19NF	G
IOG-20N	G
IOG-20NF	G
IOG-71	G
KPS-1	A

Type No.	Section
KPS-8	A
KPS-15	A
KPS-50	A
KPS-100	A
KPS-150	A
KPS-200	A
KPS-400	A
KPS-500	A
KPS-1000	A
LD-3	A
LD-3NL	A
LD-4	A
LD-4/150	A
LD-5	A
PIG-1	G
TH-1/100	G
VAP-12	P
VAP-40	P
VC-300 to 344	F
VC-350 to 354	F
VC-601	A
VC-707	F
VC-712	F
VC-721 to 734	F
VKP-1	P
VKP-1F	P
VKP-1K	P
VKP-1P	P
VKP-8	P
VKP-15	P

Type No.	Section
VKP-50	P
VKP-100	P
VKP-150	P
VKP-200	P
VKP-400	P
VKP-500	P
VKP-1000	P
VMF-18 to 150	F
VMS-18 to 150	F
VT-25	T
VT-25F	T
VTB-6	T
VTB-6K	T
VTB-6P	T
VTB-18	T
VTB-18F	T
VTB-18K	T
VTB-18P	T
VTB-25	T
VTB-25F	T
VTB-25K	T
VTB-25P	T
56163	P
56164	P
56165	P
56500	P
56501	P
56502	P
56503	P
56520	P

Type No.	Section
56521	P
56522	P
56523	P
56530	P
56531	P
56532	P
56533	P
56540	T
56541	T
56542	T
56543	T
56610	T
56611	T
56612	T
56613	T
56614	T
56615	T
56616	T
56617	T

A = Apparatus
F = Fittings
G = Gauge heads
P = Pumps
T = Taps

Pumps

Gauge Heads

Taps

Fittings

Apparatus

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