C411-02-885
Issue G

Instruction Manual
Betriebsanleitung
Mode d'emploi

PVEK Valves
PVEK Ventile
Vannes PVEK

BOC EDWARDS

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Declaration of Conformity

We, BOC Edwards,
Manor Royal,
Crawley,
West Sussex RH10 2LW, UK

declare under our sole responsibility that the product(s)

Right Angled Valves:

PV10EKA (220 V)	C411-01-000	PV25EKA (110 V)	C413-03-000	PV25EKS (220 V)	C413-02-000
PV10EKA (110 V)	C411-03-000	PV40EKA (220 V)	C414-01-000	PV25EKS (110 V)	C413-04-000
PV16EKA (220 V)	C412-01-000	PV40EKA (110 V)	C414-03-000	PV40EKS (220 V)	C414-02-000
PV16EKA (110 V)	C412-03-000	PV16EKS (220 V)	C412-02-000	PV40EKS (110 V)	C414-04-000
PV25EKA (220 V)	C413-01-000	PV16EKS (110 V)	C412-04-000		

In-Line Valves:

PV16EKA (220 V)	C416-10-000	PV40EKA (220 V)	C416-51-000	PV25EKS (220 V)	C416-32-000
PV16EKA (110 V)	C416-11-000	PV40EKA (110 V)	C416-52-000	PV25EKS (110 V)	C416-33-000
PV25EKA (220 V)	C416-30-000	PV16EKS (220 V)	C416-12-000	PV40EKS (220 V)	C416-53-000
PV25EKA (110 V)	C416-31-000	PV16EKS (110 V)	C416-13-000	PV40EKS (110 V)	C416-54-000

PVE Valve Mains Lead C411-01-090

to which this declaration relates is in conformity with the following standard(s) or other normative document(s)

EN61010-1:2001	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements.
EN61326:1997 + A1:1998 + A2:2001 (Industrial environment, Class B Emissions)	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements.

following the provisions of

73 / 023 / EEC	Low Voltage Directive.
89 / 336 / EEC	Electromagnetic Compatibility Directive.

JDWatson

Dr. J.D. Watson, Technical Director, VEMD

12 July 2004 CRAWLEY

Date and Place

This product has been manufactured under a quality system registered to ISO9001

BOC EDWARDS

P900-75-200 Issue F 2B01-010

Declaration of Incorporation

We, BOC Edwards,
Manor Royal,
Crawley,
West Sussex RH10 2LW, UK

declare under our sole responsibility that the machine(s)

Right-Angled Valves:

PV10EKA (220 V)	C411-01-000	PV25EKA (110 V)	C413-03-000	PV25EKS (220 V)	C413-02-000
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PV25EKA (110 V)	C416-31-000	PV16EKS (110 V)	C416-13-000	PV40EKS (110 V)	C416-54-000

to which this declaration relates is intended to be incorporated into other equipment and not to function independently.
The machine(s) is in conformity with the following standard(s) or other normative document(s)

98/37/EC Machinery Directive.

The machine(s) must not be put into service until the equipment into which it is incorporated has been brought into conformity with the provisions of the Machinery Directive, 98/37/EC.

Dr. J. D. Watson, Technical Manager
Vacuum Equipment and Exhaust Management Product Divisions

Date and Place

This product has been manufactured under a quality system registered to ISO9001

BOC EDWARDS

P900-76-200 Issue F 2B01-010

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Illustrations

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1 INTRODUCTION

1.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for the BOC Edwards range of PVEK valves. You must use the valves as specified in this manual.

Read this manual before you install and operate the valve. Important safety information is highlighted as WARNING and CAUTION instructions; you must obey these instructions. The use of WARNINGS and CAUTIONS is defined below.

> WARNING
> Warnings are given where failure to observe the instruction could result in injury or death to people.

> CAUTION
> Cautions are given where failure to observe the instruction could result in damage to the equipment, associated equipment and process.

The units used throughout this manual conform to the SI international system of units of measurement.

The following symbols appear on the PVEK Valves:

Warning - refer to accompanying documents.

Warning - risk of electric shock.

1.2 Description

The PVEK valves are solenoid-operated vacuum-valves which are compact and lightweight. They are designed for low energy consumption, low operating temperatures and trouble-free operation. The PVEK valve enclosure provides protection to IP55 (as defined by EN60529).

The valves are available in right-angled and in-line versions (as shown in Figures 2 and 3); the in-line valves are designated IPVEK valves. The valves are available with either stainless steel or aluminium bodies and a range of valve-body and flange sizes is available to suit your system. In external appearance, the various models differ only in vacuum port configuration and valve-body and actuator-case size; the size of the electrical-box (Figure 1, item 7) is identical in all valve models.

1. Position indicator socket
2. Electrical supply socket
3. Valve-body
4. Valve-port
5. Valve-port
6. Mounting holes
7. Electrical-box

1. Anschluß Stellungsindikator
2. Anschluß Stromversorgung
3. Ventilkörper
4. Ventilöffnung
5. Ventilöffnung
6. Montagelöcher
7. Elektrischer Schaltkasten

1. Prise femelle de l'indicateur de position
2. Prise femelle de l'alimentation électrique
3. Corps de la vanne
4. Orifice de la vanne
5. Orifice de la vanne
6. Trous de fixation
7. Coffret électrique

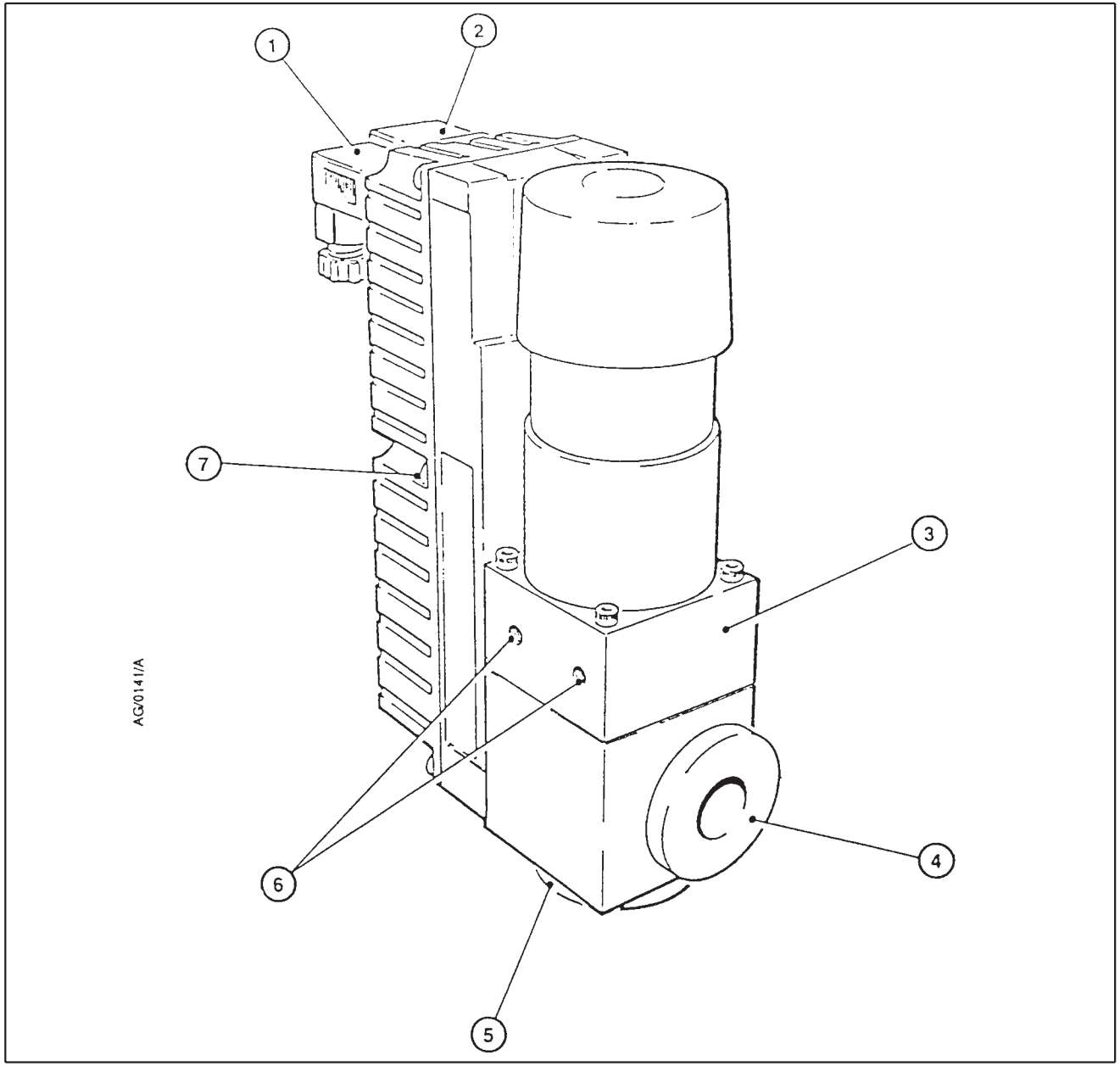

Figure 1 - PVEK valve (PV10EK right-angled valve shown)
Abbildung 1 - PVEK Ventil (dargestellt wird das Eckventil PV10EK)
Figure 1 - Vanne PVEK (Illustration du modèle PV10EK à angle droit)

1.3 Construction

Refer to the sectional view of the PVEK valve in Figure 7 to identify the item numbers in brackets.

The valve mechanism is a solenoid-operated moving pole with an integral valve-pad and bellows assembly (7). The vacuum system is isolated from atmosphere by a fluoroelastomer 'O' ring static seal (10) and a stainless steel bellows for dynamic sealing. The valve-pad also seals against the valve-body with a fluoroelastomer 'O' ring (12). The valve-body terminates in two ports with NW flanges.

A PCB inside the electrical-box (1) controls the valve actuation. A magnetic reed-switch positioned on the underside of the PCB provides position indication. The reed switch has changeover contacts and provides both normally open and normally closed position indications.

1.3

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1.4 Operation

The solenoid coil in the valve has two windings. To open the valve, both windings are energised. Initially, the inner high energy or pulse winding provides a high transient force to open the valve and is then de-energised. The outer low energy or 'hold' winding remains energised to maintain the valve in the open position with minimum power.

The valve is closed by de-energising the solenoid coil. When the outer winding is de-energised, the action of the spring provides rapid positive closure.

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2 TECHNICAL DATA

Note: Unless otherwise specified, all data in this section refers to both right-angled and in-line valves.

2.1 Mechanical data

Refer to Table 3.

2.2 Performance, operating and storage conditions

Refer to Table 1.

2.3 Electrical data

Refer to Table 2.

2.4 Materials

The valves are manufactured from the following materials:

Valve-body	
PVEKA Valve	HE30TF grade aluminium
PVEKS Valve	AISI 304 grade stainless steel
Bellows	AISI 316L stainless steel
'O' rings	Fluoroelastomer

2.5 Legislation and standards

The valves have been designed in compliance with the following legislation and standards:

73/023/EEC - Low Voltage Directive.

89/336/EEC - Electromagnetic Compatibility Directive.

EN61010 - Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements.

EN61326: (Industrial Location, Class B Emissions) - Electrical Equipment for Measurement, Control and Laboratory Use - EMC requirements.

EN60529 - Degrees of Protection Provided by Enclosures (IP Code).

Pneurop 6606 - Vacuum Flanges and Connections.

	PV10EK	PV16EK	PV25EK	PV40EK
Ambient temperature (operation) Umgebungstemperatur (Betrieb) Température ambiante (fonctionnement)	5 - 45 °C	5 - 45 °C	5 - 50 °C	5 - 50 °C
Ambient temperature (storage) Umgebungstemperatur (Lagerung) Température ambiante (stockage)	-30 - 70 °C	-30 - 70 °C	-30 - 70 °C	-30 - 70 °C
Ambient humidity (operation) Umgebungsluftfeuchte (Betrieb) Humidité ambiante (fonctionnement)	80% decreasing linearly to 50% relative humidity at 40 °C 80% linear abfallend zu 50% relativer Luftfeuchte bei 40°C 80 %, diminution linéaire jusqu'à 50 % d'humidité relative à 40 °C			
Operating altitude/operating conditions Betriebshöhe über NN/Betriebsbedingungen Altitude/conditions de fonctionnement	Up to 2000 m/For indoor use only Bis zu 2000 m/Nur für den Innenbetrieb Jusqu'à 2000 m/utilisation à l'intérieur uniquement			
Molecular conductance (right-angled valve)/ Molekular Leitwert (Eckventil)/ Conductance en régime moléculaire (vanne à angle droit)	3 l s^{-1}	4 l s^{-1}	10 l s^{-1}	34 l s^{-1}
Molecular conductance (in-line valve)/ Molekular Leitwert (Durchgangsventil)/ Conductance en régime moléculaire (vanne à passage direct)	-	2 l s^{-1}	6 l s^{-1}	15 l s^{-1}
Pressure range (valve open)/ Druckbereich (Ventil offen)/ Gamme de pression (vanne ouverte)	1×10^{-9} - 2.1×10^{3} mbar (absolute/absolut/absolu) 1×10^{-7} - 2.1×10^{5} Pa			
Maximum pressure differential (between flanges) Maximales Druckdifferenzial (zwischen Flanschen) Pression différentielle maximale (entre brides)	1×10^{3} mbar 1×10^{5} Pa			

Table 1 - Performance, operating and storage conditions
Tabelle 1 - Leistungs-, Betriebs- und Lagerbedingungen
Tableau 1 - Performances, conditions de fonctionnement et de stockage

	PV10EK	PV16EK	PV25EK	PV40EK
Leak rate/Undichtigkeitsrate/Taux de fuite	1×10^{-9} mbar l s^{-1}, 1×10^{-7} Pa l s^{-1}			
Maximum cycle frequency (per hour)/ Maximale Zyklusfrequenz (Pro Stunde)/ Fréquence maximale de manoeuvre (par heure)	400	400	400	400
Nominal lift (mm) Nominalhub (mm) Levée nominale (mm)	2.5	2.5	3.8	6.0
Time to open (ms) Öffnungszeit (ms) Temps d'ouverture	40	40	60	80
Time to close (ms) Schlie zeit (ms) Temps de fermeture	100	100	100	120
Mean time to failure (cycles) Mittlere Standzeit (Zyklen) Temps moyen avant apparition de défaillances (MTTF)	$> 5 \times 10^5$	$> 5 \times 10^5$	$> 1.3 \times 10^5$	$> 1.3 \times 10^5$

Table 1 - Performance, operating and storage conditions (continued)
Tabelle 1 - Leistungs-, Betriebs- und Lagerbedingungen (Fortsetzung)
Tableau 1 - Performances, conditions de fonctionnement et de stockage (suite)

	PV10EK	PV16EK	PV25EK	PV40EK
Electrical supply voltage range Elektrischer Spannungsbereich Plage de tension d'alimentation				
110 V nominal/110 V Nennspannung/110 V nominale	90 - 132 V			
240 V nominal/240 V Nennspannung/240 V nominale	180 - 264 V			
Frequency/Frequenz/Fréquence	50 - 60 Hz			
Continuous power (W)/Dauerleistung (W)/Puissance continue (W)				
110 V a.c.	3.3	3.3	6.1	8.0
240 V a.c.	4.4	4.4	8.2	8.3
Peak power (VA) for 60 ms/Spitzenleistung (VA) für 60 ms/ Puissance de pointe (VA) pour 60 ms				
110 V a.c.	450	450	940	1400
240 V a.c.	560	560	1200	2400
Reed-switch ratings Daten Zungenschalter Caractéristiques nominales de commutateur à lame vibrante				
Maximum voltage (peak, a.c. or d.c.) Maximalspannung (Spitzenwert, Wechselstrom oder Gleichstrom) Tension maximale (pointe, c.a ou c.c.)	28 V			
Maximum current (peak)/power (r.m.s.) Maximalstrom (Spitzenwert) / Leistung (eff.) Intensité maximale (pointe)/puissance maximale (eff)	0.25 A/3 VA			
Electrical supply plug/Netzstecker/Fiche de l'alimentation électrique				
Cable diameter/Kabeldurchmesser/Diamètre du câble	6 - 8 mm			
Microswitch plug/Mikroschalterstecker/Fiche du microrupteur				
Maximum cable diameter Maximaler Kabeldurchmesser Diamètre maximal du câble	6.5 mm			

Table 2 - Electrical data
Tabelle 2 - Elektrische Daten
Tableau 2 - Caractéristiques électriques

Dimensions: mm (see Figures 2 and 3 for keys) Abmessungen: in mm (bzgl. Erläuterungen siehe die Abbildungen 2 und 3) Dimensions : mm (voir légende des Figures 2 et 3)	**PV10EK**	**PV16EK**	**PV25EK**	**PV40EK**
A	30	40	50	65
B	42	42	55	80
C	20	20	20	40
F	59 * - †	69 * 37.4 †	82 * 72.5 †	110 * 101.5 †
H	150 * - †	160 * 142.9 †	182 * 172 †	230 * 222 †
L	116 * - †	126 * 85 †	142 * 93 †	170 * 111 †
M	-	40 †	50 †	65 †
Mounting hole thread size and maximum depth Gewindegröße und maximale Tiefe der Montagelöcher Filetage et profondeur maximale des orifices de montage	M4 x 7	M4 x 7	M4 x 7	M6 x 9
Valve-port flange size Flanschgröße der Ventilöffnung Taille de bride d'orifice de vanne	NW10	NW16	NW25	NW40
IP ratings (as defined by EN60529): valve enclosure ▲ IP-Daten (gemäß EN60529): Ventilgehäuse ▲ Indices IP (tels que définis par EN60529) : enveloppe de vanne ▲	IP55	IP55	IP55	IP55
Mass (kg) PVEKA Gewicht (kg) IPVEKA Poids (kg) PVEKS IPVEKS	0.8 * - † 0.9 - †	0.8 * 0.8 † 1.2 1.2 †	1.8 * 1.8 † 2.4 2.5 †	4.5 * 4.6 † 6.4 6.8 †

* Right-angled valve/Eckventil/Vanne à angle droit

† In-line valve (note that there is no PV10EK in-line valve)
Durchgangsventil (Es gibt kein PV10EK - Durchgangsventil)
Vanne à passage direct (Note: il n'existe pas de vanne PV10EK à passage direct)

Table 3 - Mechanical data
Tabelle 3 - Mechanische Daten
Tableau 3 - Caractéristiques mécaniques

▲ The electrical supply connector and the microswitch connector must be connected using the gasket supplied, and the correct cable diameters must be used, in order to meet the requirements of IP55.

▲ Um den Anforderungen von IP 55 zu entsprechen müssen Netzstecker und Mikroschalterstecker unter Verwendung der mitgelieferten Manschette verbunden werden und die richtigen Kabeldurchmesser müssen verwendet werden.

▲ Les connecteurs de l'alimentation électrique et du microrupteur doivent être raccordés à l'aide du joint fourni, et les diamètres de câble corrects être utilisés pour satisfaire aux exigences d'IP55.

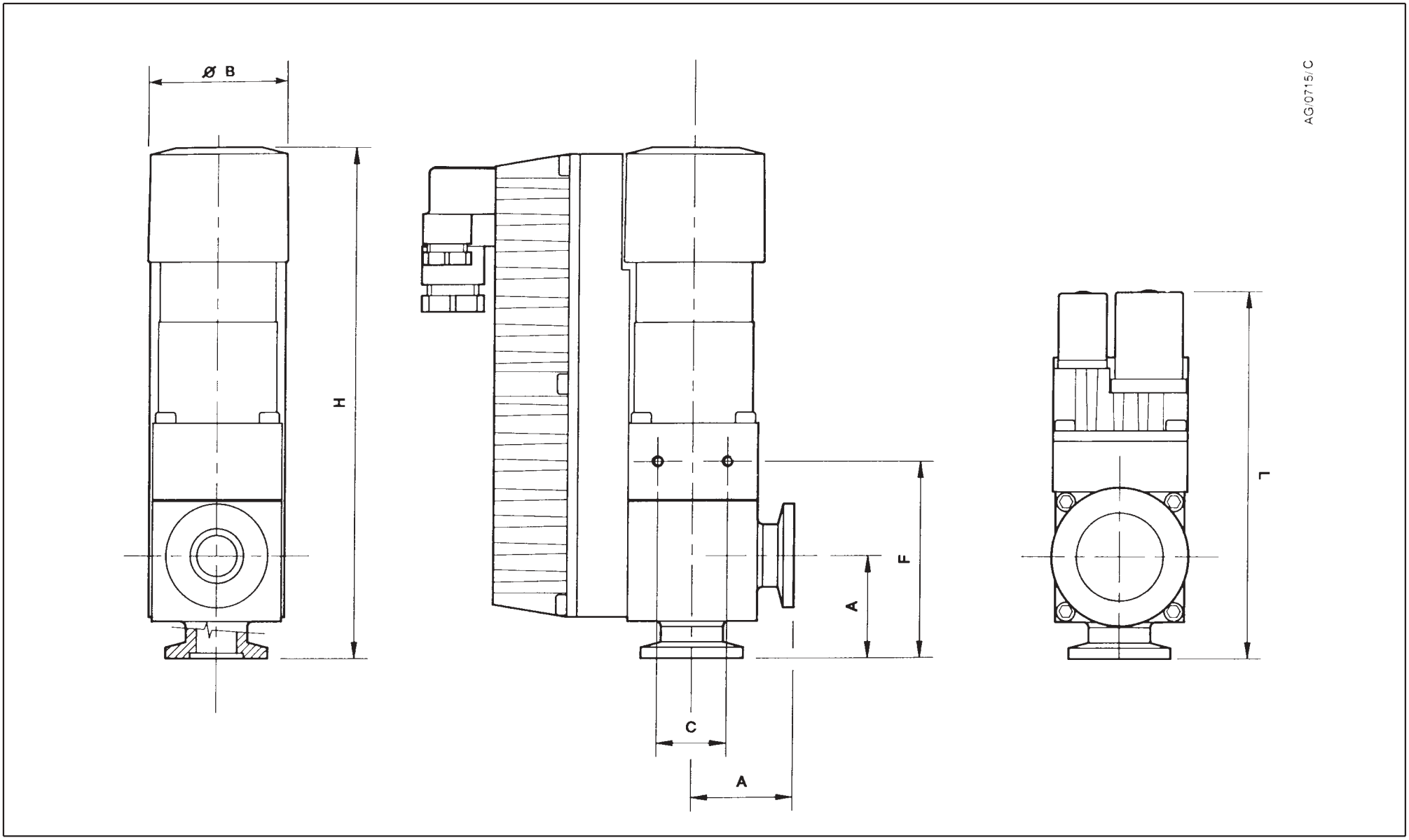

Figure 2 - Right-angled valve dimensions
Abbildung 2 - Abmessungen der Eckventile
Figure 2 - Dimensions de la vanne à angle droit

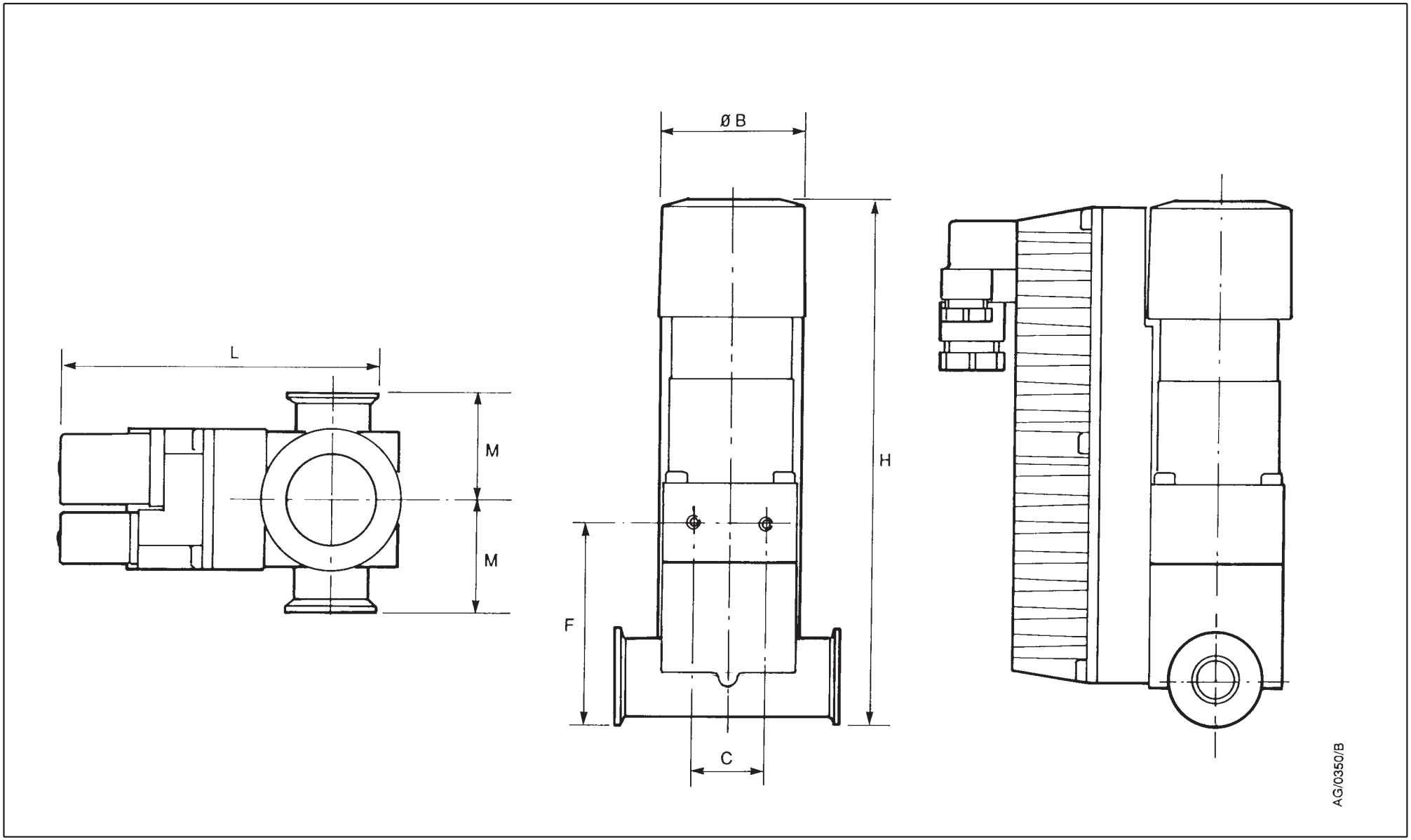

Figure 3 - In-line valve dimensions
Abbildung 3 - Abmessungen der Durchgangsventile
Figure 3 - Dimensions de la vanne à passage direct

2.6 Product Item Numbers

2.6.1 Right-angled valves

Product	Item Number
Aluminium bodies	
PV10EKA Valve (220 V)	C411-01-000
PV10EKA Valve (110 V)	C411-03-000
PV16EKA Valve (220 V)	C412-01-000
PV16EKA Valve (110 V)	C412-03-000
PV25EKA Valve (220 V)	C413-01-000
PV25EKA Valve (110 V)	C413-03-000
PV40EKA Valve (220 V)	C414-01-000
PV40EKA Valve (110 V)	C414-03-000
Stainless steel bodies	
PV16EKS Valve (220 V)	C412-02-000
PV16EKS Valve (110 V)	C412-04-000
PV25EKS Valve (220 V)	C413-02-000
PV25EKS Valve (110 V)	C413-04-000
PV40EKS Valve (220 V)	C414-02-000
PV40EKS Valve (110 V)	C414-04-000

2.6.2 In-line valves

Product	Item Number
Aluminium bodies	
PV10EKA Valve (220 V)	-
PV10EKA Valve (110 V)	-
PV16EKA Valve (220 V)	C416-10-000
PV16EKA Valve (110 V)	C416-11-000
PV25EKA Valve (220 V)	C416-30-000
PV25EKA Valve (110 V)	C416-31-000
PV40EKA Valve (220 V)	C416-51-000
PV40EKA Valve (110 V)	C416-52-000
Stainless steel bodies	
PV16EKS Valve (220 V)	C416-12-000
PV16EKS Valve (110 V)	C416-13-000
PV25EKS Valve (220 V)	C416-32-000
PV25EKS Valve (110 V)	C416-33-000
PV40EKS Valve (220 V)	C416-53-000
PV40EKS Valve (110 V)	C416-54-000

3 INSTALLATION

3.1 Unpack and inspect

Remove all the packing materials and protective covers and check the PVEK valve.

If the valve is damaged, notify your supplier and the carrier in writing within three days; state the Item Number of the valve together with your order number and your supplier's invoice number. Retain the packing materials for inspection. Do not use the valve.

If the valve is not to be used immediately, replace the protective covers. Store the valve in suitable conditions, as described in Section 6.

3.2 Install the valve

WARNING
Take appropriate safety precautions when you install the valve in a system in which dangerous process substances have been pumped.

WARNING
Fit a cover to any valve-port which is open to atmosphere. Access to open ports is dangerous.

CAUTION
We recommend that you provide additional support for a PV40EKA in-line valve. The valve flanges of an unsupported PV40EKA in-line valve may be distorted by the mass of the valve. Alternatively, fit a PV40EKS in-line valve.

The valve is normally supported by the pipeline it is fitted to and can be mounted in any orientation. Two threaded holes in the valve-body allow for additional support, if required; the dimensions of these holes are defined in Section 2. Do not exceed the specified maximum depth of thread or you will damage the valve. Connect the valve to your vacuum system with standard NW coupling components.

If necessary, you can rotate the valve-body from its standard position (in 90 steps for the right-angled valve and in 180 steps for the in-line valve). Remove the four screws which secure the solenoid actuating cylinder to the valve-body and reassemble with the cylinder turned in the required direction.

3.3 Electrical connections

> WARNING
> Ensure that the electrical installation of the PVEK valve conforms with your local and national safety requirements. It must be connected to a suitable fused and protected electrical supply and a suitable earth (ground) point.

> WARNING
> In order to comply with EN61010, the valve must be connected to a suitable 2 pole circuit breaker which is labelled appropriately and mounted in close proximity, within easy reach of the operator.

3.3.1 Fit your own electrical supply cable

Use the following procedure to fit your own electrical supply cable to the PVEK valve. Refer to Figure 4 for item numbers in brackets.

1. Check that the electrical supply corresponds with the voltage stated on the valve label.

2. Undo the screw (5) and remove the electrical supply socket (4) from the electrical-box (1). Remove the sealing-gland (2) and prise out the connector block (3).

3. Loosen the strain-relief nut (6) and pass the electrical supply cable through the nut and into the socket. Refer to Table 2 for information on the correct cable diameter.

4. Connect the electrical supply cable to the connector block as shown in Figure 5. Ensure that the earth (ground) conductor is longer than the other conductors, so that if the cable is accidentally dragged, the earth (ground) conductor will be the last conductor to be pulled from the connector block.

5. Push the connector block (3) back into the socket; ensure that it is orientated correctly so that the sockets mate with the corresponding pins labelled on the electrical-box (1).

6. Gently pull on the cable to ensure that the cable is trapped inside the connector. Tighten the strain-relief nut (6).

7. Refit the sealing-gland (2) over the socket (4) and push the socket onto the three connector pins on the electrical-box.

8. Refit the retaining screw (5) and tighten; ensure that there is a slight compression of the sealing-gland.

1. Electrical-box
2. Sealing-gland
3. Connector block
4. Electrical supply socket
5. Socket retaining screw
6. Cable strain-relief nut
7. Position indicator socket

1. Elektrischer Schaltkasten
2. Dichtungsstopfbuchse
3. Klemmenblock
4. Elektrische Steckbuchse
5. Halteschraube für Buchse
6. Zugentlastungsmutter für Kabel
7. Buchse für Stellungsindikator

1. Coffret électrique
2. Presse-étoupe d'étanchéité
3. Bloc connecteur
4. Prise femelle d'alimentation électrique
5. Vis de fixation de prise
6. Ecrou de détente de câble
7. Prise femelle de l'indicateur de position

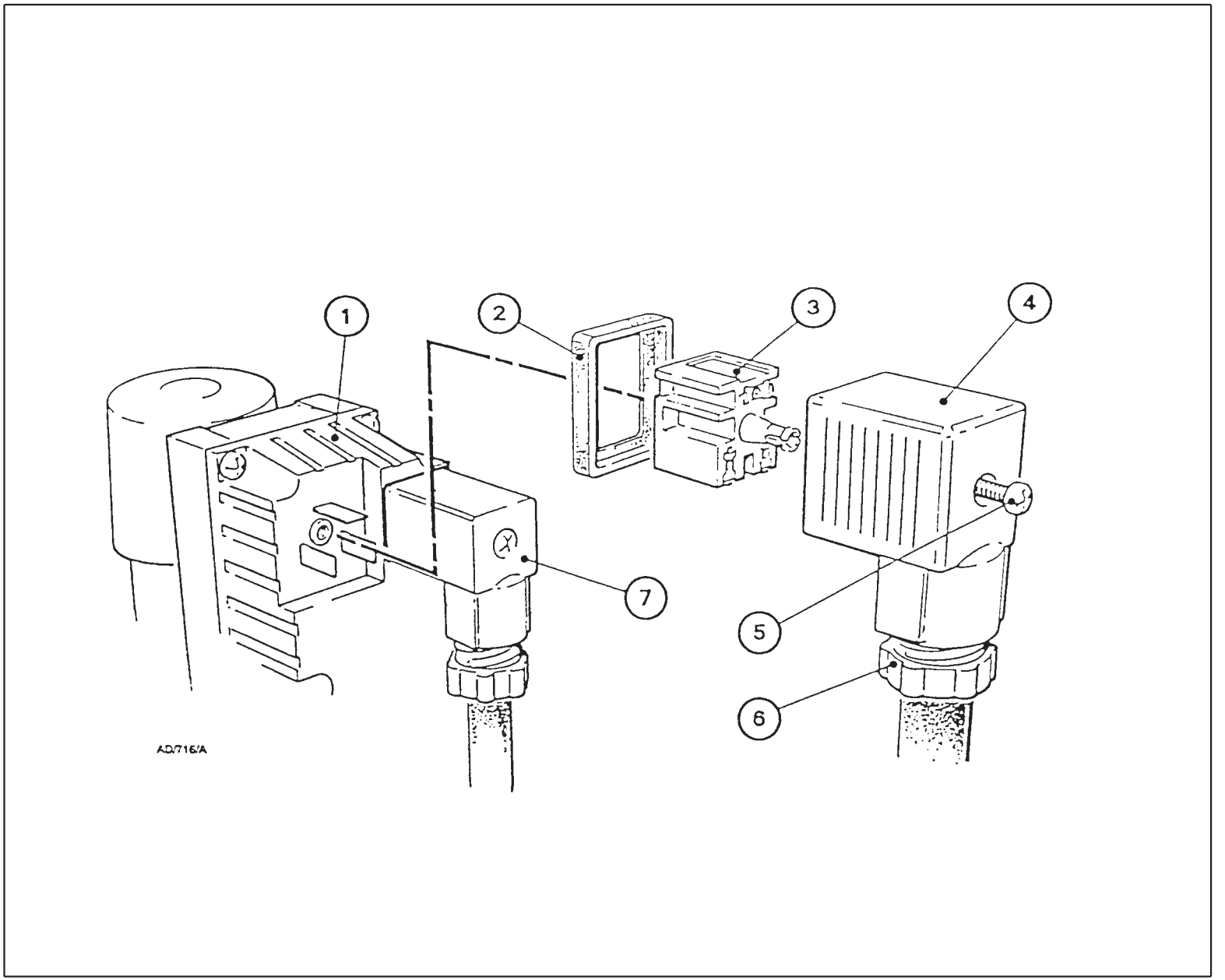

Figure 4 - Electrical connectors
Abbildung 4 - Elektrische Anschlüsse
Figure 4 - Connecteurs électriques.

1. Live
2. Neutral
3. Earth (ground)

1. Phase
2. Neutral
3. Erdung

1. Phase
2. Neutre
3. Terre (masse)

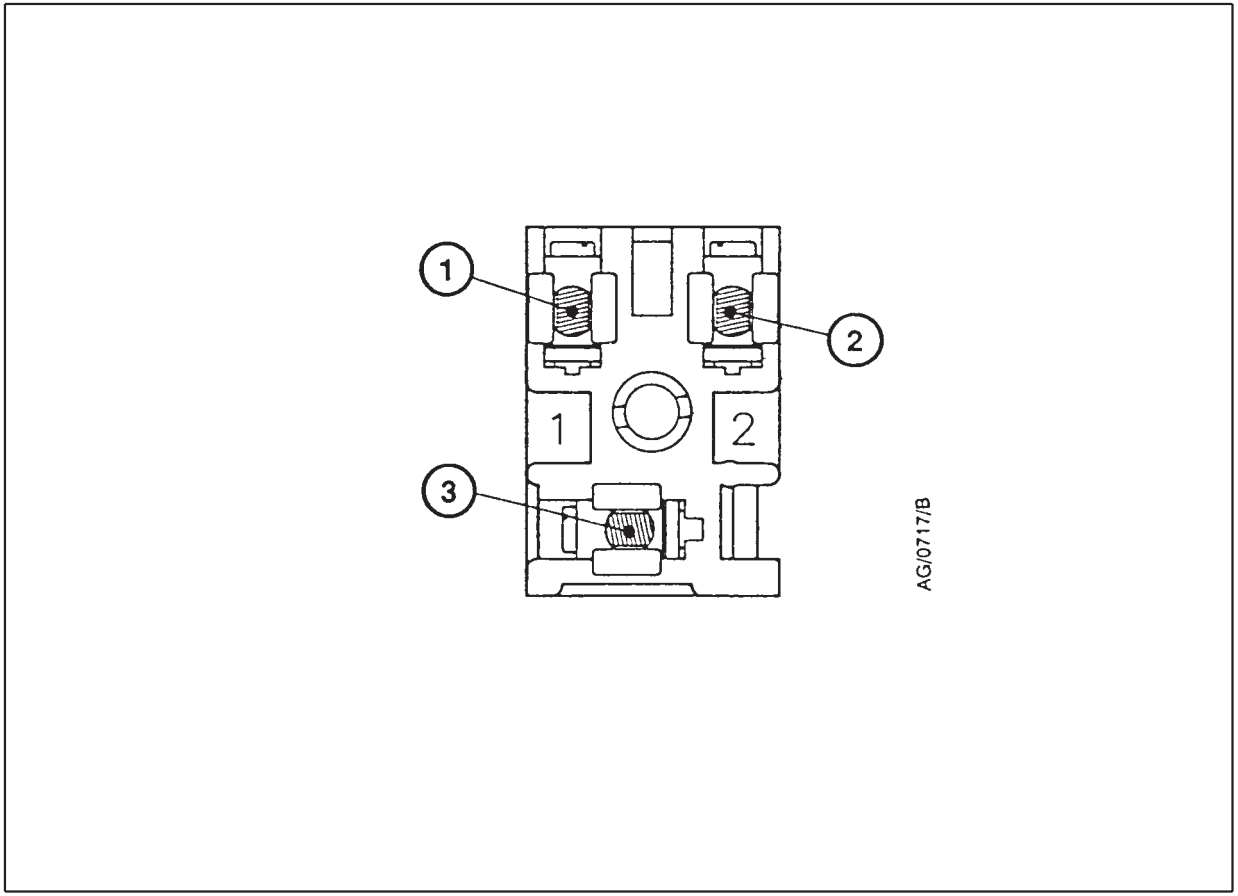

Figure 5 - Electrical supply connections
Abbildung 5 - Netzanschlüsse
Figure 5 - Connexions électriques

3.3.2 Fit the electrical supply cable accessory

Use the following procedure to fit the electrical supply cable accessory. Refer to Figure 4 for item numbers in brackets.

The accessory is supplied as a fully assembled cable, together with a new sealing-gland and socket retaining screw.

1. Undo the screw (5) and remove the existing electrical supply socket (4) from the electrical-box (1) on the valve.

2. Fit the new sealing-gland (2) to the socket (4) on the electrical supply cable accessory.

3. Push the socket (4) onto the three connector pins on the electrical-box.

4. Fit the new socket retaining screw (5) and tighten; ensure that there is a slight compression of the sealing-gland.

5. Fit the plug on the other end of the electrical supply cable accessory to a suitable electrical supply outlet.

3.3.3 Position indicator connections

WARNING
Do not use the position indicator as a safety interlock device. Under certain circumstances the position indicator may not operate correctly.

The reed switch position indicator has changeover contacts and provides both normally open and normally closed position indications. To use the reed switch position indicator, connect the terminals as described below.

1. Undo the screw and remove the position indicator socket (Figure 4, item 7) from the electrical-box. Remove the sealing-gland, extract the connector block and loosen the strain-relief nut.

2. Connect the signal cable to the terminals in the connector block as shown in Figure 6. Refer to Table 2 for information on the correct cable diameter. Do not use the terminal marked with the earth (ground) symbol.

3. Refit the connector block to the socket and replace the socket. Note that the socket is not polarised and can be fitted in any of four possible positions. Ensure that the sockets mate with the corresponding pins labelled on the electrical-box.

1. Normally closed
2. Normally open
3. Common
4. Not used

1. NC (Öffner)
2. NO (Schließer)
3. Masse
4. Nicht belegt

1. Normalement fermé
2. Normalement ouvert
3. Commun
4. Non utilisé

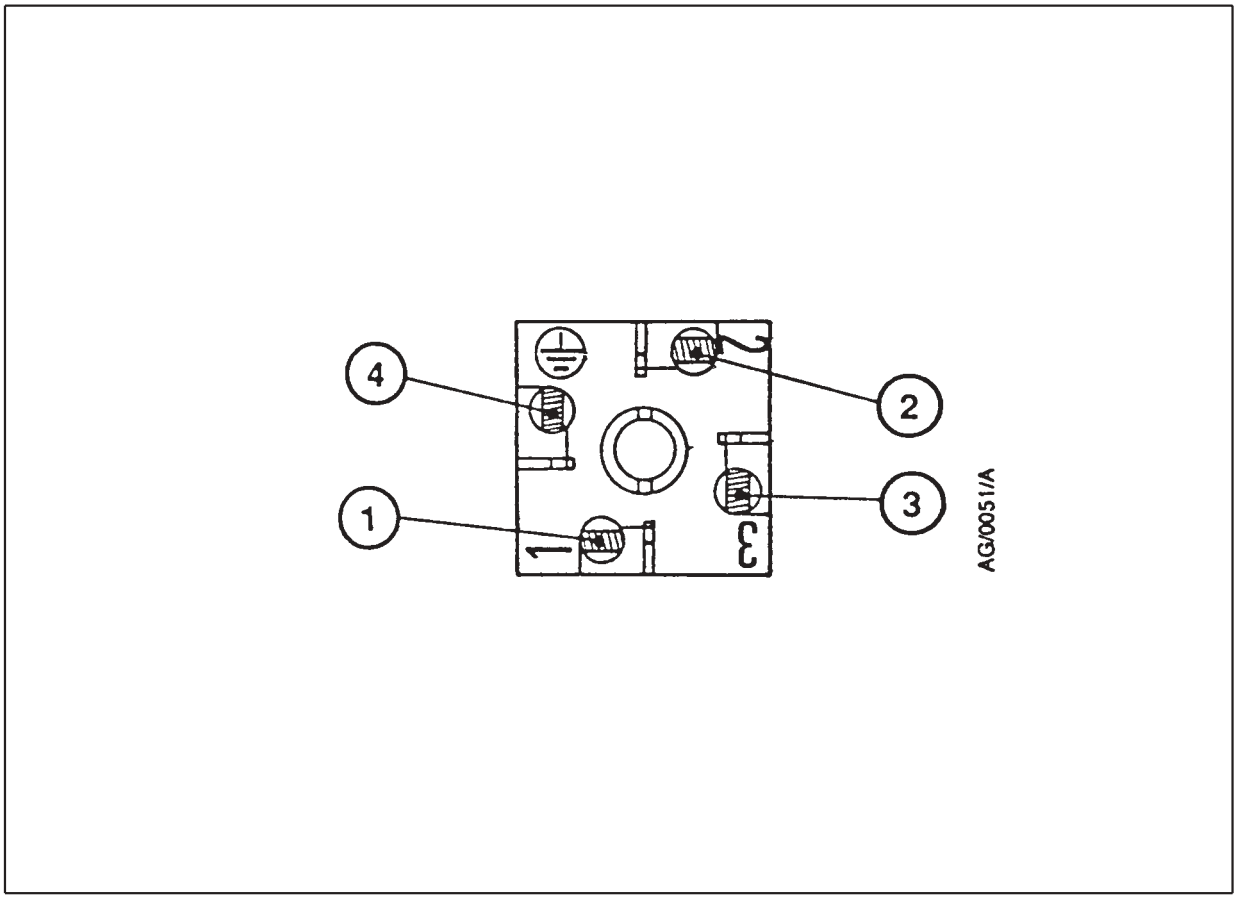

Figure 6 - Position indicator connections
Abbildung 6 - Anschlüsse des Stellungsindikators
Figure 6 - Branchements d'un indicateur de position

4 OPERATION

4.1 General

Once correctly installed, operation of the PVEK valve is dependent only upon the switching of the electrical supply to the valve.

4.2 Position indicator

> WARNING
> Do not use the position indicator as a safety interlock device. Under certain circumstances the position indicator may not operate correctly.

Do not rely entirely on the position indicator to indicate the state of the valve for the following reasons:

In the event of low electrical supply voltage or a temporary loss of the electrical supply to the valve, it is possible for the valve to close but the position indicator to show the valve still open. This is because the stray magnetic flux which remains during a temporary loss of the electrical supply could be sufficient to hold the reed switch 'open'.

If the valve is not able to close due to a physical obstruction, the position indicator will show the valve to be closed.

If it is essential to know the state of the valve for safety reasons, use additional indicators, such as pressure gauges in the pipelines on each side of the valve.

5 MAINTENANCE

5.1 General

PVEK valves do not require routine maintenance during their normal operational life. If the valve is faulty, refer to the following sections.

5.1.1 Safety information

WARNING
Obey the safety instructions given below and take note of appropriate precautions. If you do not you can cause injury to people and damage to equipment.

Ensure that maintenance is done by a suitably trained and supervised technician. Obey your local and national safety requirements

Observe all appropriate safety precautions when you maintain a valve from a system in which dangerous process substances have been pumped

Isolate the valve from the electrical supply and your vacuum system before you start maintenance

Observe all appropriate safety precautions when you come into contact with solvents and fluoroeleastomer 'O' rings

Ensure that you do maintenance in a well ventilated area

Do not use abrasive or reactive chemicals to clean the valve

Do not use solvents to clean 'O' rings

Safely dispose of all components which have been contaminated by dangerous process substances.

5.1.2 Fluoroelastomers

The seals and 'O' rings used in the PVEK valve are made from a fluoroelastomer. Fluoroelastomers can decompose into very dangerous substances if they are heated to 260 C and above. The valve may have overheated if your system has been misused, if it has malfunctioned or if the valve has been in a fire. If the valve has overheated, ensure that you observe the appropriate safety precautions to prevent contact with the seals and 'O' rings.

5.2 Dismantle and inspect the valve

CAUTION
When you reassemble the valve, make sure that 'O' rings are seated properly in their locating grooves and are not trapped or pinched.

Note: The best type of grease to use is dependent on the gases pumped in your system. For 'clean' systems, we recommend that you use Fomblin.

Refer to Figure 7 for item numbers shown in brackets.

1. Isolate the valve from the electrical supply.

2. Undo the four retaining screws (9) and remove the valve-body (11) and the valve-body 'O' ring (10) from the valve.

3. Examine the bellows/pole-piece assembly (7), the valve-body 'O' ring (10) and the valve-pad 'O' ring (12) for damage and wear.

4. If necessary, replace any worn or damaged items as described in Sections 5.3 and 5.4.

5. Refit the bellows assembly into the actuator-case; ensure free movement of the pole-piece in the actuator-case.

6. Refit the valve-body (11) to the valve; secure in place with the four retaining screws (9) and a suitable locking adhesive such as Locktite 222.

A Detail of in-line valve

1. Electrical box
2. Top cap
3. Sorbathane pad
4. Bearing assembly
5. Fixed pole
6. Coil
7. Bellows/pole-piece assembly
8. Actuator housing
9. Retaining screw
10. Valve-body ‘O’ ring
11. Valve-body
12. Valve-pad ‘O’ ring

A Detaildarstellung des Durchgangsventils

1. Elektrischer Schaltkasten
2. Haube
3. Sorbathan-Kissen
4. Lagerbaugruppe
5. Festes Polstück
6. Spule
7. Faltenbalg-/Polstückgruppe
8. Stellgliedgehäuse
9. Halteschraube
10. O-Ring des Ventilkörpers
11. Ventilkörper
12. O-Ring des Ventiltellers

A Détails d’une vanne à passage direct

1. Coffret électrique
2. Chapeau supérieur
3. Garniture Sorbathane
4. Palier
5. Tige fixe
6. Bobine
7. Ensemble soufflet/pôle mobile
8. Logement de l’actionneur
9. Vis de fixation
10. Joint torique du corps de la vanne
11. Corps de la vanne
12. Joint torique du bloc de la vanne

Figure 7 - Sectional view of PVEK valve : key
Abbildung 7 - Schnittbild des PVEK-Ventils: Legende
Figure 7 - Vue en coupe d’une vanne PVEK : légende

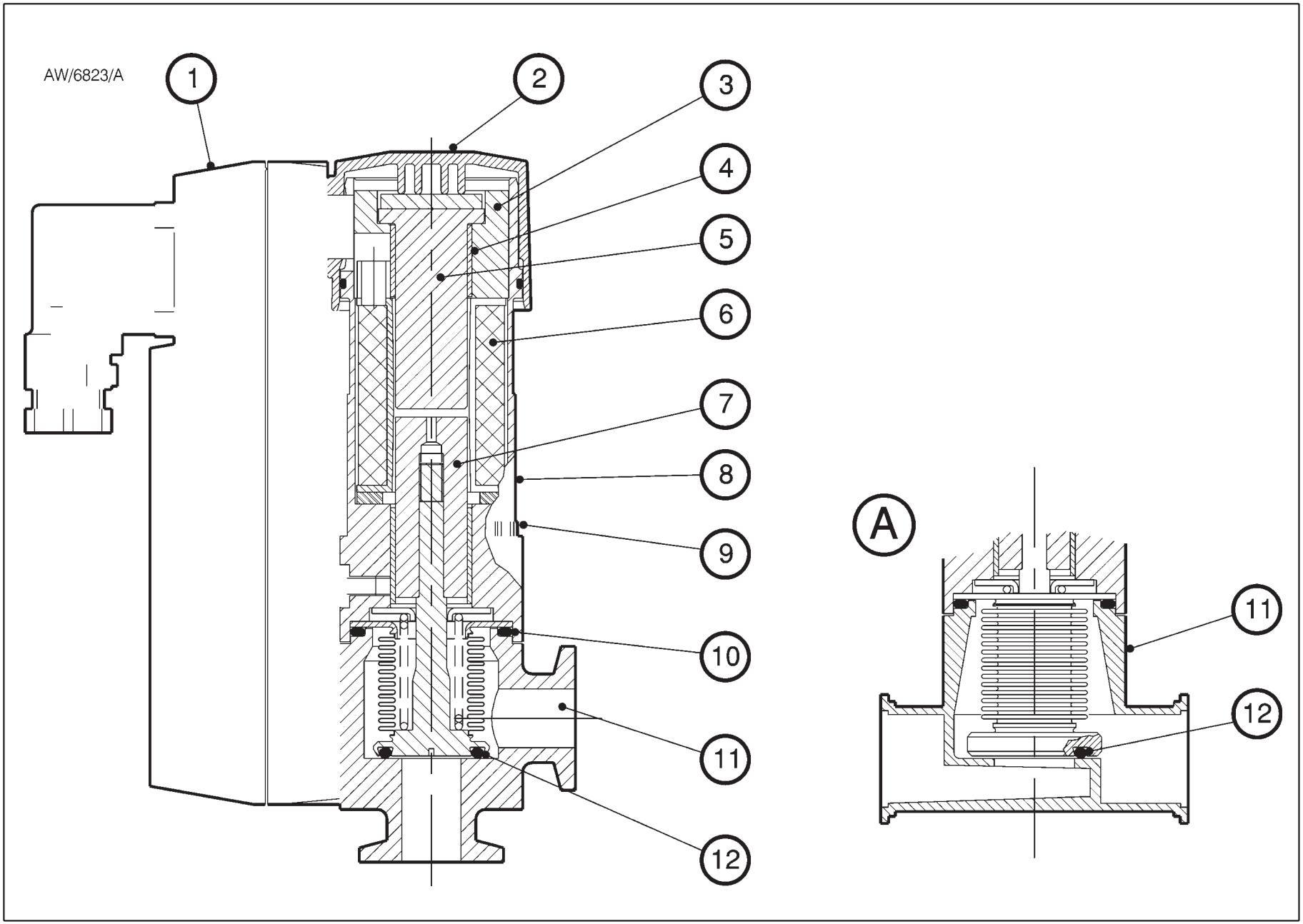

Figure 7 - Sectional view of PVEK valve
Abbildung 7 - Schnittbild eines PVEK-Ventils
Figure 7 - Vue en coupe d'une vanne PVEK

5.3 Replace the bellows/pole-piece assembly

Refer to Figure 7 for item numbers shown in brackets.

1. Dismantle the valve as described in Section 5.2.

2. Remove the old bellows/pole-piece assembly (7) and discard.

3. Fit the new valve-pad 'O' ring (12) to the new bellows assembly; apply a light wipe of high vacuum grease to ease the fit.

4. Fit the bellows assembly into the actuator-case; ensure free movement of the pole-piece in the actuator-case.

5. Reassemble the valve as described in Section 5.2.

5.4 Replace the valve-body and pad 'O' rings

Refer to Figure 7 for item numbers shown in brackets.

1. Dismantle the valve as described in Section 5.2.

2. Remove the valve-body 'O' ring (10) from the valve-body and discard.

3. Inspect the 'O' ring groove and contact surfaces. Refinish any surfaces which are damaged.

4. Fit the new valve-body 'O' ring (10) to the valve-body.

5. Remove the bellows/pole-piece assembly (7).

6. Remove and discard the valve-pad 'O' ring (12) from the bellows/pole-piece assembly.

7. Inspect the 'O' ring groove and contact surfaces. Refinish any surfaces which are damaged.

8. Fit the new valve-pad 'O' ring to the bellows/pole-piece assembly; apply a light wipe of high vacuum grease to ease the fit.

9. Refit the bellows/pole-piece assembly and reassemble the valve as described in Section 5.2.

5.5 Electrical service kit

WARNING
Do not attempt to open the electrical box. Hazardous voltages present inside the electrical box may cause death or serious injury.

WARNING
The printed circuit assembly should only be replaced by a service engineer or a suitably trained and supervised technician.

An electrical service kit containing a replacement printed circuit assembly is available as a spare: refer to Section 7.3.

5.6 Fault finding/Fehlersuche/Recherche des causes de pannes

Symptom/Symptom/Symptôme	Check/Prüfen/Vérification	Action/Maßnahmnen/Remède
The valve fails to operate. Das Ventil arbeitet nicht. La vanne refuse de fonctionner.	Has the electrical supply failed? Ist die Stromversorgung ausgefallen? Il y a eu une panne de courant.	Check the electrical supply and repair as necessary. Stromversorgung prüfen und ggfs. reparieren. Vérifiez l'alimentation électrique et procédez aux réparations nécessaires.
	Is there a loose connection in the electrical supply socket? Gibt es eine lose Verbindung in der Netzanschlußbuchse? Il y a un faux contact dans la prise femelle d'alimentation électrique.	Remove the electrical supply socket, check the electrical supply cable to socket connections and repair as necessary (see Section 3.3.1). Die Netzanschlußbuchse ausbauen, die Anschlüsse des Netzkabels an die Buchse prüfen und wie erforderlich reparieren (siehe Abschnitt 3.3.1). Déposez cette prise femelle, vérifiez les raccordements entre le câble et cette prise et procédez aux réparations nécessaires (voir paragraphe 3.3.1).
	Is the valve obstructed? Ist das Ventil durch einen Fremdkörper blockiert? La vanne est bloquée.	Dismantle the valve (see Section 5.2) and remove the obstruction. Das Ventil zerlegen (siehe Abschnitt 5.2) und das Hindernis entfernen. Démontez cette vanne (voir paragraphe 5.2) et éliminez la cause de ce blocage.

Table 4 - Fault finding
Tabelle 4 - Fehlersuche
Tableau 4 - Recherche des causes de pannes

Symptom/Symptom/Symptôme	Check/Prüfen/Vérification	Action/Maßnahmnen/Remède
Incorrect position indication. Falsche Stellungsanzeige. Une position incorrecte est indiquée.	Is there a loose connection in the position indication socket? Gibt es eine lose Verbindung in der Stellungsindikator-Buchse? Faux contact dans la prise femelle de l'indicateur de position.	Remove the socket, check the cable to socket connections and repair as necessary (see Section 3.3.1). Die Buchse ausbauen, die Anschlüsse des Kabels an die Buchse prüfen und wie erforderlich reparieren (siehe Abschnitt 3.3.1). Déposez cette prise, vérifiez les branchements entre le câble et cette prise et procédez aux réparations nécessaires (voir paragraphe 3.3.1).
	Is the electrical supply voltage low? Ist die Versorgungsspannung niedrig? La tension d'alimentation est faible.	Change the electrical supply (see Section 4.2). Die Stromversorgung ändern (siehe Abschnitt 4.2). Changez la source d'alimentation électrique (voir paragraphe 4.2).
	Is the valve obstructed? Ist das Ventil durch einen Fremdkörper blockiert? Il y a un faux contact dans la prise femelle d'alimentation électrique.	Dismantle the valve (see Section 5.3) and remove the obstruction. Das Ventil zerlegen (siehe Abschnitt 5.3) und das Hindernis entfernen. Démontez cette vanne (voir paragraphe 5.3) et éliminez la cause de ce blocage.

Table 4 - Fault finding (continued)
Tabelle 4 - Fehlersuche (Fortsetzung)
Tableau 4 - Recherche des causes de pannes (suite)

Symptom/Symptom/Symptôme	Check/Prüfen/Vérification	Action/Maßnahmnen/Remède
The valve leaks Das Ventil ist undicht. La vanne fuit.	Is the valve-body 'O' ring or seating groove damaged? Sind der O-Ring des Ventilkörpers oder die Paßrille beschädigt? Le joint torique du corps de la vanne ou la gorge de centrage de ce joint est endommagé.	Dismantle the valve and check the 'O' ring and seating groove (see Section 5.2). Refinish and/or replace as necessary. Das Ventil zerlegen und den O-Ring und die Paßrille prüfen (siehe Abschnitt 5.2). Nach Erfordernis neu bearbeiten und/oder austauschen. Démontez la vanne pour vérifier le joint torique et sa gorge de positionnement (voir paragraphe 5.2). Procédez aux retouches et/ou remplacements nécessaires.
	Is the valve-pad 'O' ring or seating groove damaged? Sind der O-Ring des Ventiltellers oder die Paßrille beschädigt? Le joint torique du bloc de la vanne ou la gorge de centrage de ce joint est endommagé.	Dismantle the valve and check the 'O' ring and seating groove (see Section 5.2). Refinish and/or replace as necessary. Das Ventil zerlegen und den O-Ring und die Paßrille prüfen (siehe Abschnitt 5.2). Nach Erfordernis neu bearbeiten und/oder austauschen. Démontez la vanne pour vérifier le joint torique et sa gorge de positionnement (voir paragraphe 5.2). Procédez aux retouches et/ou remplacements nécessaires.
	Is there a bellows leak? Ist der Faltenbalg undicht? Le soufflet fuit.	Replace the bellows/pole-piece assembly (see Section 5.3). Die Faltenbalg-/Polstückgruppe (siehe Abschnitt 5.3) austauschen. Remplacez l'ensemble soufflet/pôle mobile, comme indiqué au paragraphe 5.3.

Table 4 - Fault finding (continued)
Tabelle 4 - Fehlersuche (Fortsetzung)
Tableau 4 - Recherche des causes de pannes (suite)

6 STORAGE AND DISPOSAL

6.1 Storage

Isolate the valve from the electrical supply and disconnect it from your vacuum system. Place protective covers over the valve-ports and store the PVEK valve in cool, dry conditions until it is required for use.

When required, prepare and install the valve as described in Section 3.

6.2 Disposal

Dispose of the valve and any components removed from it safely in accordance with all local and national safety and environmental requirements.

Particular care must be taken with the following:

Fluoroelastomers which may have been subjected to temperatures above 260 C (see Section 5.1.2)

Components which have been contaminated with dangerous process substances.

7 SERVICE, SPARES AND ACCESSORIES

7.1 Introduction

BOC Edwards products, spares and accessories are available from BOC Edwards companies in Belgium, Brazil, China, France, Germany, Israel, Italy, Japan, Korea, Singapore, United Kingdom, U.S.A. and a world-wide network of distributors.

The majority of these centres employ Service Engineers who have undergone comprehensive BOC Edwards training courses.

Order spare parts and accessories from your nearest BOC Edwards company or distributor. When you order, please state for each part required :

Model and Item Number of your equipment

Serial number (if any)

Item Number and description of the part

7.2 Service

BOC Edwards products are supported by a world-wide network of BOC Edwards Service Centres. Each Service Centre offers a wide range of options including: equipment decontamination; service exchange; repair; rebuild and testing to factory specifications. Equipment which has been serviced, repaired or rebuilt is returned with a full warranty.

Your local Service Centre can also provide BOC Edwards engineers to support on-site maintenance, service or repair of your equipment.

For more information about service options, contact your nearest Service Centre or other BOC Edwards company.

Valve type Ventiltyp Type de vanne	'O' ring service kit O-Ring-Wartungssatz Jeu de maintenance de joints toriques		Electrical service kit Elektrischer Wartungssatz Jeu de maintenance électrique		Bellows Faltenbalg Soufflets		Valve Body Ventilkörper Corps du clapet	
	Right-angled valve/ Rechtwinkliges Ventil/ Vanne à angle droit	In-line valve/Gerade durchgehendes Ventil/Vanne à coulement rectiligne	Right-angled valve/ Rechtwinkliges Ventil/ Vanne à angle droit	In-line valve/Gerade durchgehendes Ventil/Vanne à coulement rectiligne	Right-angled valve/ Rechtwinkliges Ventil/ Vanne à angle droit	In-line valve/Gerade durchgehendes Ventil/Vanne à coulement rectiligne	Right-angled valve/ Rechtwinkliges Ventil/ Vanne à angle droit	In-line valve/Gerade durchgehendes Ventil/Vanne à coulement rectiligne
PV10EKA (220 V)	C411-01-800	-	C411-01-806	-	C411-01-007	-	C411-01-816	-
PV10EKA (110 V)	C411-01-800	-	C411-01-805	-	C411-01-007	-	C411-01-816	-
PV16EKA (220 V)	C411-01-800	C411-01-800	C411-01-806	C411-01-806	C411-01-007	C411-01-007	C412-01-816	C416-01-802
PV16EKA (110 V)	C411-01-800	C411-01-800	C411-01-805	C411-01-805	C411-01-007	C411-01-007	C412-01-816	C416-01-802
PV25EKA (220 V)	C413-01-800	C413-01-800	C413-01-806	C413-01-806	C413-01-007	C413-01-007	C413-01-816	C416-21-802
PV25EKA (110 V)	C413-01-800	C413-01-800	C413-01-805	C413-01-805	C413-01-007	C413-01-007	C413-01-816	C416-21-802
PV40EKA (220 V)	C414-01-800	C414-01-800	C414-01-806	C414-01-806	C414-01-007	C414-01-007	C414-01-816	C416-41-802
PV40EKA (110 V)	C414-01-800	C414-01-800	C414-01-805	C414-01-806	C414-01-007	C414-01-007	C414-01-816	C416-41-802
PV16EKS (220 V)	C411-01-800	C411-01-800	C411-01-806	C411-01-806	C411-01-007	C411-01-007	C416-02-801	C416-02-811
PV16EKS (110 V)	C411-01-800	C411-01-800	C411-01-805	C411-01-805	C411-01-007	C411-01-007	C416-02-801	C416-02-811
PV25EKS (220 V)	C413-01-800	C413-01-800	C413-01-806	C413-01-806	C413-01-007	C413-01-007	C416-22-801	C416-22-811
PV25EKS (110 V)	C413-01-800	C413-01-800	C413-01-805	C413-01-805	C413-01-007	C413-01-007	C416-22-801	C416-22-811
PV40EKS (220 V)	C414-01-800	C414-01-800	C414-01-806	C414-01-806	C414-01-007	C414-01-007	C416-42-801	C416-42-811
PV40EKS (110 V)	C414-01-800	C414-01-800	C414-01-805	C414-01-805	C414-01-007	C414-01-007	C416-42-801	C416-42-811

Table 5 - Spares
Tabelle 5 - Ersatzteile
Tableau 5 - Pièces détachées

7.4 Accessories

Electrical supply cable accessory	C411-01-090

7.4 Zubehör

Netzkabelzubehör	C411-01-090

7.4 Accessoires

Câble d'alimentation électrique	C411-01-090

BOC EDWARDS

Form HS1

Return of BOC Edwards Equipment – Procedure

INTRODUCTION

Before returning your equipment, you must warn BOC Edwards if substances you used (and produced) in the equipment can be hazardous. This information is fundamental to the safety of our Service Centre employees and will determine the procedures employed to service your equipment.

Complete the Declaration (HS2) and send it to BOC Edwards before you dispatch the equipment. It is important to note that this declaration is for BOC Edwards internal use only, and has no relationship to local, national or international transportation safety or environmental requirements. As the person offering the equipment for shipment, it is your responsibility to ensure compliance with applicable laws.

GUIDELINES

- Equipment is '**uncontaminated**' if it has not been used, or if it has only been used with substances that are not hazardous. Your equipment is '**contaminated**' if it has been used with any substances classified as hazardous under EU Directive 67/548/EEC (as amended) or OSHA Occupational Safety (29 CFR 1910).
- If your equipment has been used with radioactive substances, biological or infectious agents, mercury, polychlorinated biphenyls (PCB's), dioxins or sodium azide, you must decontaminate it before you return it to BOC Edwards. You must send independent proof of decontamination (for example a certificate of analysis) to BOC Edwards with the Declaration (HS2). Phone BOC Edwards for advice.
- If your equipment is contaminated, you must either:
  - Remove all traces of contamination (to the satisfaction of laws governing the transportation of dangerous/hazardous substances).
  - Or, properly classify the hazard, mark, manifest and ship the equipment in accordance with applicable laws governing the shipment of hazardous materials.

  Note: Some contaminated equipment may not be suitable for airfreight.

PROCEDURE

1. Contact BOC Edwards and obtain a Return Authorisation Number for your equipment.
2. Complete the Return of BOC Edwards Equipment - Declaration (HS2).
3. If the equipment is contaminated, you must contact your transporter to ensure that you properly classify the hazard, mark, manifest and ship the equipment, in accordance with applicable laws governing the shipment of contaminated/hazardous materials. As the person offering the equipment for shipment, it is your responsibility to ensure compliance with applicable law. **Note: Equipment contaminated with some hazardous materials, such as semiconductor by-products, may not be suitable for airfreight - contact your transporter for advice.**
4. Remove all traces of hazardous gases: pass an inert gas through the equipment and any accessories that will be returned to BOC Edwards. Where possible, drain all fluids and lubricants from the equipment and its accessories.
5. Seal up all of the equipment's inlets and outlets (including those where accessories were attached) with blanking flanges or, for uncontaminated product, with heavy gauge tape.
6. Seal equipment in a thick polythene/polyethylene bag or sheet.
7. If the equipment is large, strap the equipment and its accessories to a wooden pallet. If the equipment is too small to be strapped to a pallet, pack it in a suitable strong box.
8. Fax or post a copy of the Declaration (HS2) to BOC Edwards. The Declaration must arrive before the equipment.
9. Give a copy of the Declaration (HS2) to the transporter. You must tell your transporter if the equipment is contaminated.
10. Seal the original Declaration in a suitable envelope: attach the envelope securely to the outside of the equipment package, in a clear weatherproof bag.

WRITE YOUR RETURN AUTHORISATION NUMBER CLEARLY ON THE OUTSIDE OF THE ENVELOPE OR ON THE OUTSIDE OF THE EQUIPMENT PACKAGE.

BOC EDWARDS

Form HS2

Return of BOC Edwards Equipment - Declaration

Return Authorisation Number:

You must:

- Know about all of the substances which have been used and produced in the equipment before you complete this Declaration
- Read the Return of BOC Edwards Equipment - Procedure (HS1) before you complete this Declaration
- Contact BOC Edwards to obtain a Return Authorisation Number and to obtain advice if you have any questions
- Send this form to BOC Edwards before you return your equipment

SECTION 1: EQUIPMENT

Equipment/System Name_____

Part Number _____

Serial Number_____

Has the equipment been used, tested or operated ?

YES ❑ Go to Section 2 NO ❑ Go to Section 4

IF APPLICABLE:

Tool Reference Number_____

Process _____

Failure Date_____

Serial Number of
Replacement Equipment_____

SECTION 2: SUBSTANCES IN CONTACT WITH THE EQUIPMENT

Are any substances used or produced in the equipment:

- Radioactive, biological or infectious agents, mercury, poly chlorinated biphenyls (PCBs), dioxins or sodium azide? (if YES, see Note 1) YES ❑ NO ❑
- Hazardous to human health and safety? YES ❑ NO ❑

Note 1 : BOC Edwards will not accept delivery of any equipment that is contaminated with radioactive substances, biological/infectious agents, mercury, PCB's, dioxins or sodium azide, unless you:

- Decontaminate the equipment
- Provide proof of decontamination

YOU MUST CONTACT BOC EDWARDS FOR ADVICE BEFORE YOU RETURN SUCH EQUIPMENT

SECTION 3: LIST OF SUBSTANCES IN CONTACT WITH THE EQUIPMENT

Substance name	Chemical Symbol	Precautions required (for example, use protective gloves, etc.)	Action required after a spill, leak or exposure

SECTION 4: RETURN INFORMATION

Reason for return and symptoms of malfunction _____

_____

If you have a warranty claim:
- who did you buy the equipment from ? _____
- give the supplier's invoice number_____

SECTION 5: DECLARATION

Print your name:_____ Print your job title:_____

Print your organisation:_____

Print your address:_____

_____

Telephone number:_____ Date of equipment delivery: _____

I have made reasonable enquiry and I have supplied accurate information in this Declaration. I have not withheld any information, and I have followed the Return of BOC Edwards Equipment - Procedure (HS1).

Signed: _____ Date_____

Note: Please print out this form, sign it and return the signed form as hard copy.

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