VACGEN

Operating and Maintenence Handbook

All Metal Right Angle Valves

VGS03-01T01

Helping you make the next leap forward

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DISCLAIMER

This manual is to be used as a Guide Only, as there maybe variations between versions and must be used at Owner's Risk.

WARRANTY

1. Subject to fair wear and tear and the due, observance of any installation user, storage, operating or maintenance instructions the Seller undertakes to replace or, at its option repair free of charge to the purchaser, any goods which the purchaser can establish are defective by reason of defective workmanship or materials which are returned to the Seller, carriage paid, within 12 months of the date of despatch by the Seller. In the event, however, that the Seller supplies spare parts either direct, or that are fitted or installed or replaced by the Sellers' service center such spare parts will be subject to a warranty period of six months only.

2. The Purchaser cannot return any product for warranty repair without the prior approval of VACGEN and the issue of a Return Material Authorisation (RMA). This shall be obtained by contacting the service center at VACGEN. All returned products must be accompanied by a completed Declaration of Contamination form. Customers must, in the first instance, contact the local selling agent.

3. We reserve the right to decline to service equipment, we consider is in any way hazardous until a clearance or safety certificate, in a form satisfactory to VACGEN, has been completed and returned by the customer.

REPAIR

The following additional terms and conditions apply in the event that the customer chooses to use the services of VACGEN workshop on a chargeable basis. Warranty is 6 months for the part which has been replaced or repaired by VACGEN, from the date of despatch.

1. At its own cost the customer shall despatch the equipment to the workshop, carriage paid, suitably packaged, protected and insured, bearing, a Return Material Authorisation (RMA) and a completed Declaration of Contamination certificate obtained from VACGEN in advance of shipment.

2. During the period that the equipment is on VACGEN premises, VACGEN will insure the equipment against all risks.

3. VACGEN will provide an acknowledgement of the receipt together with an estimate of the repair charges. Such estimates are carried out on a visual basis and are therefore intended as a guide only. Formal fixed price repair quotations are available and involve the disassembly of the equipment to determine the full extent of the work necessary to restore the equipment to an acceptable standard. In the event that the customer chooses not to proceed with the repair VACGEN will make a charge to cover this examination effort.

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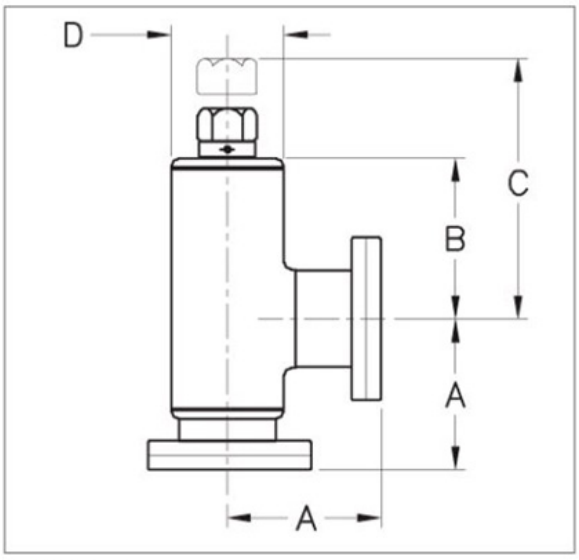
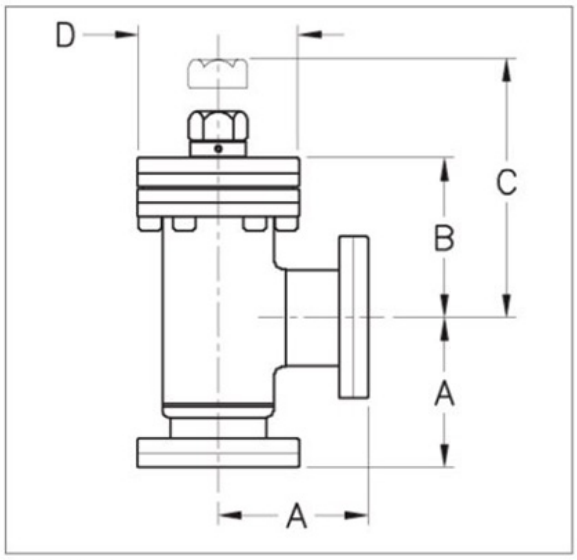
1. Introduction

All metal vacuum valves are used in applications where any organic material cannot be tolerated and more typically, where bakeout temperatures in excess of 200°C are required. The CR and CRD range of all metal right angle valves are heavy duty valves with good conductance.



CR Series



CRD Series

All Metal Right Angled Valves - CR and CRD Series

DN Type	Flange OD mm	Tube OD	Conductance litre/sec	Construction	A mm	B mm	C mm	D mm	Bakeout Temp °C Open	Bakeout Temp °C Closed	Order Code
DN19	Rotatable 34mm	19.1	5	Welded	38	59	86	22	450	300	ZCR20R
DN19	Rotatable 34mm	19.1	5	Demountable	38	59	86	34	450	300	ZCRD20R
DN40	Rotatable 70mm	41.3	34	Welded	63	69	109	49	450	300	ZCR40R
DN40	Rotatable 70mm	41.3	34	Demountable	63	69	109	70	450	300	ZCRD40R
DN63	Rotatable 114mm	63.6	100	Welded	105	106	156	76	450	300	ZCR60R
DN63	Rotatable 114mm	63.6	100	Demountable	105	106	156	114	450	300	ZCRD60R

i. The CR and CRD Series of All Metal Valves

CR and CRD ranges of all metal valves use a sealing technique based on the deformation of a copper pad against a knife edge. This method of sealing has been shown to provide a consistent UHV seal for many thousands of operating cycles. The CR series are right-angle valves with welded bonnet seals. The CR(D) series are available in three sizes - CR (D)20, 40 and 60 (corresponding approximately to the valve port diameters in millimetres).

ii. Sealing Principle

The seal in an all-metal valve is created by elastically deforming an OFHC copper pad against a knife edge. When a new pad is fitted, the initial closure of the valve is carried out at a higher than normal torque level. This is called seal formation and causes permanent deformation of the relatively soft sealing pad against the harder knife edge. Subsequent operations at the lower torque level will elastically compress the pad but not cause further permanent deformation.
Exceeding the stated operating torque can actually make the seal less reliable. If done accidentally, the seal should be reformed at the forming torque and then the normal operating torque can continue to be used.

iii. New Valves

New valves are set up and leak tested prior to despatch, to shut off to the minimum torque level required to seal the valve. During the first bakeout some stress relaxation of the pad and drive components can occur. It is therefore recommended that the shut-off mark be reset at the lowest level of operating torque necessary to seal the valve after the first bakeout is complete. Occasional torque checks are advisable, particularly if bakeout temperature or duration is increased.

Stress relaxation may also occur to a lesser extent when new copper pads are fitted. With demountable valves the bonnet bolts will also relax after the first bakeout and should be retightened with the valve opened.

iv. Maintaining a Leak-Tight Seal

Do not exceed the stated operating torque under normal circumstances.

Minimize the possibilities of abrasive particles entering the valve. Particles embedded in the relatively soft copper pad are by far the most common cause of leaks in all-metal valves. New valves should not be operated unless under vacuum. If the valve has been subjected to long periods of bakeout, the compressive force may have relaxed. Relubrication of the valve drive screw may be required. Use a torque wrench to achieve the correct operating torque. Reset the adjustable index collar (where fitted).

If the sealing pad has been damaged by contamination it may be sufficient to simply increase the operating torque within the available range. If this is not successful, reform the seal at a higher forming torque, and then operate the valve at a proportionately higher operating torque. For CR and CRD valves do not exceed the values given in the section 2.1 by more than 20%. If operating at higher torque fails to achieve a satisfactory seal, the copper pad must be changed. If the knife edge is damaged it will be necessary to return the valve to the factory for reconditioning.

v. Lubrication

Occasional lubrication of the drive screw, using lubricant (part code ZTL), is advisable when the valve is subjected to long term or high temperature bakeouts. The thread should be carefully cleaned with a wire brush before applying fresh lubricant. Do not over apply as this will cause a build up inside the mechanism which can cause the thread to seize up.

vi. Bakeout

The valves may be baked to 450°C in the open position and 300°C in the closed position. If the valve is closed during bakeout, both sides of the valve should be under vacuum. Under no circumstances should the standard valves be baked with any of the internal structure exposed to atmosphere. This will result in oxide formation occurring on the copper sealing pad which impairs the performance of the valve. Special pads are available if exposure to oxygen is unavoidable.

vii. Reconditioning and Servicing

All VACGEN bakeable valves can be reconditioned at the factory. Contact sales@vacgen.com for an RMA. They should be returned carriage paid to the address shown on the RMA form. Information regarding the apparent fault should be supplied with the returned product wherever possible.

Safety Note: When returning valves to our factory, it is very important that the valve is decontaminated (If necessary) and safe to handle. A Declaration of Contamination form is enclosed with the RMA, without this form, repair and or servicing of equipment will not be undertaken.

2. The CR and CRD Series of All-Metal Valves

The CR series are right-angle valves with welded bonnet seals (see figure 1).
The CRD series are right-angled valves with demountable bonnet seals (see figure 2).

i. Specifications of the CR and CRD Series

Valve	Flange OD (mm)	Conductance	Forming Torque Nm (ft lb)	Operating Torque Nm (ft lb)
ZCR20R	34mm	5	4.7 (3.5)	7.7-12.1 (1.7-2.7)
ZCR40R	70mm	34	15.4 (11.4)	7.7-12.1 (5.7-8.9)
ZCR60R	114mm	100	38 (28.1)	19-29.9 (14-21.1)

ii. Changing the Copper Sealing Pad

The copper pad is simply screwed into the movement assembly. A machined slot is provided in the pad for the removal tool (use a large screwdriver on size 20 valves). Some valves have a disc spring or Belleville washer behind the copper pad; take care that this does not get displaced when the pad is removed.

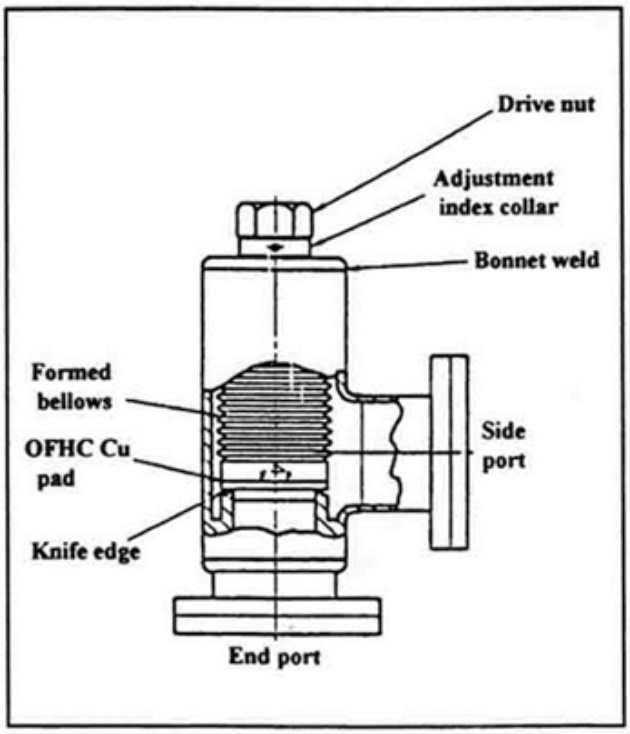


Figure 1 - Welded Bonnet Valve

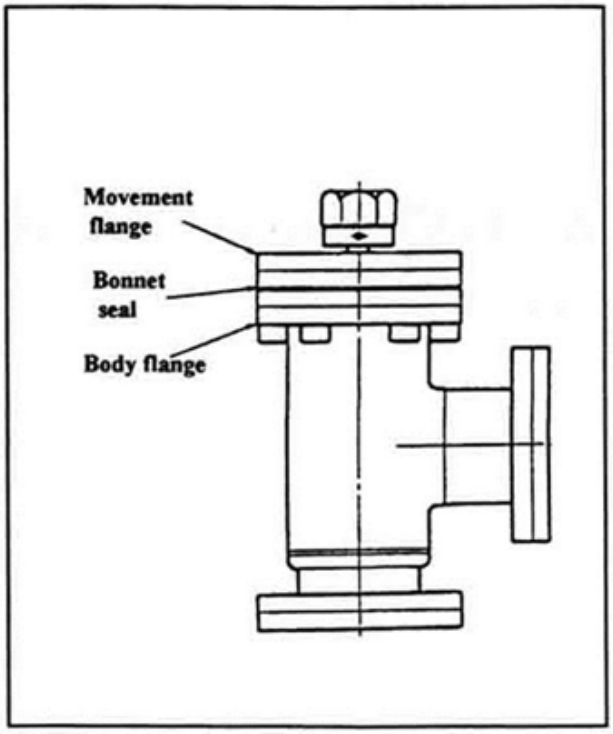


Figure 2 - Demountable Bonnet Valve

Note - Take care not to damage the area of the pad which will form the sealing face when replacing the new pad in the valve.

iv. Valves with Welded Bonnet Seals

To access the pad on valves with welded bonnet seals, remove the valve from the system. The pad can then be unscrewed through the end port and withdrawn, using tweezers or the removal tool to hold the threaded stub, through the side port.

v. Valves with Demountable Bonnet Seals

Valves with demountable movements need not be removed from the system. With the valve open, unscrew the bonnet bolts which clamp the bonnet seal. The conflat knife edge of this seal should be protected at all times, particularly against abrasive oxide particles which may have formed on the copper bonnet gasket of valves subject to high temperature bakeout (silver plated gaskets are available to avoid this problem). Replace the pad as described above. Clean and lubricate the bonnet bolts before refitting.

Note - If necessary, the complete movement assemblies can be replaced for the demountable valves.

3. CR and CRD Spares

Order Code	Description
ZCR20C	OFHC Copper Pad for CR20 and CRD20
ZCR40C	OFHC Copper Pad for CR40 and CRD40
ZCR60C	OFHC Copper Pad for CR60 and CRD60
ZCU19	Copper Gaskets for CRD20 Bonnet Seal
ZCU38	Copper Gaskets for CRD40 Bonnet Seal
ZCU68	Copper Gaskets for CRD60 Bonnet Seal
ZCUSP19	Silver Plated Copper Gaskets for CRD20 Bonnet Seal
ZCUSP38	Silver Plated Copper Gaskets for CRD40 Bonnet Seal
ZCUSP68	Silver Plated Copper Gaskets for CRD60 Bonnet Seal
ZCRD20MA	Movement Assembly for CRD20
ZCRD40MA	Movement Assembly for CRD40
ZCRD60MA	Movement Assembly for CRD60
ZCRHW	Handwheel for CR/CRD40 and CR/CRD60

Revision	Date	Comment	Initials
1	April 1997	Original Release	MJD
2	March 2009		ECN #3342
3	August 2015	VACGEN Branding	AJL
4	March 2021	Standardisation	ILM

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