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SMART BUTTERFLY
COMMANDVALVE™

USER MANUAL



All KF and CF Flanged Generation II Models

Firmware Version 1.7.3

CV-05022023 - V 1.7.3

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TABLE OF CONTENTS

Warranty **2**
Customer Service and Support **2**
Intellectual Property **2**
Safety **5**
Important Safety Information 5
1. General Information **6**
1.1 Introduction 6
1.2 Specifications 7
1.3 Dimensions 8
1.4 Key Components 9
1.5 Valve Repair and O-Ring Replacement 9
1.6 Downloads and Firmware Updates 9
1.7 Parts and Accessories 10
2. Applications **11**
2.1 Roughing, Backing, and High Vacuum 11
2.2 Throttling 12
3. Installation **13**
3.1 Power and Communication Connections 13
3.2 Vacuum Flange Connections 14
3.2.1 KF Flanges 14
3.2.2 CF Flanges 15
4. Operation **16**
4.1 Manual Control 16
4.2 Remote Operation 17
4.2.1 DirectVac II CommandValve Control Software 17
4.2.2 Terminal Software 18
4.2.3 Serial Commands Summary 19
4.2.4 Serial Command Details 20

LIST OF FIGURES

Figure 1 - CommandValve package contents 6
Figure 2 - Key components 9
Figure 3 - CommandValves used as roughing, backing and high vacuum valves 11
Figure 4 - CommandValves used for throttling applications 12
Figure 5 - Wiring connections 13
Figure 6 - Valve stem orientation 14
Figure 7 - KF type CommandValve connection 14
Figure 8 - CF type CommandValve Connection 15
Figure 9 - Finished CF connection 15
Figure 10 - Handle sticker with LED color key 16
Figure 11 - Switching modes 16
Figure 12 - DirectVac II CommandValve control software interface 17
Figure 13 - Select the COM port 18
Figure 14 - Serial Commands in Termite 18

LIST OF TABLES

Table 1 - Technical specifications 7
Table 2 - KF flanged CommandValve dimensions 8
Table 3 - CF flanged CommandValve dimensions 8
Table 4 - CommandValve parts 9
Table 5 - Replacement parts and accessories for KF CommandValves 10
Table 6 - Replacement parts and accessories for CF CommandValves 10
Table 7 - CF flange bolt torques and kits 15
Table 8 - Summary of serial commands 19

SAFETY

IMPORTANT SAFETY INFORMATION

Thank you for purchasing this equipment from Ideal Vacuum Products. We want you to operate it safely.

- **Read this manual before installing or operating this equipment. Failure to follow the warnings and instructions may result in serious injury or equipment damage.**
- **Keep this manual in a safe location for future reference.**
- **This equipment should only be installed and operated by trained, qualified personnel, wearing appropriate protective equipment.**
- **Follow all codes that regulate the installation and operation of this equipment.**

DANGER



CommandValves are not hermetically sealed. They include O-rings on the valve stem. DO NOT use CommandValves in applications where acutely toxic chemicals are present.

CommandValves have been tested at many times higher than the positive pressure specifications described here without leaking. However, the butterfly stem O-ring seals could start to leak when process contaminants deposit on the shaft stem.

CAUTION



Always wear protective equipment, including safety glasses and gloves. Exercise care when working with vacuum equipment.

NOTICE



CommandValves are not suitable for:

- **Temperatures above 50°C**
- **Differential pressure >15 psi**

NOTE

To eliminate installation delays, test all automation and control operations of the CommandValve before installing it into the vacuum system.

1. GENERAL INFORMATION

1.1 INTRODUCTION

The Ideal Vacuum Products (IVP) series of CommandValves™ are smart electronic butterfly valves. They are a reliable, low-cost alternative to manual or pneumatic gate valves. CommandValves are available in ISO KF sizes from KF-16 to KF 50, and in Conflat sizes from CF 1.33” to CF 3.375”.

These smart valves are operated either manually, using onboard pushbutton controls, or by computer control via an integrated USB virtual serial port. This makes our CommandValves an excellent solution for vacuum system integration, automation, and control. These IVP exclusive high flow butterfly valves feature a small footprint, the shortest possible gas path, high accuracy, and fast closure time (~270ms). CommandValves are rated for high vacuum applications to 3 x 10^{-8} Torr, and for positive pressures to 15 psig. They have an operating temperature range of 0° C to 50° C and a MTTR (mean time until repair) of 30,000 cycles. CommandValves employ O-ring stem seals which does not allow them to be used for ultra-high vacuum.

CommandValves can be used as roughing, backing, and high vacuum valves. Because they can be opened and closed incrementally in 0.1 degree increments, from 90 degrees (fully open) to 0 degrees (closed), these valves can be used for precision throttling of the exhaust or purge line where it is desirable to maintain a steady vacuum chamber pressure (i.e., for altitude simulation).

CommandValve bodies and butterflies are made exclusively of 304L stainless steel, and have Viton® FKM O-ring seals[1].

Documentation, firmware updates (if available), and DirectVac™ II software for CommandValve control is freely downloadable from any CommandValve product listing page at idealvac.com.

CommandValves are powered by low voltage (12 VDC). A universal power supply adapter (input 100-240VAC 50/60Hz, output 12 VDC@3A) and a USB-A to USB-B mini cable are included with each CommandValve package.



Figure 1 - CommandValve package contents

1 - *Viton is used because of its low permeability, resistance to heat, compression set, and degradation by a great variety of fluids and chemicals, including oils, fuels, lubricants, most mineral acids, and aliphatic and aromatic hydrocarbons.*

1.2 SPECIFICATIONS

PARAMETER	MEASURE/TYPE
KF Flange Sizes	KF-16, KF-25, KF-40, KF-50
CF Flange Sizes	CF 1.33”, CF 2.125”, CF 2.75”, CF 3.375”
Minimum Vacuum	$3x10^{-8}$ Torr (high vacuum)
Maximum Pressure	15 psig
Conductance	KF-16 / CF 1.33”: 3 liters/sec KF-25 / CF 2.12”: 10 liters/sec KF-40 / CF 2.75”: 30 liters/sec KF-50 / CF 3.38”: 85 liters/sec
Operating Temperature Range	0° to 50° C
Operation	Manual: Via two onboard control buttons Remote: RS-232 serial via USB-B mini port (3 ft. USB cable included)
Leak Rate	1 x 10^{-9} std cc/sec. Helium
Position Range	0° to 90°
Position Accuracy	< 0.5°
Open-to-Close time	270 ms
MTTR (mean time until repair)	30,000 cycles
Materials Exposed to Vacuum	Valve body & butterfly: 304L stainless steel Seals: Viton
Input Voltage	12 VDC
Maximum Current	0.47A
Power Consumption at Idle	0.78W
Power Consumption in Motion	5.58W
AC Power Adapter	Universal 100-240 VAC, 50/60 Hz to 12 VDC@3A power supply included
Input Power	100-240 VAC, 50/60 Hz

Table 1 - Technical specifications

1.3 DIMENSIONS

Please see Sec. 3.2, p. 15 for making vacuum flange connections.

KF Flanged CommandValves					
Flange	**Part #**	**A**	**B**	**C**	**D**
KF-16	**P108390**	**5.73 in.** (145.6 mm)	**0.59 in.** (15.0 mm)	**1.50 in.** (38.1 mm)	**2.00 in.** (50.1mm)
KF-25	**P108389**	**6.41 in.** (162.9 mm)	**0.94 in.** (23.9 mm)	**2.125 in.** (54.0 mm)	**2.00 in.** (50.1 mm)
KF-40	**P108388**	**7.07 in.** (179.4 mm)	**1.48 in.** (37.6 mm)	**2.74 in.** (69.6 mm)	**2.25 in.** (57.2 mm)
KF-50	**P108185**	**7.27 in.** (184.8 mm)	**1.96 in.** (49.8 mm)	**2.95 in.** (75.0 mm)	**2.24 in.** (56.9 mm)

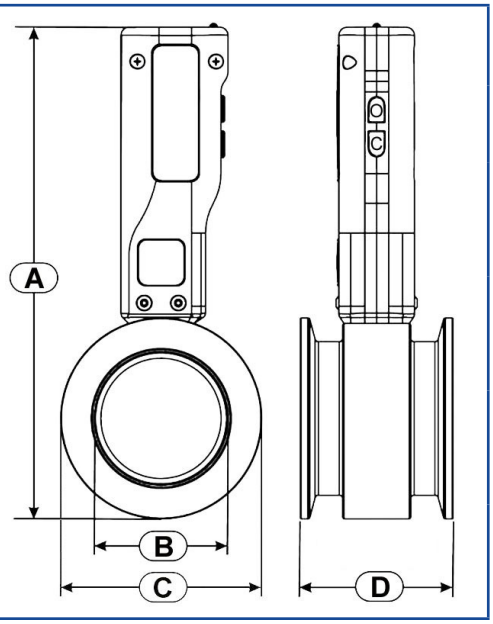
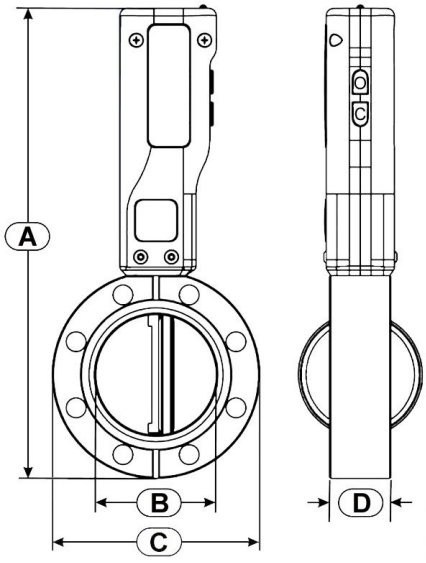


Table 2 - KF flanged CommandValve dimensions

CF Flanged CommandValves					
Flange	**Part #**	**A**	**B**	**C**	**D**
CF 1.33”	**P108517**	**5.84 in.** (148.3 mm)	**0.72 in.** (18.3 mm)	**1.33 in.** (33.8 mm)	**1.00 in.** (25.4mm)
CF 2.125”	**P108436**	**6.41 in.** (162.9 mm)	**0.94 in.** (23.9 mm)	**2.125 in.** (54.0 mm)	**1.00 in.** (25.4mm)
CF 2.75”	**P108437**	**7.07 in.** (179.5 mm)	**1.48 in.** (37.6 mm)	**2.75 in.** (69.9 mm)	**1.00 in.** [1] (25.4mm)
CF 3.375”	**P108438**	**7.71 in.** (195.8 mm)	**1.96 in.** (49.8 mm)	**3.375 in.** (85.7 mm)	**1.00 in.**[2] (25.4mm)



1 - Total width is 1.53 in. (38.9 mm) when valve is fully open (butterfly extends beyond valve body).
2 - Total width is 2.02 in. (51.3 mm) when valve is fully open (butterfly extends beyond valve body).

Table 3 - CF flanged CommandValve dimensions

1.4 KEY COMPONENTS

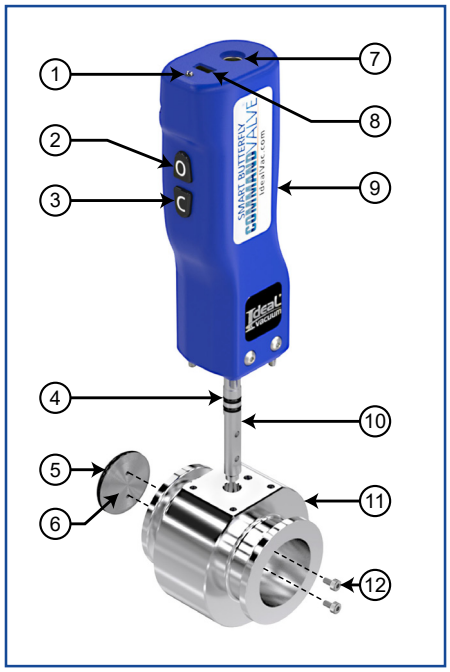


Figure 2 - Key components

Item	Description
1	LED power and position indicator
2	Open push button
3	Close push button
4	Valve stem (shaft) O-ring seals
5	Butterfly o-ring seal
6	Butterfly
7	DC input connector 2.1x5.5 mm, center positive
8	Mini USB-B serial port
9	Valve handle
10	Valve stem
11	Valve body
12	Vented butterfly retaining screws

Table 4 - CommandValve parts

1.5 VALVE REPAIR AND O-RING REPLACEMENT

CommandValve shaft O-rings cannot easily be replaced since the handle must be disassembled in order to remove the shaft from the unit. It is recommended to return the valve to Ideal Vacuum where trained technicians can replace the butterfly and shaft O-rings and helium leak check the valve. Please contact customer support for CommandValve service.

1.6 DOWNLOADS AND FIRMWARE UPDATES

The most recent CommandValve information is provided on idealvac.com and is found on any CommandValve listing page. Free downloads include:

- The most recent version of this manual.
- The IVP Firmware Update Tool and Patch Notes User Manual in which a link to the Firmware Update Tool software is provided..
- DirectVac II software (control software for the CommandValve).

Firmware:

CommandValve firmware may occassionally be updated to fix minor issues or to add new features. Firmware updates can be downloaded and installed through the USB port **ONLY IF THE COMMANDVALVE HAS VERSION 1.7.1 FIRMWARE OR NEWER.** The valve's firmware version can be verified through the DirectVac II software or by querying the valve through terminal software using the ***version*** serial command (see Sec. 4.2.2, p. 19, Terminal Software). Older versions of the firmware cannot be upgraded through the USB port by download. Please contact customer support for update options or for technical support.

1.7 PARTS AND ACCESSORIES

We have a large offering of connection hardware and sealing gaskets in all sizes and types. Please see Sec. 3.2, p. 15 for making CommandValve to vacuum flange connections.

To prevent galling or seizing and to eliminate the need for thread lubricants, silver plated bolts are recommended for CF connections larger than 1.33".

KF Flanged CommandValve Replacements and Accessories				
Description	**KF-16**	**KF-25**	**KF-40**	**KF-40**
Centering Ring w/ Viton O-Ring	**P101242**	**P101243**	**P101244**	**P101245**
Hinge Clamp w/ Wing Nut	**P101198**	**P101199**	**P101200**	**P101201**
Bulkhead Clamp	**P104598**	**P104599**	**P104600**	**P104601**

Table 5 - Parts and accessories for KF CommandValves

CF Flanged CommandValve Replacements and Accessories				
Description	**CF 1.33"**	**CF 2.125"**	**CF 2.75"**	**CF 3.375"**
Viton Conflat Gasket	**P104339**	**P104340**	**P104341**	**P104342**
Copper Conflat Gasket	**P102277**	**P104337**	**P102278**	**P102279**
Connection Bolt Kit	**P108981**	**P108970**	**P108980**	**P108979**
Full Extension Nipple			**P102207**	**P108986**

Table 6 - Parts and accessories for CF CommandValves

NOTICE

The butterfly in CF 2.75" and 3.375" Conflat flanged CommandValves extends slightly past the valve flange when the valve is fully open. On these valves, use a short nipple to move the valve away from the high vacuum pump. This ensures the butterfly does not contact the rotator or inlet when the valve is opened fully. Pump or valve damage could result. The butterfly does not protrude on CF 1.33" or CF 2.125" valves and a nipple is not needed for these smaller CommandValves.

2. APPLICATIONS

CommandValves can be used in roughing and high vacuum backing lines to direct gas flow from the vacuum chamber to the roughing pump, or between the high vacuum and backing pumps. Although not recommended, they can also be used as replacements for no valve, manual, or pneumatic gate valves between a small high vacuum pump and chamber.

NOTICE

CommandValves do not close automatically and are not intended as a failsafe valve. If a power failure occurs, high vacuum pump damage could result.

Because the opening angle of the CommandValve butterfly can be controlled, they are ideally suited for use as throttling valves for pressure and flow control when plumbed into the roughing line or when used as vent or purge valves.

2.1 ROUGHING, BACKING, AND HIGH VACUUM

Figure 3, below, illustrates a typical example of a high-vacuum system that includes three CommandValves. One valve controls roughing of the vacuum chamber. Another is used to open and close the backing line between the exhaust port of the high vacuum turbo pump and the backing (roughing) pump. The third is used between the high vacuum pump and the chamber.

Starting at ambient atmosphere, the roughing valve is opened and the backing and high vacuum valves are closed. The roughing pump is powered on and roughing begins. When the high vacuum crossover threshold pressure is reached, the roughing valve is closed and the backing and high vacuum valves are opened. When the process is completed, the high vacuum and backing valves are closed and the chamber is vented to atmosphere. Automating and synchronizing these valves can be readily accomplished using the CommandValve's computerized control capabilities. (see Sec.4.2, p.17, Remote Operation).

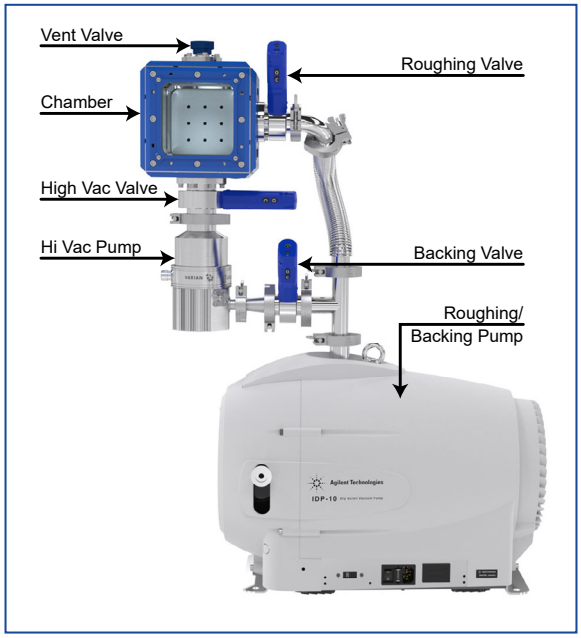


Figure 3 - CommandValves used as roughing, backing and high vacuum valves

2.2 THROTTLING

CommandValves are commonly used for pressure and flow control (throttling) in the medium vacuum range, where a desired pressure is maintained inside the vacuum chamber. Because the CommandValve can be set to any angle between fully open and closed, the CommandValve provides a means to regulate the removal rate of chamber gases.

In throttling applications, a vent or purge leak valve is installed on the chamber to supply a constant low flow rate of gas into the chamber. A pressure gauge and controller is used to monitor the pressure in real-time, and a CommandValve is plumbed between the chamber and vacuum pump. With the CommandValve under computer control, the software program monitors chamber pressure and constantly adjusts the CommandValve's butterfly angle to throttle the evacuated gas flow rate so that the desired chamber pressure is maintained. For the most precise pressure and flow control, the vent or purge leak valve is replaced with a second CommandValve. With computer control, the two CommandValve's are synchronized to work together to maintain the target pressure more precisely than with just one valve. Figure 4, below, shows an example of the use of CommandValves in a throttling application (An MKS Baratron® 626D capacitance manometer gauge and an IVP Dual Capacitance Manometer Gauge Controller, P1010127 are illustrated).

It is important to know the pump's maximum continuous operation limits when planning for a process which requires flow control. The system designer must ensure that the pump, whether a roughing or high vacuum pump, is sized to have sufficient continuous pumping speed to overcome the vent or purge valve flow rate, at least enough to drop the chamber's pressure to the desired target pressure range. A well-designed throttling system should also consider the conductance of the vacuum tubing.

When operating a turbo pump under throttling conditions (typically between 0.5 to 10 Torr), where it is operating at its maximum flow rate for extended periods, the pump will run hot from the high current load. This can cause premature bearing failure. To extend turbo bearing life, use water cooling when the pump is used for throttling applications.

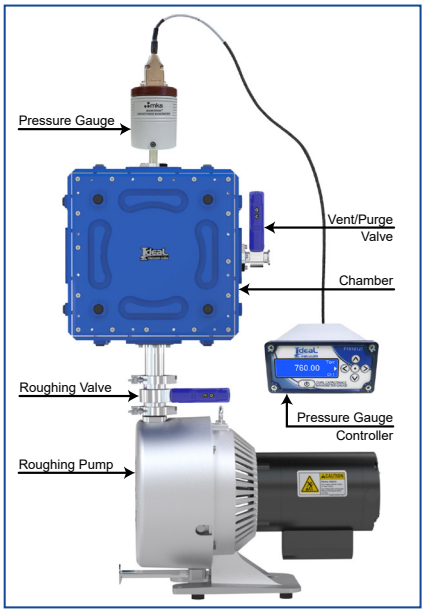


Figure 4 - CommandValves used for throttling applications

3. INSTALLATION

3.1 POWER AND COMMUNICATION CONNECTIONS

The CommandValve needs just two connections: power and communications. If the valve is operated manually, only the power supply needs to be connected (see Chap. 4, p. 16 - Operation).

The CommandValve does not have an on/off switch. Plug the supplied AC/DC power adapter into a convenient outlet and the adapter's power cord into the CommandValve. The valve immediately powers on. It goes through a "homing cycle" and the LED illuminates. Disconnect the cable to power the valve off.

Communication with a remote computer is via the included USB-B mini to USB-A cable. Plug the USB-B mini connector into the valve, and plug the USB-A connector into the computer (see Sec. 4.2, p. 17, Remote Operation).

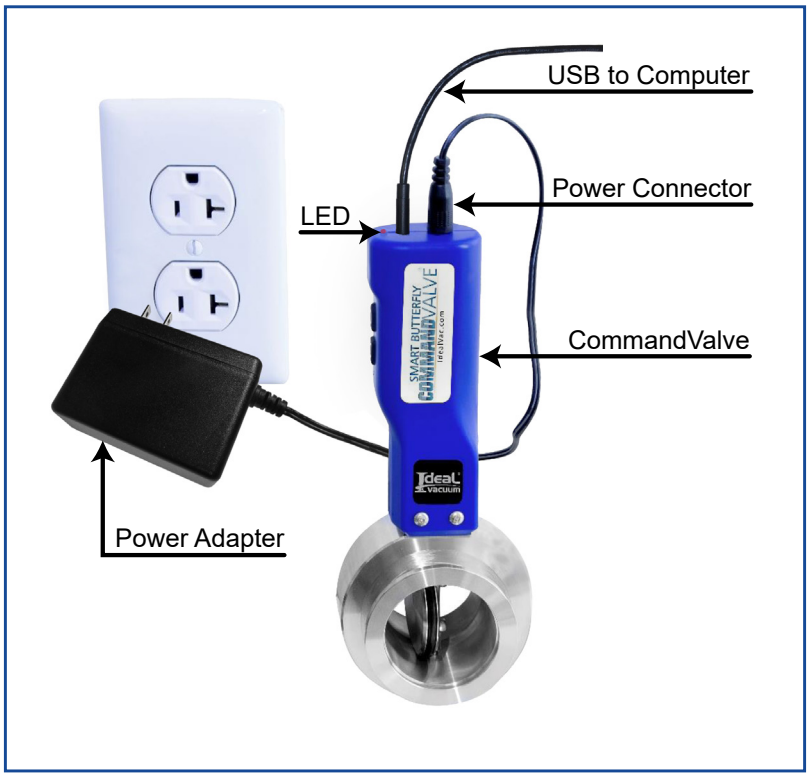


Figure 5 - Wiring connections

3.2 VACUUM FLANGE CONNECTIONS

CommandValves are available with either KF or CF flanges. Installation of the valve depends on the flange type and its location in the vacuum system.

When used as a roughing, backing or high vacuum valve, the valve stem should face towards the pump. When used as a vent or purge valve, the valve stem should face towards the chamber.

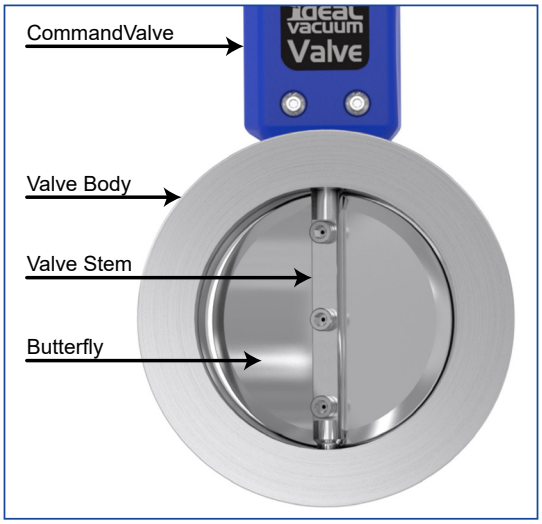


Figure 6 - Valve stem orientation

3.2.1 KF FLANGES

To install a CommandValve in-line with KF type flanges, refer to Figure 7, below. Mate the KF flange faces of the CommandValve to the KF flange faces of the vacuum line on either side of the valve. Use KF centering rings with O-ring seals between the flanges. Wrap a KF hinge clamp around the mated flanges and tighten the wing nuts until the seals are tight. The KF connection is appropriate for applications down to $3x10^{-8}$ Torr.

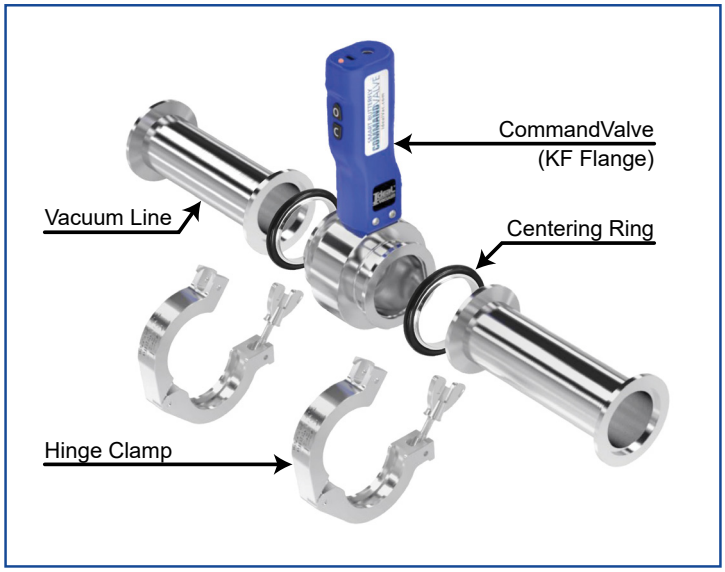


Figure 7 - KF type CommandValve connection

3.2.2 CF FLANGES

CommandValves with CF flanges are designed with through bolt holes. To install a CommandValve in-line with CF type flanges, the two mating CF flanged line fittings must also have through bolt holes. Viton or copper gaskets are used to seal the flanges on either side of the valve. Long bolts go through both line fittings and the CommandValve, and are secured with platenuts (see Figure 8 below). We recommend using silver plated bolts on CommandValves larger than 1.33" to prevent galling or seizing and to eliminate the need for thread lubricants. In order to make sure the gaskets remain properly aligned over the flange's knife edge, we recommend the fittings be stacked vertically when connecting the joints, if possible. Use care not to bang parts together which could damage the Conflat knife edges. If flanges are fitted with leak-test grooves, the grooves should be aligned.

Tighten the bolts gradually in 1/8 to 1/4 turn increments in an alternating crisscross pattern. Continue tightening incrementally until the proper torque ratings have been achieved (see torque specifications in Table , below).

CF flanged CommandValves contain O-ring seals on the valve stem. This limits ultimate chamber pressure to that of an O-ring sealed system, typically $3x10^{-8}$ Torr.

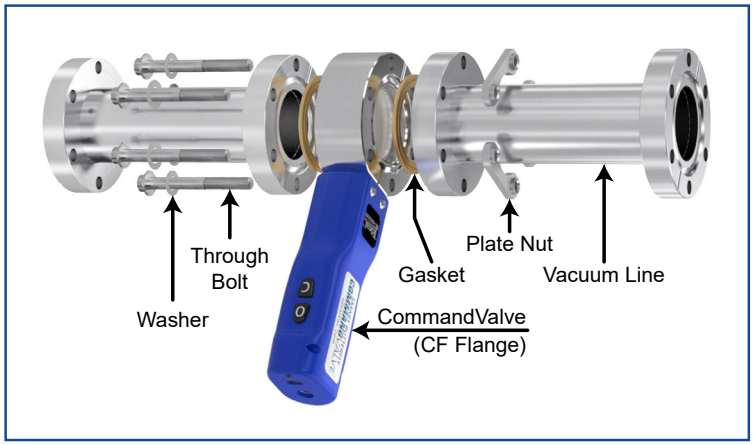


Figure 8 - CF type CommandValve Connection



Figure 9 - Finished CF connection

Torque Limits and Bolt Kits for CF Flanged CommandValves				
CF Flange Size	**# of Bolts**	**Bolt Size**	**Torque (in-lbs.)**	**Bolt Kit**
1.33"	6	8-32 x 1.25"	28	P108981
2.12"	4	1/4-28 x 2.25"	110	P108980
2.75"	6	1/4-28 x 2.25"	110	P108980
3.38"	8	5/16-24 x 2.5"	190	P108979

Table 7 - CF flange bolt torques and kits

NOTICE

The butterfly in Conflat flanged CommandValves (CF 2.75" and CF 3.375") extends slightly past the valve flange when the valve is fully open. Use a short nipple to move the valve away from the high vacuum pump to ensure the butterfly does not contact the rotator or inlet when the valve is opened fully.

4. OPERATION

The CommandValve can be operated either manually, using the onboard pushbuttons, or remotely with serial commands via USB. The LED on the end of the valve handle indicates the valve state: red is closed, orange is partially open, and green is fully open (90°). Note that CommandValves do not close automatically. If power is disconnected or a power failure occurs, the valve remains in its present position.

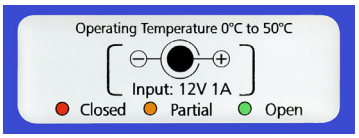


Figure 10 - Handle sticker with LED color key

When initially powered, the CommandValve goes through a “homing” cycle. The homing cycle calibrates motor power, mechanical backlash, and sets the 0° (closed) position of the valve’s butterfly. Whenever the valve is re-energized, or a ***RST**, ***reset*** or ***home*** serial command is sent to the valve, it automatically performs a homing cycle. During the homing cycle, serial commands are inactive. (see Sec. 4.2.3, p. 19, Serial Commands Summary).

4.1 MANUAL CONTROL

The CommandValve can be controlled locally by the Open and Close push buttons on the valve’s controller handle. There are two operational modes: Full Open/Close and Incremental. There are also two speed modes: Maximum and Slow (see Slow command, p. 21). The last operational and speed mode settings are saved and persist when valve power is cycled, unless subsequently changed.

Full Open/Close Mode:

In Full Open/Close Mode the valve goes to the fully open position when the Open button is pressed (butterfly at 90°), and goes from its current position to the closed position when the Close button is pressed.

Incremental Mode:

In Incremental Mode (the factory default) the valve goes to a position between open and closed when the Open or Close button is momentarily pressed.

Switching Operational Modes:

To switch between Full Open/Close and Incremental modes, press and hold both the Open and Close buttons simultaneously for a few seconds. The LED will flash several times indicating the mode is changed.

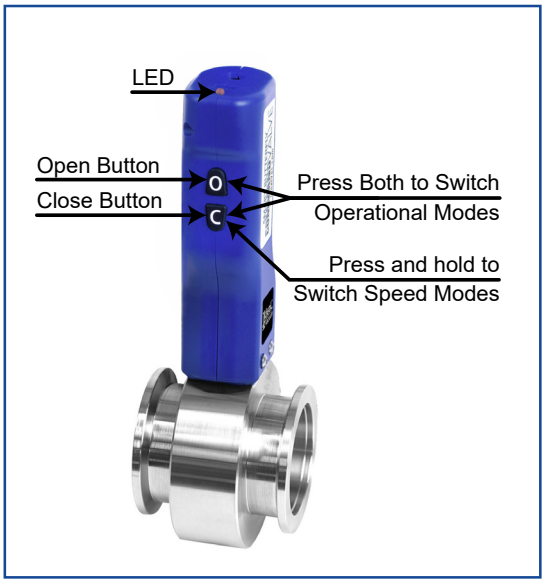


Figure 11 - Switching modes

Switching Speed Modes:

To switch between the maximum butterfly speed (the factory default) and “slow” mode, where the butterfly opens and closes at just over its minimum speed, press and hold down the Close button for 4 seconds. The LED will flash once indicating the mode is changed. To switch back to maximum speed, press and hold the Open button for 4 seconds. The LED will flash once again.

4.2 REMOTE OPERATION

Any device capable of running a USB host and that can communicate serial commands can precisely operate the CommandValve. The CommandValve can be operated with IVP's DirectVac II software, freely downloadable from any CommandValve listing on idealvac.com, with terminal software, such as Termite®, by writing a CommandValve control program, or by integration into an existing system automation program.

4.2.1 DIRECTVAC II COMMANDVALVE CONTROL SOFTWARE

IVP's DirectVac II software is a Windows program that controls a CommandValve. The software is compatible with CommandValves with firmware version 1.7.2 or newer. The program provides an animated representation of the valve's operation in real-time and allows the user to easily and precisely operate the valve with buttons or to directly input serial commands (see Sec. 4.2.3, p. 19, Serial Commands Summary).

CLICK HERE to Download DirectVac II Software

To Manually Download and Install DirectVac II CommandValve Control Software:

1. Go to idealvac.com
2. Go to any CommandValve product listing.
3. Download the IVP DirectVac II CommandValve Control Software.exe file.
   The file will typically be saved in the Windows Downloads folder.
4. Double-Click the DirectVac II Setup.exe file.
5. Follow the on-screen prompts to install the software
   During installation you can choose to add a shortcut and this manual to the Desktop.
6. After the installation is finished, connect the CommandValve to the computer with the USB cable and connect power.
7. If you selected to have a shortcut placed on the desktop during installation, double-click it. Alternatively, go to the Windows Start Menu. Select DirectVac II from the IdealVac folder.

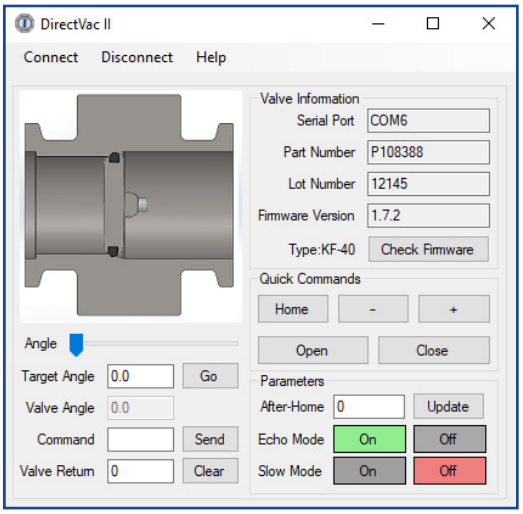


Figure 12 - DirectVac II CommandValve control software interface

4.2.2 TERMINAL SOFTWARE

There are many CommandValve automation and control features available through serial communication. Another method to control the valve is by using terminal software, such as Termite (compuphase.com/software_termite.htm). The computer communicates with the valve through the supplied USB-B mini to USB-A cable. The distance between the valve and computer can be increased by a USB extension cable (part number P1012818).

Before operating the valve, the CommandValve's COM port must be selected. Figures 13 and 14 below show the set up and operation using Termite.

1. Download (if necessary) and start the terminal software.
2. Click Clear.
3. Click Settings.
4. Choose the valve's COM port, then press OK.

   The correct COM port must be selected before the valve will accept commands. Choose the COM port below COM1 (COM1 is auto-entered, but it is not the correct port). In Figure 13, the CommandValve is on COM4.

   If there is not a second COM port available in the pull down menu, disconnect and reconnect the valve's USB cable, then restart Termite.

5. Make sure the Append LF (line feed) is selected. In Termite, this adds a (hidden) terminating line feed character (\n) to all serial commands. All serial commands must be terminated with a line feed in order to operate correctly.
6. Finish by selecting Data bits, Stop bits, Parity, and no Flow control none.

Figure 15 shows some of the available serial commands. A complete list with detailed information is on the following pages.

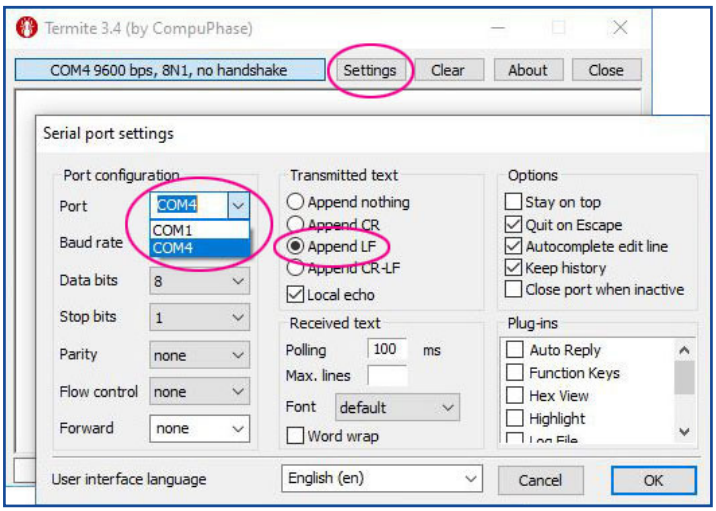


Figure 13 - Select the COM port

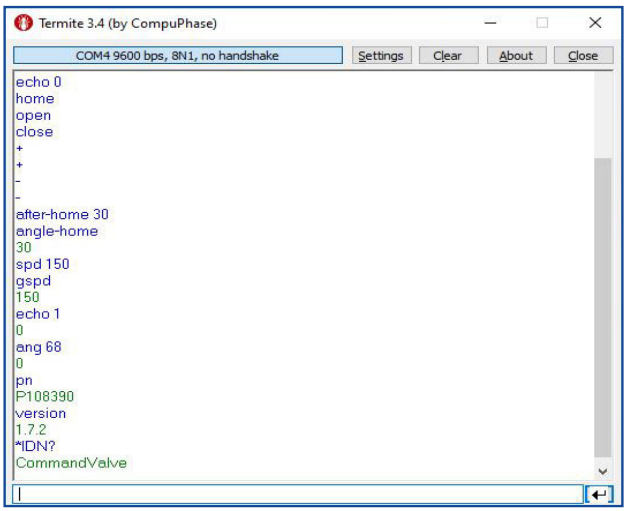


Figure 14 - Serial Commands in Termite

4.2.3 SERIAL COMMANDS SUMMARY

Table 8, below, summarizes the available RS-232 serial commands. The pages that follow describe in detail the use of and syntax for each command. Commands are case sensitive. When using terminal software or if writing a custom program, all serial commands must be terminated with a line feed (\n). The serial port parameter setting is 8-N-1 (8 data bits, no parity, and one stop bit). The CommandValve can handle transmission baud rates up to 115200 bit/s.

Command	Function
echo[2]	Enables or disables command feedback (replies) for select commands.
open	Sends the butterfly to the fully open position (90°).
close	Sends the butterfly to the closed position (0°).
ang	Sends the butterfly to a user specified angle.
+	Opens the butterfly by 1°.
-	Closes the butterfly by 1°.
stop	Immediately stops the butterfly at its current postion.
pos	Gets the current angular position of the butterfly in degrees.
err	Gets the butterfly's current deviation from the target position in degrees.
home	Performs the valve's homing cycle and sets the 0° closed position.
after-home[2]	Defines the angle the butterfly will return to after each home cycle.
angle-home	Returns the currently set **after-home** angle.
slow[2]	Enables and disables reduced butterfly rotational speed.
version	Gets the firmware version of the valve.
pn	Gets Ideal Vacuum's valve part number.
sn	Gets the serial number (lot number) of the valve.
***IDN?**	Gets the unique product identifcation/model number of the valve (VISA).
***RST**	Reboots the valve and performs a homing cycle (VISA).
reset	Same as *RST.
warning	Returns the warning register. When only a warning is active and no errors, the valve will operate and move normally.
error	Returns the current error code. If error code is not "0" then the valve will not move.
defaults	Resets valve to factory defaults: (Echo mode=off, Home angle=0, Slow mode=off, Push buttons=incremental mode)

***2** - This setting is saved in non-volatile memory and persists when valve power is cycled, unless subsequently changed.*

Table 8 - Summary of serial commands

4.2.4 SERIAL COMMAND DETAILS

echo <#>

Description: Enables or disables feedback on commands that do not reply with a numerical or string value.

This setting persists when valve power is cycled, unless it is subsequently changed.

Argument: 0 or 1 (0 = off, 1 = on). *echo 0 is the default.*

Example: ***echo 0*** (turns off command feedback from the valve on select commands).

echo 1 (turns on command feedback from the valve on select commands).

Reply: When echo is on, these echo codes may be returned:

Echo Code	Description
0	Command received OK. Command Successful.
1	Command received. Invalid argument.
2	Command received. Missing argument.
3	Invalid command.
4	Cannot execute command. Valve is in an error state.
5	A warning was triggered. Check valve warning code.
6	An error was triggered. Check valve error code.

open

Description: Sends the butterfly to 90° (the fully open position).

Reply: 0 - 6 (when echo is on). 0 = Success.

close

Description: Sends the butterfly to 0° (the closed position).

The close command returns the valve's butterly to 0° as determined by the homing cycle. It is equivalent to entering a command of ***ang 0****.*

Reply: 0 - 6 (when echo is on). 0 = Success.

ang <##.#>

Description: Opens the butterfly to a user specified angle.

Argument: Range is 0.0 to 90.0

Example: ***ang 25*** (opens the butterfly to 25° from closed position).

Reply: 0 - 6 (when echo is on). 0 = Success.

+

Description: Opens the butterfly 1° from its current position.

Reply: 0 - 6 (when echo is on), 0 = Success, 1 = angle is already at 90°.

-

Description: Closes the butterfly 1° from its current position.

Reply: 0 - 6 (when echo is on), 0 = Success, 1 = angle is already at 0°.

stop

Description: Immediately stops the butterfly's motion at its current position.

Reply: 0 - 6 (when echo is on). 0 = Success.

pos

Description: Gets the angular position of the butterfly in degrees (from the closed position).

Reply: *<##.#>*

err

Description: Gets the valve's current deviation from the target position in degrees.

Reply: *<##.#>* (range -90.0 to 90.0)

When the butterfly is static, ***err*** *should not be more than ±0.5 degrees.*

If **err** *is requested while the butterfly is in motion, err could be significantly larger.*

home

Description: Runs the valve's homing cycle.

The homing cycle calibrates motor power, mechanical backlash, sets the 0° (closed) position of the valve's butterfly, sets the minimum butterfly rotational speed, and positions the butterfly to the ***after-home*** *angle.*

During the homing cycle, serial commands are inactive.

Reply: 0 - 6 (when echo is on), 0 = Success. *Reply is delayed until homing cycle is completed.*

after-home *<##>*

Description: Defines the opening angle that the butterfly will return to after each home cycle.

This setting persists when the valve is ***reset*** *or when valve power is cycled, unless it is subsequently changed.*

Argument: Range is 0 to 90 (integer values only). *after-home 0 is the default.*

Example: ***after-home 20*** (butterfly opens to 20° after power is cycled or valve is reset.

Reply: 0 - 6 (when echo is on), 0 = Success

angle-home

Description: Gets the currently set ***after-home*** angle.

Reply: *<##.#>*

slow <#>

Description: Enables or disables slower butterfly rotation.

*The **slow** speed is set just above the minimum butterfly speed, as determined during the **home** cycle.*

This setting persists when valve power is cycled or **reset** *command is entered, unless it is subsequently changed.*

Argument: 0 or 1 (0 = off, 1 = on). *slow 0 is the default.*

Example: ***slow 0*** (butterfly rotates at maximum speed).

slow 1 (butterfly rotates at reduced rotational speed).

Reply: 0 - 6 (when echo is on), 0 = Success.

version

Description: Gets the valve's firmware version number.

Please check idealvac.com for the latest firmware revision (see Sec. 1.7, p. 11).

Reply: *<#.#.#>*

pn

Description: Gets the valve's Ideal Vacuum product number.

This is the specific valve product number (SKU number) listed on idealvac.com.

Reply: P<#######>

sn

Description: Gets the valve's serial/lot number.

This number is needed when contacting Ideal Vacuum's customer support.

Reply: *<#####>*

*IDN?

Description: Gets the valve's unique product identification (VISA)

Reply: "CommandValve"

*RST

Description: Reboots the valve and the valve performs a homing cycle.

*The homing cycle calibrates motor power, mechanical backlash, sets the 0° (closed) position of the valve's butterfly, sets the minimum butterfly rotational speed, and positions the butterfly to the **after-home** angle.*

During the homing cycle, serial commands are inactive.

*User defined **echo**, **slow**, **spd**, and **after-home** settings persist after ***RST** or **reset.***

Reply: 0 - 6 (when echo is on), 0 = Success. *Reply is delayed until homing cycle is completed.*

reset

Description: Behaves the same as *RST.

warning

Description: Returns the warning register.

When a warning is active but there are no errors, the valve will operate normally.

Reply: These warning codes may be returned:

Warning Code	Description
0	No warning stored. Status OK.
1	Valve required excessive power to open during home cycle.
2	Valve required excessive power to close during home cycle.
4	Valve backlash value too high.

Warning codes are stored in an 8 bit register and returned via serial in integer format. Multiple warnings can be active on the valve. For example, a warning code of "6" would be returned if both warning 2 and warning 4 are active.

Warnings are automatically reset by the valve if the condition causing the warning is no longer encountered.

error

Description: Returns the current error code.

Reply: The error codes (below) may be returned.

Note: If the error code is not "0" then the valve will not move.

Any error code is resolved by homing the valve.

Error Code	Description
0	No error stored. Status OK.
1	Valve has not yet been homed successfully.
2	Homing failure. Valve failed to open.
3	Homing failure. Valve failed to close.
4	Homing failure. Valve failed to calibrate position.
5	Homing failure. Failed to calibrate backlash.
6	Homing failure. Failed to calibrate valve speed.

Only one error code is stored at any time. If an error is encountered, the valve will not attempt to execute any moves except a homing cycle. An error code is automatically reset by the valve if the condition causing the error is no longer encountered.

defaults

Description: Resets the valve to factory defaults:

Echo mode = off

Home angle = 0°

Slow mode = off

Push buttons = incremental mode



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