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# SIGNAL CONVERTER

# (Ideal Vacuum Product Number: P1012593) USER MANUAL



## For All CommandValves

SVSC-03072025- V 1.0.4

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Prior to returning any product, we require that you contact us by phone or email to determine if the issue can be resolved quickly. A technical support representative will work with you to resolve the problem. If the issue cannot be resolved in that manner, we will issue an RMA number and provide product return instructions.

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If you have any questions concerning the installation or operation of this equipment, or if you need warranty or repair service, please contact us. Customer Service and Technical Support is available weekdays, from 8am-5pm, Mountain Time.

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## TABLE OF CONTENTS

/arranty2		
Customer Service and Support	2	
Intellectual Property	2	
Safety	3	
1. Overview	4	
1.1 Description	4	
1.2 Dimensions and Mounting	4	
1.3 What is Included	5	
2. Connections	6	
3. Analog Usage	7	
4. Modbus Usage	7	
5. Modbus Register Tables	8	
6. Modbus Configuration Tables	9	

#### LIST OF FIGURES

Figure 1 - Dimensions	.4
Figure 2 - Power and USB Ports	.5
Figure 3 - Analog and RS-485 Modbus Ports	.5

#### LIST OF TABLES

Table 1 - Converter port descriptions	5
Table 2 - RJ11 jack pinout	5
Table 3 - Analog Modes	7
Table 4 - CommandValve Model IDs	7
Table 5 - Baud Rate Modes	7
Table 6 - Coils	8
Table 7 - Input Registers	8
Table 8 - Holding Registers	8

## SAFETY

Thank you for purchasing this equipment from Ideal Vacuum Products. Please operate it safely.



Read this manual and all associated equipment manuals 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.

## 1. OVERVIEW

Before using the signal converter, make sure the CommandValve has the latest firmware version installed. Download and follow the instructions in the Firmware Update Tool and Patch Notes User Manual to determine the current CommandValve firmware version and how to update it to the latest version.

idealvac.com/files/manuals/IVP\_Firmware\_Update\_Tool\_and\_Patch\_Notes\_User\_Manual.pdf

#### 1.1 DESCRIPTION

The Ideal Vacuum Command Valve<sup>™</sup> Signal Converter extends the capability of the Command Valve by providing valve management via analog and Modbus communications. The Signal Converter is compatible with all Command Valves with firmware version 1.7.2 or higher.

Without the Signal Converter, the CommandValve is limited to control solely via serial commands via a USB host. The CommandValve, through its USB port can be operated with IVP's DirectVac II software, downloadable from any CommandValve listing on idealvac.com, with terminal software, such as Termite<sup>®</sup>, by writing a CommandValve control program, or by integration into an existing system automation program.

#### **1.2 DIMENSIONS AND MOUNTING**

The SIgnal Converter is packaged in a compact, black ABS case. It can be mounted on any flat surface using high quality two-sided tape or by using the flange mounting holes. CAD files are available at <a href="https://www.idealvac.com/pp/P1012593">https://www.idealvac.com/pp/P1012593</a>.



Figure 1 - Dimensions

#### 1.3 WHAT IS INCLUDED

- CommandValve Signal Converter box (P1012593)
- ➤ 36" Molex-to-DC Connector Cable

(Powers CommandValve through Signal Converter)

➤ 6 ft. Mono Angled Mini Phone Plug (3.5mm/1/8")

(Analog Input and Output), 2 ea.

► RJ12-to-Screw Terminal Adapter

(RS485 Modbus communication)

- > Modular Splitter, RJ12 Plug to Two RJ12 Jacks (for daisy chaining multiple CommandValves)
- > RJ12 to RJ12 Extension Cable, 1 ft. (for daisy chaining multiple CommandValves)



Figure 1 - Dimensions

## 2. CONNECTIONS

Power is supplied to the Signal Converter with a 12 VDC power supply ①. The 12 VDC power supply included with the CommandValve is used to power both the Signal Converter box and the CommandValve. Power is output from the Signal Converter to the CommandValve through the Molex power connector ②. A Molex-to-DC plug cable is supplied with the Converter. The USB-A port provides communication between the Signal Converter and the CommandValve ③. Analog signals are output and input through the two 3.5mm (1/8") mini phone jacks, ④ & ⑤. Orange and green LEDs indicate the state of the CommandValve ⑥. A steady green LED indicates that the Converter has power. A steady orange LED indicates that a CommandValve is detected. A flashing green LED indicates that the Commandvalve butterfly is moving. The RJ12 jack is for RS485 ModBus communications ⑦. Pinouts for the RJ12 jack are shown in Table 2, below. An RJ12-to-screw terminal breakout adapter is included.





Figure 4 - Analog and RS-485 Modbus Ports

Item	Description
1	Power Input, 12 VDC, 5.5 x 2.1mm Jack, Center Positive
2	Molex 2 Conductor Power Connector, 3 mm pitch, Outputs 12 VDC Power to the CommandValve (top pin positive)
3	USB-A Port, Connects to the CommandValve
4	Analog Signal Output from the CommandValve, 3.5 mm (1/8") Mini Phone Jack, Tip Positive
5	Analog Signal Input to the CommandValve, 3.5 mm (1/8") Mini Phone Jack, Tip Positive
6	Indicator LEDs (Orange and Green)
7	RJ12 Adapter for RS485 ModBus Communications

Table 1 - Converter port descriptions



Table 2 - RJ12 jack pinout

## 3. ANALOG USAGE

The Signal Converter is set from the factory to accept analog input signals and supply analog output signals from 0.5 to 4.5 volts through the Converter's 3.5 mm (1/8") mini phone jacks. This voltage range defines a linear scale between a CommandValve butterfly angle of 0° and 90°. Values below the low end of the range are mapped to 0° and values higher than the high end of the range are mapped to 90° (for any voltage range configuration).

There are four possible analog voltage range configurations, shared by both the input and output signals. The voltage configuration selection is set through the Modbus Holding Registers (*"Analog Range Mode"*, Table 5, p. 8), using an analog voltage range selection (Table 6, p. 9). Analog input can be disabled (and should be disabled) if one wants to utilize the Modbus interface to control the valve (see Modbus Usage, below).

## 4. MODBUS USAGE

Modbus is utilized to configure the Signal Converter. Modbus RDU protocol on RS-485 is followed.

Modbus can control the valve on a Modbus network and can also be used to monitor and debug the analog system. Modbus registration tables are found on page 7. Modbus configuration tables are found on page 8.

As delivered, Modbus is NOT configured to control the valve directly. Setting the "*Analog Input*" coil (<u>Coils, Table 3, p. 8</u>) to it's off state and then modifying the "*Desired Angle*" (<u>Holding Registers,</u> <u>Table 5, p. 8</u>) provides the necessary ability to control the valve.

To monitor the status of the valve, "*Angle Position*" provides an interface to read the valve's real butterfly angle value (<u>Input Registers, Table 4, p. 8</u>).

The "*Valve Model ID*" identifies which CommandValve has been identified on the controller, if any (<u>Input Register, Table 4, p. 8</u>, and <u>Valve Models, Table 7, p. 9</u>).

The Modbus interface provides a "*Control On*" coil to stop the Converter from controlling the CommandValve through ANY input (<u>Coils, Table 3, p. 8</u>). This allows the user to use the push buttons on the side of the CommandValve without them fighting the Signal Converter.

By default, Modbus serial settings are baud rate 9600, data bits 8, stop bits 1, no parity, and no flow control. The baud rate is changed in the "*Baudrate Mode*" (<u>Holding Registers, Table 5, p. 8</u>) and by setting the baud rate mode (<u>Table 8, p. 9</u>).

By default, the Modbus slave address is 1, but the Signal Converter also reacts to broadcasted messages on slave address 0. The "*Modbus Slave Address*" is changed in the Holding Registers (<u>Table 5, p. 8</u>).

Per the Modbus standard, it is recommended to have a minimum 2ms pause between transactions on the RS 485 line.

# 5. MODBUS REGISTER TABLES

Name/Function	Coils
Control On (0)	The Converter controls the Command Valve. (Non-volatile) Default: On
Analog Input On (1)	The Converter uses analog input to control the valve angle. (Non-volatile) Default: On
Analog Output On (2)	The Converter outputs the valve angle to the analog out line. (Non-volatile) Default: On
Valve Home (3)	Triggers a homing event on the valve.
Valve Speed (4)	Sets the speed (slow mode) on the valve. (Non-volatile) Default: Off
Factory Reset (5)	Resets the Converter settings to default (including non-volatile settings). Triggers a Restart.

Table 3 - Coils

Name/Function	Input Registers
Angle Position (0)	The angle of the command valve. $x10$ (0 – 900)
Valve Model ID (1)	The model ID of the command valve that is currently connected. (See Model ID, Table 4)
Analog Input On (2)	Input Voltage x 100. (0 – 500)
Analog Output On (3)	Output Voltage x100. (0 – 500)
Firmware Major Version (4)	Firmware major version
Firmware Minor Version (5)	Firmware minor version

Table 4- Input Registers

Name/Function	Holding Registers
Desired Angle (0)	The desired angle for the CommandValve x10. (Overridden by analog while <i>Control On</i> and <i>Analog Input</i> on) $(0 - 900)$
Analog Range Mode (1)	Defines the analog signal range for the analog in and out (Non-volatile) Default: 0.5 – 4.5 V (See Analog Modes, Table 6)
Baudrate Mode (2)	Sets the baudrate speed (Non-volatile) Default 38,400 baud
Modbus Slave Address (3)	Sets the Converter's Modbus network slave address Default is network address 1

Table 5 - Holding Registers

## 6. MODBUS CONFIGURATION TABLES

ID Index	Analog Voltage Range
0	0.5 – 4.5 V (Default)
1	0.5 – 5.0 V
2	0.0 – 5.0 V
3	0.0 – 3.3 V

#### Table 6 - Analog Modes

ID Index	Valve Models
0	No Command Valve attached.
1	KF-16
2	KF-25
3	KF-40
4	KF-50
5	CF 1.33
6	CF 2.125
7	CF 2.75
8	CF 3.375
11	Unidentified/Misconfigured Command Valve.

#### Table 7 - CommandValve Model IDs

ID Index	Baud Rate Modes
0	9600 (Default)
1	14400
2	19200
3	28800
4	38400
5	57600
6	115200

#### Table 8 - Baud Rate Modes



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