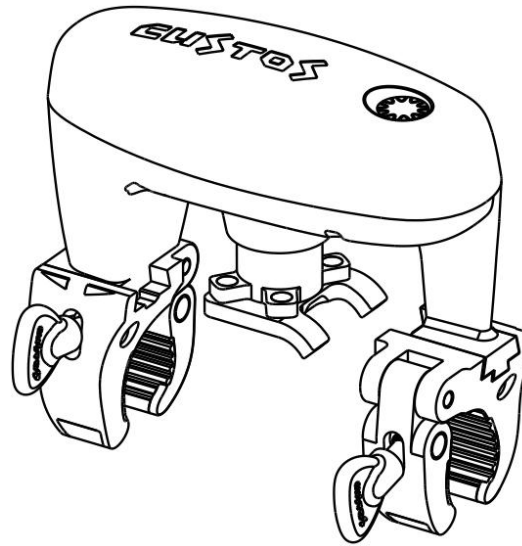


Custos Ball Valve Servo

Technology for Humanity



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1 INTRODUCTION

1.1 Custos BVS

Custos Ball Valve Servo “Custos BVS” is capable for outdoor deployment for controlling water valve OPEN / CLOSE. It also supports auto CLOSE valve when water leak is detected by Local Leak Sensor Probe.

2 FEATURES & SPECIFICATIONS

2.1 Physical Specifications

Parameter	Value
Model No.	BVSLWU (US) / BVSLWE (EU)
Dimensions	14.8 x 9.6 x 13.3mm
Weight	BVS Unit: 603g
Body Color	White
Knob Color	Light Blue
Waterproof and Dustproof	IP66 level / Outdoor deployment
Usage	For Indoor and Outdoor Water Valve On/Off
Operation Temperature	14~122°F (-10 ~ +50°C)
Relative Humidity	8% ~ 80%

2.2 Hardware Specifications

Parameter	Value
RF Module	SX1261
RF Distance	40m (Indoor)/120m (Outdoor)
Region Frequency	US: US915, FCC CFR47 Part 15.249; EU: EU868
Motor Torque Power	Adaptive torque output max: 8n.m
Water Leak Sensor	Local Water Leak Sensor Probe
Temperature Sensor	Built-in MCP9700x, Range from -40°C to +125°C / (-40°F to +257°F)
Action Button	Touch Sense Button x 1
LED Indicator	3 colors LED. (Green, Yellow & Red)
Sound Indicator	Buzzer (Max. 85dB)
Power Supply	AC-DC: AC (110V 60Hz / 220V 50Hz); DC (12V / 1A)
Power Consumption	Standby: ~10mA @ 12VDC = 0.12W Full Operation: Max ~700mA @ 12VDC = 8.4W

3 WHAT INSIDE IN THE BOX

3.1 Standard Custos BVS package comes with below items:

- A. Custos BVS Main Unit x 1
- B. AC-DC Adaptor x 1, (AC 110/220V to DC 12V/1A)
- C. Local Leak Sensor Probe x 1 (Optional)

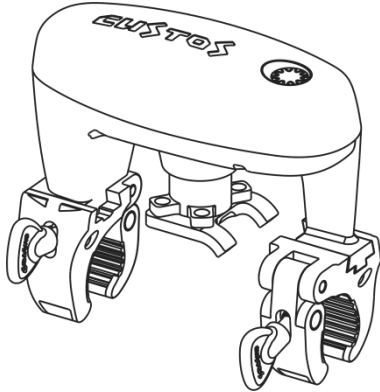


Figure 3A



Figure 3B

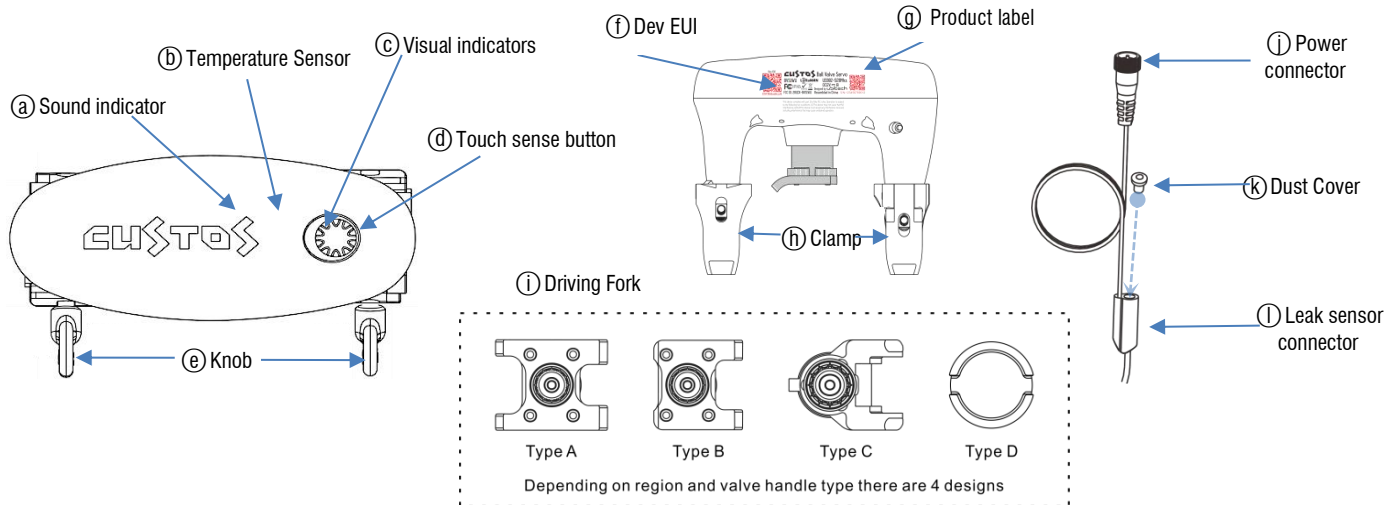


Figure 3C

4 UNDERSTANDING CUSTOS BVS

4.1 Connectors & Interfaces

Terminology	Description	Terminology	Description
(a) Sound indicator	Buzzer	(g) Product label	Product info and serial number
(b) Temperature sensor	Built-in temperature sensor	(h) Clamp	Clamp on water pipe. Max 1-1/4 inch
(c) Visual indicators	3 colors LED with green, yellow & red	(i) Driving fork	Couple with valve handle
(d) Touch sense button	Network, water valve & alarm operations	(j) Power connector	DC 12V / 1A in
(e) Knob	Use to adjust clamp widths	(k) Dust cover	Prevent dust and water
(f) Dev EUI	Device EUI	(l) Leak sensor connector	Local leak sensor probe



5 KEY & INDICATORS BEHAVIOR

5.1 Touch Sense Button

- Short Press: One click comes with one short beep sound.
- Long Hold: Press and holding the key. “Come with 1 x short beep per second”

5.2 Visual Indicator

- 3 Colors LED: GREEN, YELLOW & RED
- ON Event: ON, quick blinking, slow blinking and “fade-in & fade-out”

5.3 Sound Indicator

- Buzzer: Long & short beep sound.

6 PHYSICAL INSTALLATION

6.1 Quick Installation Instruction:

- Make sure to disconnected the power.
- Place the Valve Handle in Close position.
- Choose right size Fork of BVS and aligning with Valve Handle. *Refer to “Figure 6A”
- Make sure the Knob and Valve Handle are facing on same side. *Refer to “Figure 6 B”
- Tighten Clamps while holding down the Custos BVS.
- Unplug the Dust Cover and plug Local Water Sensor Probe into connector tightly. (Optional) *Refer to Figure 6 C
- Connect the power socket to DC Adaptor, screw up the water seal cover.
- Plug DC Adaptor into AC Power Outlet.

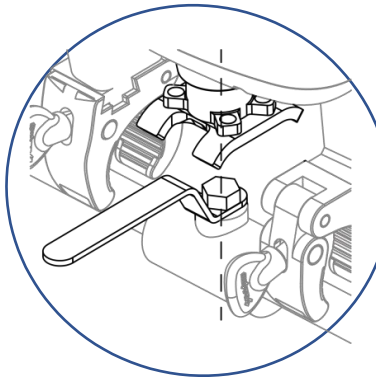


Figure 6A

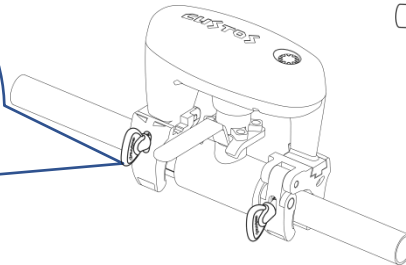


Figure 6B

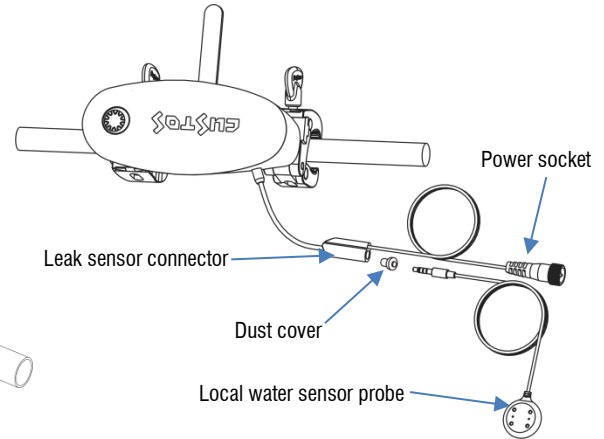


Figure 6C

7 WORKING MODE SUPPORT

7.1 Standalone

- The LED indicator stays with Yellow blinking without joining the LoRaWAN network or lose the network connection.
- Support OTAA, Water Valve Operation, Water Leak detection & Alarm.

7.2 Network Mode

- LED indicator stays in Green Heartbeat “Fade-in & Fade-out” after joined LoRaWAN network.

7.3 Water Valve

- Support OPEN, CLOSE, PAUSE
- RESUME during OPEN/CLOSE operation.
- Manual Calibration position of valve handle. (Only support operate by Touch Sense Button)
- Water Valve will be closed automatically once Local Water Leak Sensor Probe is triggered.

7.4 Water Leak Sensor & Alarm

- Water Leak Alarm will be activated and to CLOSE Water Valve automatically once Local Water Leak is detected.
- Once Local Water Leak is detected then Custos BVS will also send out Heartbeat through LoRaWAN network.

7.5 Temperature Sensor

- By default, BVS sends temperature report automatically to gateway when every 1°C or 1.8°F degree changed.

8 TOUCH SENSE BUTTON KEYLOCK

Custos BVS is capable for outdoor deployment. To prevent mis-operation by rain drop, end-user can enable Touch Sense Button Keylock function to forbid the operation of Touch Sense Button until to disable the keylock function.

8.1 Touch Sense Button Keylock Enable

After enabled Touch Sense Button Keylock function, Custos BVS will ignore all key events excepting Touch Sense Button Keylock Disable function. (Refer to 8.2)

- i. Start: Long hold Touch Sense Button 3 seconds then short click 3 times.
- ii. Process: Yellow LED on 1 second then Red LED on 1 second with 1 beep sound.
- iii. Success: Yellow LED slow blinking.

8.2 Touch Sense Button Keylock Disable

- i. Start: Long hold Touch Sense Button 3 seconds then short click 3 times.
- ii. Process: Yellow LED on 1 second then Red LED on 1 second with 3 beep sounds.
- iii. Success: LED indicator resume previous status. (Yellow LED blinking or Green LED slow blinking)

9 WATER VALVE OPERATION

9.1 Manual Calibration Valve Position

Calibration function will identify the correct OPEN/CLOSE position and torque force, it will avoid excess stress applied to your valve. By default, BVS will perform auto-calibration when re-power on every time.

- i. Start: Long Hold Touch Sense Button 5 seconds then short click 5 times.
- ii. Processing: Water Valve run OPEN and CLOSE 1-2 cycles, Yellow LED blinking and quick short beep sound keep continue.
- iii. Success: The LED indicator changes to Yellow LED blinking.

9.2 Turn Valve to OPEN

Turn Valve to OPEN position and let water run through the pipe.

- i. Start: Short click Touch Sense Button 1 time.
- ii. Processing: Water Valve turning to OPEN position, Green Heartbeat LED “Fade-in & Fade-out” and short beep sound keep continue.
- iii. Success: The LED indicator changes to Yellow LED blinking

9.3 Turn Valve to CLOSE

Turn Valve to CLOSE position and doesn't let water run through the pipe.

- i. Start: Short click Touch Sense Button 1 time.
- ii. Processing: Water Valve turning to CLOSE position, Yellow Heartbeat LED “Fade-in & Fade-out” and short beep sound keep continue.
- iii. Finished: The LED indicator changes to Yellow LED blinking

9.4 Pause OPEN/CLOSE Operation

Pause only take effect during OPEN or CLOSE operation.

- i. Start: Short click Touch Sense Button once.
- ii. Processing: Yellow LED blinking and Valve stop operation.

9.5 Resume OPEN/CLOSE Operation

Resume only take effect during Pause operation.

- i. Start: Short click Touch Sense Button once.
- ii. Finished: Valve resume to operation (Continue to Opening / Closing) and LED indicator changes to LED Yellow/Green Heartbeat.

10 WATER LEAK SENSOR & ALARM

10.1 Water Leak Detection & Alarm

Custos BVS comes with Local Leak Sensor Probe and support following functions, in short, once Water Leak is detected, Water Leak Alarm will be activated, hence the water valve will be closed spontaneously, at this moment all other operations will not be accepted except Water Leak Alarm Cancellation.

- i. Activated Water Leak Alarm
 - RED LED fast blinking.
 - Fast beep sound.
- ii. CLOSE Water Valve automatically
- iii. Send out Heartbeat
- iv. Water Valve keeps in CLOSE position
- v. The operation is forbidden temporally until perform Water Alarm Cancellation operation. (Refer 10.2)

10.2 Water Leak Alarm Cancellation

Water Leak Alarm Cancellation operation only accepted when Local Water Leak Sensor Probe is no longer detected water.

- i. Start: Long hold Touch Sensor Button 2 seconds.
- ii. Success: The LED indicator changes to previous status. (Yellow LED blinking or Green LED slow blinking and buzzer goes silence.)
- iii. Send out Heartbeat.

11 TEMPERATURE SENSOR

11.1 Temperature Report

- i. By default, Custos BVS will send out Heartbeat automatically when temperature in 1 °C or 4°F change of ambient temperature.
- ii. Custos will send out °F in US version and °C for other versions.

12 APPENDIX

Terminology, all events and operations details including action key event, LED and Buzzer status.

12.1 System Event Status

Event	Detail	LED	Buzzer
System Ready	BVS is Ready to operate after power on or reset.	Green LED ON 2 seconds	2 beep sounds
Standalone mode heartbeat	Standalone Heartbeat without network connection	Yellow LED blinking	---
Event Success	Finished operation and success	Green LED ON 2 seconds	Short beep x 2
Event Error	Operation fail or not available	RED LED blinking 3 times	Long beep x 3
Event Timeout	Operation timeout	RED LED ON	1" Pulse sound

12.2 Touch Sense Button Keylock

Event	Action / Status	Key Action	LED Status	Buzzer Status
Keylock Enable	Enable Lock Key Function	Hold 3 seconds & click 3 times	Yellow LED ON 1 second Red LED ON 1 second	Long beep x 1
	Success – “In Network mode”	---	Yellow LED slow blinking	---
	Success – “In Standalone Mode”	---	Yellow LED blinking	---
Keylock Disable	Disable Lock Key Function	Hold 3 seconds & click 3 times	Yellow LED blinking	Long beep x 3
	Success – “In Network mode”	---	Green LED slow blinking	---
	Success – “In Standalone Mode”	---	Yellow LED blinking	---

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12.3 Operation Mode

Operation Mode	Function	Description	Action Key		Operation Support	
			Long	Short	Standalone	Network
Water Valve Manual Operation	1.Open	Control water valve to full open	---	1	Support	Support
	2.Close	Control water valve to full close	---	1	Support	Support
	3.Pause	Pause only works during open/close operation	---	1	Support	Support
	4.Resume	Resume to previous during Pause operation	---	1	Support	Support
	5.Auto-calibration	Perform calibrate position and torque force	5	5	Support	Support
Water Leak Alarm	6.Trigger to close valve	Auto close water valve	---	1	Support	Support
	7.Alarm Cancellation	Resume to normal operation mode if no alarm triggered	2	---	Support	Support

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12.4 Water Valve Operation

Event	Action / Status	Key Action	LED Status	Buzzer Status
OPEN Valve	Start OPEN (Valve in closed position)	Click 1 time	Yellow LED keep blinking	---
	Processing	---	Yellow LED keep blinking	Keep short beep
	Success	---	Green LED ON 1 second	Short beep×2
	Next status (In Network Mode) Next	---	Green LED slow blinking	---
	Next Status (In Standalone Mode)	---	Yellow LED slow blinking	---
CLOSE Valve	Start CLOSE (Valve in opened position)	Click 1 time	Green LED ON 1 second	1” Pulse sound
	Processing	---	Yellow LED keep blinking	Keep short beep
	Success	---	Green LED ON 1 second	Short beep×2
	Next status (In Network Mode)	---	Green LED slow blinking	---
	Next Status (In Standalone Mode)	---	Yellow LED slow blinking	---
PAUSE Operation	PAUSE Only available during Open/Close operation	Click 1 time	Yellow LED ON 1 second Red LED ON 1 second	1” Pulse sound
	Processing- “In Network Mode”	---	Yellow LED slow blinking	---
	Next status “In Network Mode”	---	Green LED keep blinking	---
	Processing- “In Standalone Mode”	---	Yellow LED keep blinking	---
	Next status- “In Standalone Mode”	---	Yellow LED keep blinking	---
RESUME Operation	Start RESUME available during Open/Close operation	Click 1 time	Green LED ON 1 second	Short beep×3
	Next Status-Return Open/Close		Yellow / Green LED blinking	Keep short beep
Manual Calibration	Start Manual Calibration	Hold 5 second & click 5 times	---	---
	Processing-Open & Close 1-2 cycles	---	Yellow LED keep blinking	Keep short beep
	Next Status-“In Network Mode”	---	Green LED slow blinking	---
	Next status- “In Standalone Mode”	---	Yellow LED keep blinking	---

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12.5 Water Leak Event & Alarm

Event	Action / Status	Key Action	LED Status	Buzzer Status
Leak Sensor Probe Triggered	Start Water Leak Alarm	---	RED LED fast blinking	Fast beep sound
	Processing-Close Water Valve Automatically	---	RED LED fast blinking	Fast beep sound
Leak Alarm Cancellation	Alarm Cancellation	Long hold 2 seconds	Green LED blinking 2 times	Short beep×2
	Success cancellation	---	Green LED blinking 3 times	Short beep×3
	Next Status-"In Network Mode"	---	Green LED slow blinking	---
	Next Status-"In Standalone Mode"	---	Yellow LED blinking	---

12.6 Patents

CN Patent: ZL 2019 1 0505506.0

US Patent: US 10,995,876 B2

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Contact us if you have any questions

Website:

<https://ubitech.hk/custos-lw/>