

# Motor Servo for Ball Valves

SKU: BVSLWE01

Version: 1.0.0



## Product Description

This motor converts existing and installed ball valves into intelligent water control devices. Thanks to the innovative clamp mechanism, it can be installed on shut-off valves with a pipe diameter between 0.5 and 1.5 inches within minutes, without the need for additional tools, and can be removed just as easily. A patented coupling mechanism allows for torques of up to 8 Nm, enabling it to function even with rusty and old valves. The servo motor is waterproof and can be used in damp, dirty, and outdoor environments.

In the open position, the motor automatically performs valve training once a week (closing/opening by 1/8 turn to remove dirt and scale). The device is also capable of measuring the rotation angle and detecting the end positions of the lever. It approaches the end positions slowly to avoid friction and unnecessary mechanical stress. It is powered by an external 12V power supply through a waterproof coupling.

Incorporating an additional water sensor directly connected to the device enhances functionality, enabling the motor to serve as a leak protection system without the

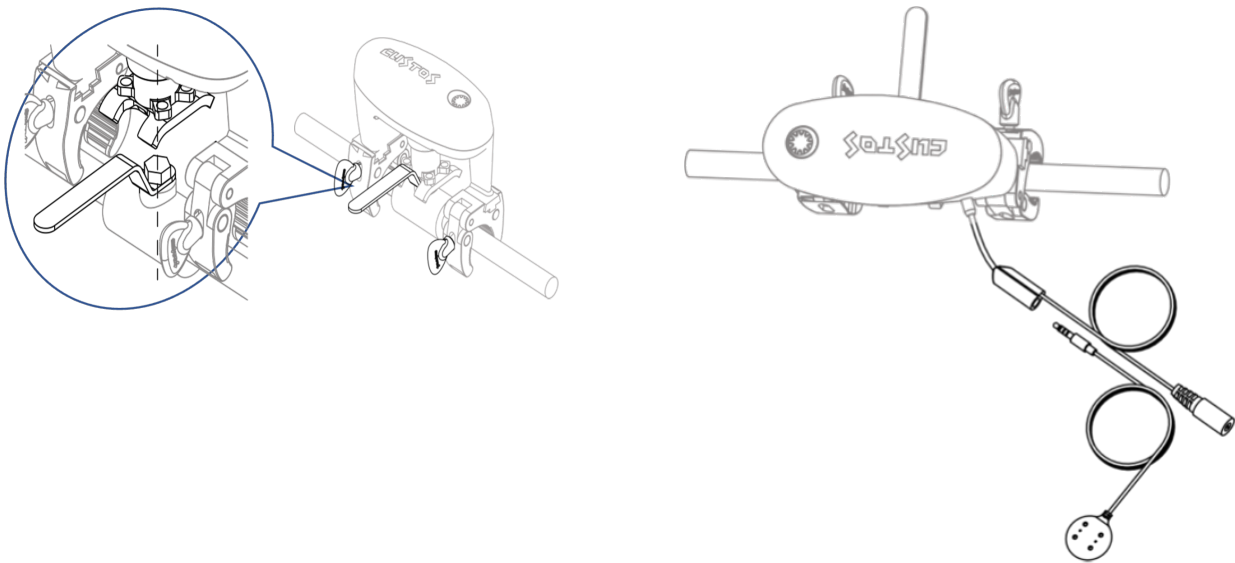


need for further configuration or wireless connectivity.

Control is facilitated through local buttons, and remote operation is achieved through LoRaWAN commands. The device functions as a LoRaWAN Class C device, necessitating LoRaWAN network coverage for optimal performance. In the absence of existing coverage, the alternative is to set up and operate a dedicated LoRaWAN gateway. For direct coupling to an AQSWE01 please use BVSLWE02.

## Installation

1. Make sure that the device is disconnected from the power.
2. Select the correct side of the fork based on the width of the valve handle.
3. Ensure that the two clamping buttons and the handle are pointing in the opposite direction (the handle must be able to move freely).
4. Tighten the clamps with your hands while holding the BVS.
5. If necessary, remove the dust cover and connect the local water sensor.
6. Connect the DC adapter to the power cable coming from the BVS and tighten the waterproofing.
7. Plug the power adapter into a 230V outlet.



## Calibration

The device measures both the rotation angle and the end positions of the handle. This allows it to gently approach the end positions, avoiding unnecessary mechanical stress. Each time the device is powered on, it performs a calibration run. To start the calibration, simply press the button once. You will observe some movements of the handle, and after 10 to 20 seconds, the device is ready for operation.

Calibration requires the BVS to be mounted on a ball valve. The device detects if no valve is present and cancels the calibration. In this case, operation of the handle



(both by button and remote command) is disabled.

## External Water Sensor

The device allows the attachment of an optional wired water sensor. There is a corresponding socket on the power cable next to the motor. Remove the blue protective pad and insert the sensor. Please press the plug with some force to ensure a waterproof connection. If the sensor head detects water, a flood alarm sounds, and the LED flashes red. Depending on parameter 8, the valve is closed or remains in the current position.

Once the sensor head is free of water, you can clear the alarm by pressing the button for 2 seconds. It is also possible to clear the alarm with a wireless LORA command.

## Manual Operation of the Motor

The device has a single button with a built-in tricolor LED. To switch the valve, you can click the button or hold the button down for a few seconds. The BVS helps you count the seconds by beeping every second. The device is designed for outdoor use and must prevent malfunctions due to water droplets on the button. Therefore, please press the button firmly (not too shyly), even if you only click briefly, so that the touchless button recognizes your finger.

Pressing the button for 2 seconds (2 \* beeping) clears an alarm.

## LEDs

The device has a tricolor LED with the following meanings:

- Green slow blinking: Valve is open (can be turned off via parameter 6)
- Red slow blinking: Valve is closed (can be turned off via parameter 6)
- Red/Green blinking: Motor is moving
- Red blinking or solid red: Alarm
- Red triple blinking: Motor is blocked
- Green blinking: Connecting to LoRaWAN network

## Connection to LoRaWAN Network

This device, with its three keys (Dev EUI, Join EUI, Join Key), needs to be registered with a LoRaWAN network operator that covers the device's location with radio signals.

If you purchased the device directly from Aqua-Scope's online shop, use the email address used for the purchase and the public device key (Dev EUI) on the website



<https://aqua-scope.com/lora>. You will receive a message with all three keys to the provided email address. The public key is also printed on the device as a 16-digit number and as a QR code for scanning. The QR code and 16-digit number are also printed on the outer packaging.

If you purchased the device from a dealer, the dealer will provide the three keys. If they do not, please contact [support@aqua-scope.com](mailto:support@aqua-scope.com) by email.

Immediately upon inserting the batteries or connecting a power supply, the device will attempt to connect to the LoRaWAN network using the three keys you provided. The LEDs will blink during this process. After approximately 25 seconds, this process, called 'JOIN,' will either be successful or aborted. In the latter case, the device immediately enters sleep mode.

If, for any reason, the sensor loses connection to the server, an automatic reconnection process, called 'Rejoin,' will take place. This process repeats whenever the device attempts to send a message to the LoRaWAN network.

Pressing the button always initiates a LoRaWAN communication, leading to a 'Rejoin' as explained above. Please observe the Duty Cycle regulation—sending messages or Rejoins too quickly in succession may be ignored by the LoRaWAN network.

## LoRaWAN Payload Commands (Payload Format)

LoRaWAN commands can be daisy chained into the payload up to the defined maximum payload size of 51 bytes. This means that for all commands sent to defined number of bytes in the payload is required to avoid misinterpretation of command and/or command values in the receiver side. **All uplink and downlink commands use FPort=10.**

- **Uplink Command Hardware Version Report: 0x03 - HW - CAP\_MSB CAP\_LSB (4 Byte):** This command reports the hardware version and a bitmap of the capabilities of the device. It is sent unsolicited as the first command during boot-up and as replying command to downlink command *Hardware Version Get*. HW is a single byte indicating the version of the hardware. The bitmap indicates the different capabilities of the device.
- **Uplink Command Configuration Report: 0x04 - IDX - VAL\_MSB - VAL\_LSB (4 Byte):** This command reports a configuration parameter of the device: IDX is the number of the configuration parameter. The 16 Bit VAL is the parameter itself. Configuration parameters are always 16 Bit values. The table below describes the configuration parameters and their values.
- **Uplink Command Sensor Report: 0x06 - ID - VAL\_MSB - VAL\_LSB (4 Byte):** This command reports sensor values. The ID indicates the sensor type and defines the format of the 16-Bit VAL. The sensor types of this devices are listed below.



- **Uplink Command Firmware Version Report: 0x0a - VER\_MSB VER\_2 VER\_3 VER\_LSB (5 Byte):** This command reports the 32-bit value of the current firmware. It is sent unsolicited as the first command during boot-up and as replying command to downlink command 'Hardware Version Get'.
- **Uplink Command Alarm Report: 0x0b - STATE - TYPE - VAL\_MSB - VAL\_LSB (5 Byte):** This command reports start and end of alarms. The STATE-Byte indicates the status of the alarm (0x01 = active, 0x00 = inactive). The TYPE Byte indicates the type of alarm and defines the content of the 16 Bit VAL. Possible alarm IDs and the values reported are listed below.
- **Downlink Command Hardware Version Get: 0x03 - (1 Byte):** This command calls for a Hardware Version Report sent upstream
- **Downlink Command Configuration Set: 0x04 - IDX - VAL\_MSB - VAL\_LSB (4 Byte):** This command allows setting configuration parameters of the device: IDX is the number of the configuration parameter. The 16 Bit VAL is the parameter itself. Configuration parameters are always 16 Bit Values. The table below describes the configuration parameters and its values.
- **Downlink Command Sensor Get: 0x06 - ID (2 Byte):** This command requests the report of sensor values. The ID indicates the sensor type. The sensor types of the devices are listed below.
- **Downlink Command Valve Position: 0x07 - STATE (2 Byte):** This command turns the water valve - if associated - into OPEN (state = 1) or CLOSE (state = 0) position
- **Downlink Command Alarm Clear: 0x0b - TYPE (2 Byte):** This command clears an alarm. TYPE is the type of alarm to be cleared. Type = 0 clears all active alarms. For other types of alarms to be cleared please refer to the uplink command 0x0b.
- **Downlink Command Configuration Get: 0x14 - IDX (2 Byte):** This command allows reading the configuration value IDX. The device will respond with an upstream command Configuration Report
- **Downlink Command Valve Status Get: 0x17 - (1 Byte):** This command requests a command "Device Status Report" sent upstreams.

## LoRaWAN Sensor Types

The following sensor types are supported by the Aqua-Scope Monitor.

- 0x01: Temperature: VAL is temperature in 1/10 Degree Celsius, (2-complement). *Example: 0x06 0x01 0x00 0xCD => Temperature 0x00CD = 205 = 20.5 C., 0x06 0x01 0xFF 0xEA => Temperature 0xFFEA = -20 = -2 C*



## LoRaWAN Valve Positions for Command 0x07

- 0x00 Valve Close
- 0x64 Valve Open

## LoRaWAN Alarm Types

The following alarmtypes are supported.

- 1 (0x01): Flood Sensor Tripped. VAL is 0x01 or 0x00.
- 2 (0x02): Freeze/Frost Danger. VAL is actual temperature.
- 3 (0x03): Temperature out of limits, VAL is actual temperature. For encoding of temperature please refer to section 'LoRaWAN Sensor Types'.

## LoRaWAN Configuration Parameters

All Configuration Parameters are 2 Byte values that can be set and read out using LoRaWAN 'Configuration Get' and 'Configuration Set' commands.

- **Parameter 1 - Status interval:** The device reports regularly to the LORA network. This parameter defines the time interval for these reports in minutes. The default is 0x015 = 15 minutes. The value range is 0x0005 - 0x10E0
- **Parameter 2 - Message type:** This parameter defines whether confirmed or unconfirmed messages are sent over LoRaWAN. The default is 0x01 = confirmed message. The value 0x00 sets to unconfirmed message.
- **Parameter 3 - Scale value for temperature report:** This parameter defines whether a temperature value should be in Celsius (0x00) or Fahrenheit (0x01). The default setting is Celsius.
- **Parameter 4 - Repeat alarm report:** This parameter defines how an alarm report is sent to the LoRa network. The parameter combines two different values: The more significant byte describes how often an alarm packet is retransmitted. The default setting here is 0x03 = 3 times. A value between 0x00 (no repetition) and 0xff (unlimited repetition) can be selected. The least significant byte defines the repeat interval in minutes. Here the default setting is 0x01. This means the default parameter is 0x0301.
- **Parameter 5 - Regular valve training:** A valve should be moved regularly to maintain its smooth operation. The device can perform this training independently from control by a LoRa network. The parameter combines two different values: The higher-order byte describes whether (1) or not (0) valve training should take place. The low-order byte defines the interval of the training in days. Values between 1 and 30 days are possible. The default value is 0x0107, i.e. training takes place every 7 days.
- **Parameter 6 - Local display:** With this parameter the buzzer and the LEDs can be activated (0x01) or deactivated (0x00) directly at the device. The



lower byte defines the behavior of the buzzer, the higher byte the behavior of the LED. The default value is 0x0101, i.e. both buzzer and LED are active (for example during motor movement).

- **Parameter 7 - Threshold value for temperature report:** This parameter defines at which temperature change an additional temperature report is sent in addition to the regular temperature report. The value is given in 0.1 degrees Celsius and must be greater than 0x000a (= 1 degree). The default value is 0x000a.
- **Parameter 8 - Automatically close valve when external flood sensor trips:** On default (value=0x00) the valves will not close when the sensor trips but setting the value to 1 will suppress this function. The alarm is still reported and shown on the device.
- **Parameter 9 - Buzzer notify when join the server:** When the device joins to a LoRaWAN server, the buzzer will sound (value=1). This function can be suppressed with value = 0.

## Scope of Delivery

- Motor with power cable
- 1 \* wired flood sensor pad
- 12 V Power Supply

## Technical Data

- Model No. BVSLWE01 (EU)
- Dimensions 14.8 x 9.6 x 13.3mm
- Weight BVS Unit: 603g
- Body Color White
- Motor Torque Power Adaptive torque output max: 7 Nm
- Waterproof and Dustproof IP66 level / Outdoor deployment
- LoRaWAN
  - LoRa Module SX 1261
  - Region Frequency EU: 868.42 & 869.85MHz
  - Activation: OTAA
  - LoRaWAN Class: C
  - LoRaWAN Version: 1.0.2
- Peripherals and Interfaces
  - 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
  - Power Supply AC-DC: AC (110V 60Hz / 220V 50Hz); DC (12V / 1A)





- Power Consumption Standby:  $\sim 10\text{mA} @ 12\text{VDC} = 0.12\text{W}$
- Full Operation: Max  $\sim 700\text{mA} @ 12\text{VDC} = 8.4\text{W}$
- Environmental Conditions and Trading
  - Shipment/Storage:  $-30\text{ }^{\circ}\text{C} \dots +70\text{ }^{\circ}\text{C}$
  - Operation:  $-20\text{ }^{\circ}\text{C} \dots 60\text{ }^{\circ}\text{C}$
  - Outdoor Use: IP67 (to power supply coupling), Power Supply is IP20
  - UN Customs Tariff: 85011093900

## Support and Contact

Should you encounter any problem, please give us the opportunity to address it before returning this product. Please check our website [www.aqua-scope.com](http://www.aqua-scope.com) and particularly the support section for answers and help. You can also send a message to [info@aqua-scope.com](mailto:info@aqua-scope.com).

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## Declaration of Conformity



Aqua-Scope Technology OÜ, Sakala 7-2, 10141 Tallinn, Republic of Estonia, declares that this radio emitting device works on the following frequencies:

**Български** С настоящото Aqua-Scope Technology OÜ декларира, че този тип радиосъоръжение BVSLWE01 е в съответствие с Директива 2014/53/ЕС. Цялостният текст на ЕС декларацията за съответствие може да се намери на следния интернет адрес: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce).

**Čeština** Tímto Aqua-Scope Technology OÜ prohlašuje, že typ rádiového zařízení BVSLWE01 je v souladu se směrnicí 2014/53/EU. Úplné znění EU prohlášení o shodě je k dispozici na této internetové adrese: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce).

**Dansk** Hermed erklærer Aqua-Scope Technology OÜ, at radioudstyretypen BVSLWE01 er i overensstemmelse med direktiv 2014/53/EU. EUoverensstemmelseserklæringens fulde tekst kan findes på følgende internetadresse: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce).

**Deutsch** Hiermit erklärt Aqua-Scope Technology OÜ, dass der Funkanlagentyp BVSLWE01 der Richtlinie 2014/53/EU entspricht. Der vollständige Text der EU-Konformitätserklärung ist unter der folgenden





Internetadresse verfügbar: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce).

**Eesti** Käesolevaga deklareerib Aqua-Scope Technology OÜ, et kesolev raadioseadme tp BVSLWE01 vastab direktiivi 2014/53/EL nуетele. ELi vastavusdeklaratsiooni tielik tekst on kttesaadav jrgmisel internetiaadressil: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**English** Hereby, Aqua-Scope Technology OÜ declares that the radio equipment type BVSLWE01 is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Español** Por la presente, Aqua-Scope Technology OÜ declara que el tipo de equipo radioeléctrico BVSLWE01 es conforme con la Directiva 2014/53/UE. El texto completo de la declaracin UE de conformidad está disponible en la direccin Internet siguiente: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Ελληνικά** Με την παρούσα ο/η Aqua-Scope Technology OÜ, δηλώνει ότι ο ραδιοεξοπλισμός BVSLWE01 πληροί την οδηγία 2014/53/EE. Το πλήρες κείμενο της δήλωσης συμμόρ φωσης EE διατίθεται στην ακόλουθη ιστοσελίδα στο διαδίκτυο: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Français** Le soussigné, Aqua-Scope Technology OÜ, déclare que l'équipement radioélectrique du type BVSLWE01 est conforme la directive 2014/53/UE. Le texte complet de la déclaration UE de conformité est disponible l'adresse internet suivante: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Hrvatski** Aqua-Scope Technology OÜ ovime izjavljuje da je radijska oprema tipa BVSLWE01 u skladu s Direktivom 2014/53/EU. Cjeloviti tekst EU izjave o sukladnosti dostupan je na sljedećoj internetskoj adresi: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Italiano** Il fabbricante, Aqua-Scope Technology OÜ, dichiara che il tipo di apparecchiatura radio BVSLWE01 conforme alla direttiva 2014/53/UE. Il testo completo della dichiarazione di conformit UE disponibile al seguente indirizzo Internet: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Latviešu** Ar šo Aqua-Scope Technology OÜ deklarē, ka radioiekārta BVSLWE01 atbilst Direktīvai 2014/53/ES. Pilns ES atbilstības deklarācijas teksts ir pieejams šādā interneta v ietnē: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce) Lietuvių Aš, Aqua-Scope Technology OÜ, patvirtinu, kad radijo įrenginių tipas BVSLWE01 atitinka Direktyvą 2014/53/ES. Visas ES atitikties deklaracijos tekstas prieinamas šiuo internet adresu: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Magyar** Aqua-Scope Technology OÜ igazolja, hogy a BVSLWE01 típus rádiberendezés megfelel a 2014/53/EU irányelvnek. Az EUMegfelelő ségi nyilatkozat teljes szövege elérhető a következő internetes címen: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Malti** B'dan, Aqua-Scope Technology OÜ, niddikjara li dan it-tip ta' tagħmir tar-radju BVSLWE01 huwa konformi madDirettiva 2014/53/UE. It-test kollu tad-dikjarazzjoni ta' konformit tal-UE huwa disponibbli f'dan l-indirizz talInternet li ġej: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Nederlands** Hierbij verklaar ik, Aqua-Scope Technology OÜ, dat het type radioapparaat BVSLWE01 conform is met Richtlijn 2014/53/EU. De volledige tekst van de EUconformiteitsverklaring kan worden geraadpleegd op het volgende internetadres: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Polski** Aqua-Scope Technology OÜ niniejszym oświadcza, że typ urządzenia radiowego BVSLWE01 jest zgodny z dyrektywą 2014/53/UE. Pełny tekst deklaracji zgodność I UE jest dostępny pod następującym adre sem internetowym: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Português** O(a) abaixo assinado(a) Aqua-Scope Technology OÜ declara que o presente tipo de equipamento de rádio BVSLWE01 está em conformidade com a Diretiva 2014/53/UE. O texto integral da declarao de conformidade está disponível no seguinte endereo de Internet: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Română** Prin prezenta Aqua-Scope Technology OÜ declară că tipul de echipamente BVSLWE01 este în



conformitate cu Directiva 2014/53/UE. Textul integral al declarației UE de conformitate este disponibil la următoarea adresă internet: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Slovensko** Aqua-Scope Technology OÜ potvrdjuje, da je tip radijske opreme BVSLWE01 skladen z irektivno 2014/53/EU. Celotno besedilo izjave EU o skladnosti je na voljo na naslednjem spletnem naslovu: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Slovensky** Aqua-Scope Technology OÜ týmto vyhlasuje, že rádiové zariadenie typu BVSLWE01 je v slade so smernicou 2014/53/EÚ. Úplné EÚ vyhlásenie o zhode je k dispozícii na tejto internetovej adrese: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Soumi** Aqua-Scope Technology OÜ vakuuttaa, että radiolaitetyyppi BVSLWE01 on direktiivin 2014/53/EU mukainen. EUvaatimustenmukaisuusvakuutuksen täysimittainen teksti on saatavilla seuraavassa internetosoitteessa: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Svenska** Härmed försäkrar Aqua-Scope Technology OÜ att denna typ av radioutrustning BVSLWE01 verensstämmer med direktiv 2014/53/EU. Den fullständiga texten till EUförsäkran om verensstämmelse finns på följande webbadress: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

## Disposal Guidelines



Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging health and well-being.