Badger Meter

# BEACON® Advanced Metering Analytics

## With ORION® Network as a Service (NaaS)

## OVERVIEW

The BEACON® Advanced Metering Analytics (AMA) Solution with ORION® Network as a Service (NaaS) presents a simple, yet powerful solution to bring a new level of utility optimizing information to light.

The solution combines our intuitive BEACON AMA Software as a Service (SaaS) with a NaaS approach using proven ORION Cellular endpoints to deliver greater visibility and control over utility management.

Built-in infrastructure management services and a system design that keeps you in step with technology advancements, allows you to do what you do best—manage your water utility. Plus, built-in consumer engagement tools help enhance customer service, increase satisfaction and reduce costs.


## SOFTWARE APPLICATIONS

**BEACON Advanced Metering Analytics (AMA)**

With tools beyond meter reading and network management, BEACON AMA software offers targeted Advanced Metering Analytics. BEACON AMA software puts interval meter data to work to increase efficiency in day-to-day utility operations and address demands for actionable intelligence.

- **Problem solver** – User intuitive data tools place the power of water consumption data at your fingertips, allowing you to rapidly respond to customer inquiries and quickly resolve—and even eliminate—many billing issues.
- **Customized design** – A customizable dashboard delivers information configured to user security access level in a format matched to the utility's individual requirements, providing data management integrity, security and control.
- **Works with you** – Integration with utility systems—billing, work order, inventory, Customer Relationship Management (CRM) and Geographic Information Systems (GIS)—streamlines and improves utility operations without disrupting the current utility billing interface file transfer process.
- **Find out fast** – Alert conditions can be set to monitor and notify users of system exceptions, including continuous flow, for faster leak detection.
- **Innovation at your service** – Secure, hosted platform with automatic software upgrades ensures the latest technology and features are always available.

**EyeOnWater®**

The BEACON AMA software suite includes informative consumer outreach tools to improve customer service consisting of the EyeOnWater consumer engagement website, smartphone mobile apps, and email or SMS text alerts, providing easy access to personal consumption data and alerts to potential leaks. With these tools, water consumers are able to view their usage activity, and gain greater understanding and control of what they use and the value you provide.

## HARDWARE

ORION NaaS is powered by the proven ORION system for interval data capture and two-way communication. The solution employs cellular endpoints which, as they leverage the public cellular network and require no proprietary gateways to operate, dramatically reduce infrastructure requirements compared to a traditional fixed network. This speeds installations and simplifies expansion as a system evolves.

- **High resolution data** – ORION Cellular endpoints are programmed to automatically broadcast 15-minute meter reading and event data to the BEACON software up to four (4) times per day. The high resolution data helps identify potential customer-side leaks and other anomalies in water use, and provides the utility with a potent tool to enhance its customer service.
- **Two-way communication** – BEACON AMA software communicates with ORION Cellular endpoints to accomplish a number of system tasks, including requesting additional information from the endpoint and synchronizing the internal endpoint clock. If needed, the ORION two-way system architecture sends upgrades to the endpoint firmware over the air via the network, utilizing the powerful BEACON AMA software suite.
- **Data integrity** – Each message from the ORION Cellular endpoint is securely transported to the BEACON AMA software only via private network and never over the public internet.

## SECURITY

BEACON AMA is ISO 27001 certified and SOC 2 examined for security, availability and confidentiality.

## TECHNICAL SUPPORT AND TRAINING

Configured for the utility, safe and secure BEACON AMA SaaS provides utilities with regular software updates, long-term support and maintenance. Comprehensive BEACON AMA training courses are available for online or on-site delivery at the time of system deployment. To maintain best practices, a library of online resources and options for group web-based training and support are also available. Once deployed, our technical support specialists can be contacted by phone, email and web to provide ongoing, customer-friendly support. Customized one-on-one training is available (fee applies) to further enhance user expertise.

Additionally, Badger Meter offers extended customized training to further enhance user expertise.

## TECHNICAL REQUIREMENTS

### BEACON AMA

Developed as a hosted software platform, BEACON AMA is a cloud-based application accessed through a standard web browser. Internet access is required. User logins provide secure access.

BEACON AMA supported web browsers include the latest and next previous major releases of Google® Chrome, Microsoft® Edge, Mozilla® Firefox®, Microsoft® Internet Explorer® (IE 11 only); and Apple® Safari®.

### EyeOnWater Consumer Engagement

The EyeOnWater consumer engagement website is a cloud-based application accessed through a standard web browser. Internet access is required. Water consumer user logins provide secure access to their information.

Supported web browsers include the latest and next previous major releases of Google® Chrome, Microsoft® Edge, Mozilla® Firefox®, Microsoft® Internet Explorer® (IE 11 only); and Apple® Safari®.

EyeOnWater smartphone applications require Android 6.0 or iOS 9.1 or later, and can be downloaded from Google Play or the Apple Store.

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Badger Meter

# E-Series® Ultrasonic Meter

## Cold Water Stainless Steel Meter, 1-1/2 and 2 inch

## DESCRIPTION

The E-Series® Ultrasonic meter uses solid-state technology in a compact, totally encapsulated, weatherproof, and UV-resistant housing, suitable for residential and commercial applications. Electronic metering provides information—such as rate of flow and reverse flow indication—and data not typically available through traditional, mechanical meters and registers. Electronic metering eliminates measurement errors due to sand, suspended particles and pressure fluctuations.

**The Ultrasonic 1-1/2 and 2 inch meters feature:**

- Minimum extended low-flow rate lower than typical positive displacement meters.
- Simplified one-piece electronic meter and register that are integral to the meter body and virtually maintenance free.
- Sealed, non-removable, tamper-protected meter and register.
- Easy-to-read, 9-digit LCD display presents consumption, rate of flow, reverse-flow indication, and alarms.
- High resolution industry standard ASCII encoder protocol.

The Ultrasonic meter is available with an in-line connector for easy connection and installation to AMR/AMI endpoints. It is also available with a flying lead for field splice connection.

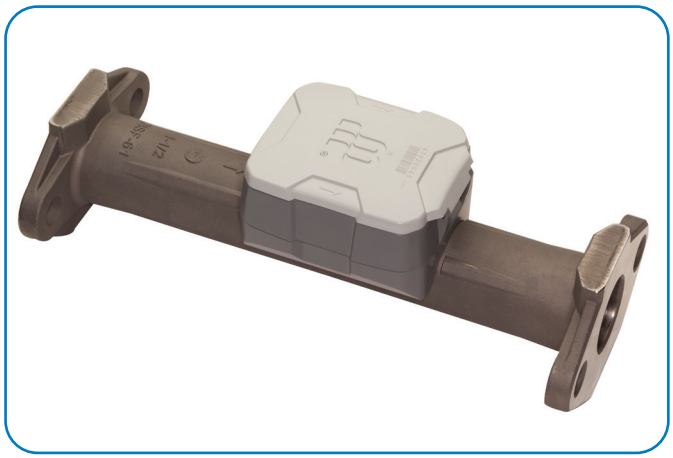
## APPLICATIONS

Use the Ultrasonic meter for measuring potable cold water in residential, commercial and industrial services. The meter is also ideal for non-potable, reclaimed irrigation water applications or less than optimum water conditions where small particles exist.

E-Series Ultrasonic meters meet and exceed ANSI/AWWA C715 standards. The meters comply with the lead-free provisions of the Safe Drinking Water Act, are certified to NSF/ANSI Standards 61 and 372 and carry the NSF-61 mark on the housing.

## OPERATION & PERFORMANCE

As water flows into the measuring tube, ultrasonic signals are sent consecutively in forward and reverse directions of flow. Velocity is then determined by measuring the time difference between the measurement in the forward and reverse directions. Total volume is calculated from the measured flow velocity using water temperature and pipe diameter. The LCD display shows total volume and alarm conditions and can toggle to display rate of flow.



In the normal temperature range of 45…122° F (7…50° C), the Ultrasonic "new meter" consumption measurement is accurate to:

- ±1.5% over the normal flow range
- ±3.0% from the extended low flow range to the minimum flow value

## CONSTRUCTION

E-Series Ultrasonic meters feature a stainless steel, lead-free meter housing, an engineered polymer and stainless steel metering insert, a meter-control circuit board with associated wiring, LCD, and battery. Wetted elements are limited to the pressure vessel, the polymer/stainless steel metering insert and the transducers. The electronic components are housed and fully potted within a molded, engineered polymer enclosure, which is permanently attached to the meter housing. The transducers extend through the stainless steel housing and are sealed by O-rings.

The metering insert holds the stainless steel ultrasonic reflectors in the center of the flow area, enabling turbulence-free water flow through the tube and around the ultrasonic signal reflectors. The metering insert's patented design virtually eliminates chemical buildup on the reflectors, ensuring long-term metering accuracy.

## METER INSTALLATION

The meter is completely submersible and can be installed using horizontal or vertical piping, with flow in the up direction. The meter will not measure flow when an "empty pipe" condition is experienced. An empty pipe is defined as a condition that occurs when the flow sensors are not fully submerged.

## SPECIFICATIONS

| **E-Series Ultrasonic Meter Size** | **1-1/2 in. (40 mm)** | **2 in. (50 mm)** |
|---|---|---|
| **Normal Test Flow Limits** | 1.25…100 gpm (0.28…22.7 $m^3$/hr) | 1.5…160 gpm (0.34…36.3 $m^3$/hr) |
| **Minimum Test Flow Limits** | 0.40 gpm (0.09 $m^3$/hr) | 0.50 gpm (0.11 $m^3$/hr) |
| **Safe Maximum Operating Condition (SMOC)** | 100 gpm (22.7 $m^3$/hr) | 160 gpm (36.3 $m^3$/hr) |
| **Typical Pressure Loss** | 3.8 psi (0.26 bar) | 5.2 psi (0.36 bar) |
| **Reverse Flow – Maximum Rate** | 12 gpm (2.73 $m^3$/hr) | 18 gpm (4.09 $m^3$/hr) |
| **Operating Performance** | In the normal temperature range of 45…122° F (7…50° C), new meter consumption measurement is accurate to:<br>• ±1.5% over the normal flow range<br>• ±3.0% from the extended low flow range to the minimum flow value | |
| **Storage Temperature** | – 40…140° F (– 40…60° C) | |
| **Maximum Ambient Storage (Storage for One Hour)** | 150° F (66° C) | |
| **Measured-Fluid Temperature Range** | 34…140° F (1…60° C) | |
| **Humidity** | 0…100% condensing; meter is capable of operating in fully submerged environments | |
| **Maximum Operating Pressure of Meter Housing** | 175 psi (12 bar) | |
| **Register Type** | Straight reading, permanently sealed electronic LCD; digits are 0.28 in. (7 mm) high | |
| **Register Display** | • Consumption (up to nine digits)<br>• Rate of flow<br>• Alarms<br>• Unit of measure factory programmed for gallons, cubic feet and cubic meters | |
| **Register Capacity** | • 100,000,000 gallons<br>• 10,000,000 cubic feet<br>• 1,000,000 cubic meters | |
| **Totalization Display Resolution** | • Gallons: 0.X<br>• Cubic feet: 0.XX<br>• Cubic meters: 0.XXX | |
| **Battery** | 3.6-volt lithium thionyl chloride; battery is fully encapsulated within the register housing and is not replaceable; 20-year battery life | |

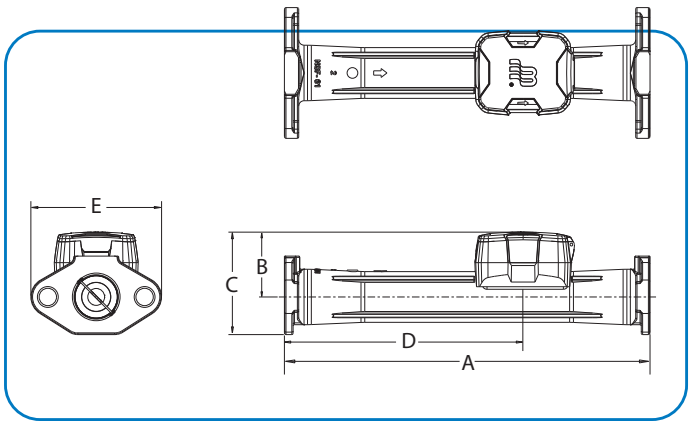
## MATERIALS

| | |
|---|---|
| **Meter Housing** | 316 stainless steel |
| **Measuring Element** | Pair of ultrasonic sensors located in the flow tube |
| **Register Housing & Lid** | Engineered polymer |
| **Metering Insert** | Engineered polymer & stainless steel |
| **Transducers** | Piezo-ceramic device with wetted surface of stainless CrNiMo |

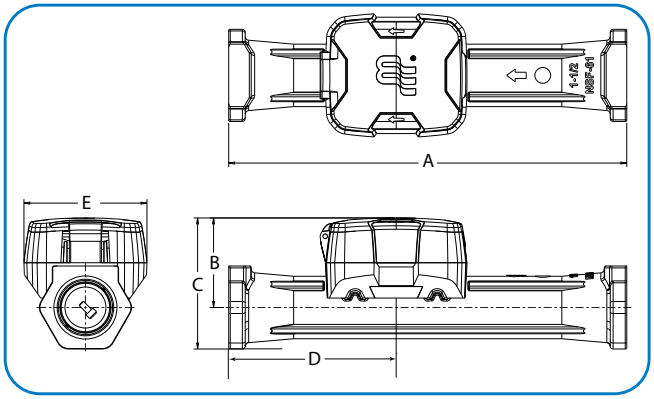
## PHYSICAL DIMENSIONS

| E-Series Ultrasonic Meter Size | 1-1/2 in. (40 mm) | 1-1/2 in. (40 mm) | 2 in. (50 mm) | 2 in. (50 mm) |
|---|---|---|---|---|
| **Housing** | **Elliptical** | **HEX** | **Elliptical** | **HEX** |
| **Size Designation X Lay Length** | 1-1/2 x 13 in. (38 x 330 mm) | 1-1/2 x 12.62 in. (38 x 321 mm) | 2 x 17 in. (51 x 432 mm) | 2 x 15.25 in. (51 x 387 mm) |
| **Weight (without AMR)** | 8.2 lb (3.7 kg) | 6.5 lb (2.9 kg) | 11.9 lb (5.4 kg) | 8.9 lb (4.0 kg) |
| See illustration below for Measurement Designations. | | | | |
| **Length (A)** | 13 in. (330 mm) | 12.62 in. (321 mm) | 17 in. (432 mm) | 15.25 in. (387 mm) |
| **Height (B )** | 2.80 in. (71 mm) | 2.84 in. (72 mm) | 3.01 in. (77 mm) | 3.06 in. (78 mm) |
| **Height (C)** | 4.55 in. (116 mm) | 4.15 in. (105 mm) | 4.76 in. (121 mm) | 4.68 in. (119 mm) |
| **Length (D)** | 7.10 in. (180 mm) | 5.31 in. (135 mm) | 11.10 in. (282 mm) | 5.05 in. (128 mm) |
| **Width (E)** | 5.50 in. (140 mm) | 3.90 in. (99 mm) | 6.08 in. (154 mm) | 3.90 in. (99 mm) |
| **Bore Size** | 1-1/2 in. (40 mm) | 1-1/2 in. (40 mm) | 2 in. (51 mm) | 2 in. (51 mm) |
| **Two-Bolt Elliptical Flange (AWWA)** | 1-1/2 in. (40 mm) | — | 2 in. (51 mm) | — |
| **Bolt Hole Diameter** | 0.69 in. (17.53 mm) | — | 0.81 in. (20.57 mm) | — |
| **Companion Flange** | 1-1/2 in. (40 mm) | — | 2 in. (51 mm) | — |
| **Internal Thread Size** | — | 1-1/2 in. NPT | — | 2 in. NPT |

### Elliptical Measurement Designations

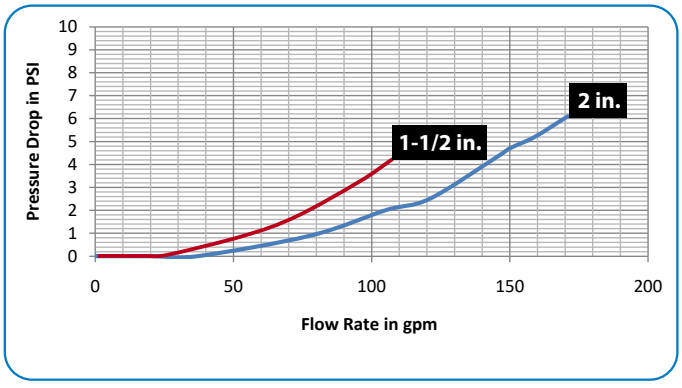



### HEX Measurement Designations




## PRESSURE LOSS CHART

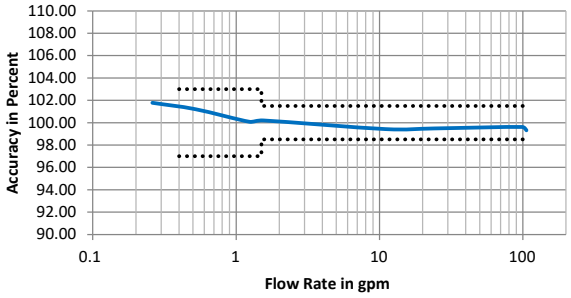
Flow rate in Gallons Per Minute (gpm)



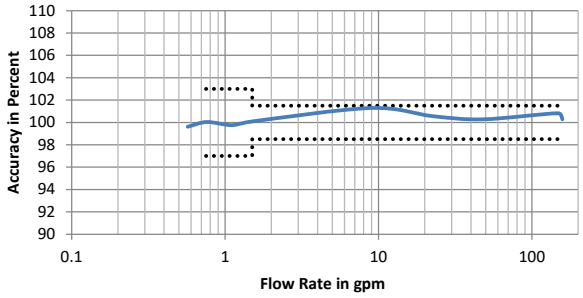
## ACCURACY CHARTS

Rate of Flow in gallons per minute (gpm)

**1-1/2 in. Meter**




**2 in. Meter**

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# ORION® Water Endpoints

## Fixed Network (SE) Endpoint

## DESCRIPTION

ORION Fixed Network (SE) endpoints ("endpoint(s)") are designed to operate in either mobile priority or fixed network priority mode of operation. Mobile priority mode supports two-way mobile communication and one-way fixed network communication. Fixed network priority mode supports two-way mobile and two-way fixed network communications. Both modes of operation allow utilities to use either mobile or fixed network technology to collect reading data from the endpoint at any time.

When initially installed, the endpoints begin transmitting in mobile priority mode. Once gateways are deployed, utilities may begin to immediately collect fixed network readings from either operating mode, and with appropriate licensing, may transition endpoints to fixed network priority mode without having to visit the account.

## FUNCTIONALITY

**Operation:** The endpoint continuously monitors the encoder circuit. At predetermined intervals, the endpoint broadcasts the totalized reading value, along with other meter data, to the network gateway transceivers or mobile collection devices.

**Activation:** The endpoints offer a Smart Activation feature. All ORION endpoints are shipped in an inactive, non-transmitting state. After the endpoint is installed, it begins broadcasting data when the encoder senses the first usage of water. No field programming or tools are required to activate the endpoint.

**Broadcast Mode:** Once activated, the endpoints begin transmitting in mobile priority mode. Utilities deploying a fixed network system may leave the endpoint in mobile priority mode of operation and collect data at any time, using either two-way mobile collection or through the deployment of gateway transceivers. In mobile priority mode, the endpoint will send a mobile reading once every six seconds and a fixed network data message once an hour. Utilities licensed to deploy a two-way fixed network system may transition the endpoints to fixed network priority mode of operation using the endpoints two-way communication feature via the gateway transceiver. Endpoints in fixed network priority mode continue to send a mobile message once every ten seconds for reading and troubleshooting purposes.

**Data Profiling:** The endpoints store up to 90 days of hourly historical interval meter data within nonvolatile memory.

**Output Message:** Each hour, the endpoint stores a reading at the top of the hour. The endpoint broadcasts its unique serial number, reading(s) and status indicators in either fixed network priority mode or mobile priority mode depending on the system configuration. When gateway transceivers are deployed, each fixed network message in mobile priority mode includes the most current top-of-the-hour reading plus the previous 11 top-of-the-hour reads. In fixed network priority mode, the endpoint broadcasts up to the last 24 top-of-the-hour reads for gateway transceiver data collection.

Endpoints also support collection of a current endpoint reading, status indicators and snapped daily read (midnight UTC) for mobile (walk-by or drive-by) data collection. Using the two-way endpoint feature, historical interval data and other endpoint information can be captured from the endpoint during the mobile reading process.

## APPLICATION

**Configurations**: Available in integral, remote or endpoint-only configurations, the endpoint can be deployed in indoor, outdoor and pit applications. The endpoint electronics and battery assembly are fully encapsulated in epoxy for environmental integrity.

**Meter Compatibility**: When attached to a Badger Meter encoder, the endpoint is compatible with all current Badger Meter Recordall® Disc, Turbo Series, Compound Series, Combo Series and Fire Service meters and assemblies, and with E-Series® Ultrasonic and M-Series® Electromagnetic Flow meters.

**Encoder Compatibility**: The endpoint is suitable for use with all Badger Meter encoders as well as the following Badger Meter approved three-wire encoder registers that have a manufacture date of 2000 or newer, are programmed into the AMR/AMI three-wire output mode and have three-wires connected: Elster C700 Digital, InVISION and ScanCoder® encoders and evoQ4 meter (encoder output); Hersey® Translator; Master Meter® Octave® Ultrasonic meter encoder output; Metron-Farnier Hawkeye; Mueller Systems 420 Solid State Register (SSR) LCD; Neptune® ProRead, E-Coder® and ARB-V®; and Sensus® Electronic Register encoder (ECR) and ICE.



Product Data Sheet

## SPECIFICATIONS

| | |
|---|---|
| **Dimensions** | 5.125 in. (H); 1.75 in. (W) at top; 2.125 in. (W) at bottom |
| **Broadcast Frequency MHz Band** | FCC regulated 902…928 MHz frequency hopping modulation |
| **Operating Temperature Range**<br><br>**Storage and Meter Reading** | –40…60° C (–40…140° F) based on storage and meter reading.<br>RF output may be reduced by extremely low temperatures. The water meter should not be subjected to temperatures below freezing. |
| **Humidity** | 0…100% condensing |
| **Battery** | One (1) lithium thionyl chloride C cell (nonreplaceable) |
| **Battery Life** | 20 years (calculated) |

**Construction**: All endpoints are housed in an engineered polymer enclosure with an ORION RF board, battery and antenna. To assure long-term performance, the enclosure is fully potted to withstand harsh environments and to protect the electronics in flooded or submerged pit applications.

**Wire Connections:** ORION Fixed Network endpoints are available with in-line connectors (Twist Tight or Nicor®) for easy installation and connection to compatible encoders/meters. The endpoints are also available with flying leads for field splice connections. Other wire connection configurations may be available upon request.

**Range**: Transmission reception depends on a number of factors, including the location of the network gateway transceiver. Other factors include topographical features, a building's construction materials and obstacles such as buildings, trees, vegetation and fences. Temporary conditions, such as a vehicle parked near the endpoint or heavy rain or snow, could also affect reception. These factors need to be considered when installing or designing a fixed network system layout and communicating with the endpoint using a handheld or mobile reading system. For a more in-depth discussion, see the white paper, *Understanding RF Propagation of AMR/AMI Systems*, available at *www.badgermeter.com*.

## FEATURES

| | |
|---|---|
| **Communication Type** | Two-Way |
| **Application Type** | Control/Monitor |
| **Reading Interval Type** | Hourly |
| **Encoder Compatibility** | Absolute/Incremental |
| **Fixed Network Reading** | √ |
| **Mobile Reading in Fixed Network Mode** | √ |
| **Premise Leak Detection** | √ |
| **Cut-Wire Indication** | √ |
| **Reverse Flow Indication (Absolute Encoder)** | √ |
| **No Usage Indication** | √ |
| **Encoder Error (Absolute Encoder)** | √ |
| **Low Battery Indication** | √ |
| **Remote Programming** | √ |
| **Remote Clock Synchronization** | √ |
| **Firmware Upgrades** | √ |

**License Requirements**: ORION Fixed Network endpoints comply with Part 15 of the FCC Rules. No license is required by the utility to operate an ORION meter reading system.

**Transportation**: The Federal Aviation Administration prohibits operating transmitters and receivers on all commercial aircraft. The ORION endpoint is considered an operating transmitter and cannot be shipped by air.

**Caution**: Changes or modifications to the equipment that are not expressly approved by Badger Meter could void the user's authority to operate the equipment.

## Making Water Visible®



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