Data Sheet U53/401
Supersedes U53/700

# Model U53 Open Channel Flow Measurement System

**(for monitoring flow in flumes and weirs)**


**(measures flow, volume, depth, and air temperature)**

■ **Ultrasonic Flow Measurement Technique.**
The Model U53 system uses pulse echo technology to provide accurate flow and volume monitoring for open channel flow in flumes and weirs.

■ **Built-in Dimension Tables for Most Flumes and Weirs.**
A large selection of dimension tables for most flumes and weirs are built into the U53 analyzer, making set up easy. (See the specifications on page 2 for a complete list.) For unusual or custom-built gauging structures, a user-definable flow/depth curve can be entered with up to 30 points.

■ **Universal-mount 1/2 DIN Enclosure.**
The U53 analyzer is housed in a 1/2 DIN, epoxy-coated metal NEMA 4X (IP65) enclosure. Its hinged front panel provides easy wiring access. The supplied bracket and stainless steel hardware enable panel, surface, and pipe mounting.

■ **Large Backlit LCD Readout with User-selectable Units.**
The graphic LCD shows the measured flow, depth, volume, and total in a variety of selectable units. Other useful data such as air temperature, analog output values, diagnostic warnings, and error messages are also shown.

■ **Resettable and Non-resettable Totalizers.**
Volume can be reset at any time. The non-resettable total keeps counting until reaching its limit and then resets automatically. Both totalizers hold count when power is lost and resume count after power is restored.

■ **Menu-guided Operation.**
The large display, simple keypad, and logical menu structure make the U53 system easy to use. Menu screens, containing up to six text lines, guide you through setup, calibration, operation, and test/maintenance functions.

■ **Simple Interactive Diagnostics.**
Built-in diagnostics continuously test analyzer and sensor operation.

■ **Multiple Language Capability.**
All screens can be selected for display in English, French, Italian, Spanish, German, or Swedish.

■ **Two 0/4-20 mA Analog Outputs.**
Each isolated analog output can be assigned to represent the measured flow, depth, or volume.

■ **Four Configurable Relays.**
Each relay can be set to function as a dual-alarm, control, or Penstock control relay, operating in response to the measured flow, depth, or volume. Other relay function choices include flow pulse and system status operation.

■ **Passcode-protected Access.**
For security, a passcode feature restricts access to configuration settings and calibration data to only authorized personnel.

■ **Electromagnetic Conformance.**
The system exceeds U.S. and meets European standards for EMI and RFI emissions and immunity.

# Specifications

## Model U53 Analyzer

**Operational:**

Display ..... Graphic dot matrix LCD, 128 x 64 pixels with LED backlighting; 1/2 inch (13 mm) main character height; 1/8 inch (3 mm) auxiliary information character height; menu screens contain up to six text lines

| Measurement | Selectable Ranges |
|---|---|
| Flow | 0-9999, 0-999.9, or 0-99.99 with selectable multiplier and flow rate units |
| Volume (resettable) | 0-9,999,999 with selectable volume units |
| mA Outputs (1 and 2) | 0.00-20.00 mA or 4.00-20.00 mA |
| Depth | 0-1200.0 inches, 0-100.0 feet, 0-30,000 mm, or 0-30.000 meters |
| Air Temperature | -40.0 to +212.0°F or -40.0 to +100.0°C |
| Total (non-resettable) | 0-9,999,999 with seven scrollable volume units |

Gauging Structure Types ..... Built-in tables for weirs and flumes listed below, or user-defined 30-point flow/depth curve to calculate flow

- V notch weir
- Rectangular weir
- Cipolletti weir
- Rectangular flume
- Round bottom flume
- Neyrpic flume
- Parshall flume
- Palmer-Bowlus flume
- Khafagi flume
- Leopold-Lagco flume
- H Type flume
- Trapezoidal flume

Ambient Conditions ..... Operation: -4 to +140°F (-20 to +60°C); 0 to 95% relative humidity, non-condensing
Storage: -22 to +158°F (-30 to +70°C); 0 to 95% relative humidity, non-condensing

Relays (four):

Types/Outputs ..... Electromechanical relays; SPDT (Form C) contacts; U.L. rated 5A 115/230 VAC, 5A @ 30 VDC resistive

Operational Mode ..... Each relay (A, B, C, and D) can be set to be driven by the measured flow, depth or volume (resettable)

Function Modes:

- Alarm ..... Settings for low alarm pt., low alarm pt. deadband, high alarm pt., high alarm pt. deadband, off delay, and on delay
- Control ..... Settings for high/low phasing, setpoint, deadband, off delay, and on delay
- Penstock ..... Settings for high/low phasing, off delay, and on delay
- Flow Pulse ..... Relay provides a fixed 0.5 second contact closure pulse output each time a user-set volume is reached
- Status ..... Not configurable; relay only activates when a diagnostic WARNING condition exists (sensor or analyzer failure, line power interruption, and other abnormal operating conditions)

Indicators ..... Relay annunciators (A, B, C, and D) indicate respective relay on/off status

Temperature Compensation ..... Automatic from -40 to +176°F (-40 to +80°C)

Sensor-to-Analyzer Distance ..... 328 ft. (100 m) maximum

Power Requirements ..... 90-130 VAC, 50/60 Hz. (20 VA max.) or 180-260 VAC, 50/60 Hz. (20 VA max.)

Calibration Methods:

Cal Depth 1 Point ..... Enter known water depth

Cal Depth 2 Point ..... Enter known sensor range (distance from sensor to water level) and known water depth

Analog Outputs (two) ..... Isolated 0/4-20 mA outputs; each with 0.004 mA (12-bit) resolution and capability to drive up to 600 ohm loads; each output can be assigned to represent the measured flow, depth, or volume (resettable)

***NOTE:*** *Parameter values can be entered to define the endpoints at which the minimum and maximum output mA values are desired.*

Communication:

- RS-232 ..... Enables configuration and retrieval of measured data for one analyzer using IBM-compatible PC and GLI optional software tool kit
- HART Protocol ..... Enables configuration and retrieval of measured data for multiple analyzers over a communication link using appropriate hand-held terminal or data system with HART software

Memory Backup (non-volatile) ..... All user settings are retained indefinitely in memory (EEPROM)

EMI/RFI Conformance ..... Exceeds U.S. and meets European standards for conducted and radiated emissions and immunity; certified CE compliant for applications as specified by EN 50081-1 for emissions and EN 50082-2 for immunity

Electrical Certifications:

General Purpose ..... CSA/$CSA_{NRTL}$ and FM (UL pending)
Class I, Div. 2 (Groups A, B, C, and D) .... CSA/$CSA_{NRTL}$ and FM (UL pending)

**Analyzer Performance (Electrical, Analog Outputs):**

Accuracy ..... 0.5% of span
Sensitivity ..... 0.1% of span
Repeatability ..... 0.1% of span
Response Time ..... Less than 180 seconds to 90% of value upon step change

**Mechanical:**

Enclosure ..... NEMA 4X; polycarbonate face panel, epoxy-coated high-quality cast aluminum door and case with four 1/2 inch (13 mm) conduit holes, nylon mounting bracket, and stainless steel hardware

Mounting Configurations ..... Panel, surface, and pipe (horizontal and vertical) mounting

Net Weight ..... 3.5 lbs. (1.6 kg) approximately

# Specifications (continued)

**Model U53 Sensor**

**Measuring Range:**
Depth ..... 10 inches to 20 feet (0.25 to 6 m)
Air Temperature ..... -40 to +176°F (-40 to +80°C)

**Measuring Resolution:**
Depth ..... ± 0.039 inches (1 mm)
Air Temperature ..... ± 0.18°F (0.1°C)

**Mechanical:**
Construction ..... IP68 PBT (polybutylene terephthalate) body with integral temperature sensor
Ambient Conditions ..... 32 to 140°F (0 to 60°C)
Cable (integral) ..... Standard 10 ft. (3 m) length; optional lengths of 30 ft. (10 m) or 100 ft. (30 m)
Weight ..... 1.1 lb. (0.5 kg) approximate

# Ordering Information

- **Model U53A4A1N Flow Analyzer (without HART)**
- **Model U53A4B1N Flow Analyzer (with HART)**

  Analyzer for use with U53S ultrasonic flow sensor. Analyzer includes four electromechanical relays, and is housed in 1/2 DIN, NEMA 4X enclosure with hardware for panel, surface or pipe mounting.

- **Model U53S Ultrasonic Flow Sensor**

**MODEL NUMBER**
**U53S** Ultrasonic flow sensor for use with U53 analyzer.

**INTEGRAL CABLE LENGTH** (see Note below)
**010** 10 feet (3 meters)
**030** 30 feet (10 meters)
**100** 100 feet (30 meters)

**U53S** **Product Number**

**Choose one from each category.**

**NOTE:** The optional 30 or 100 foot cable length must be specified at time of ordering, and cannot be added to the sensor after it is manufactured.

## Accessories (order separately):

- **Sensor Mounting Hardware 3004A0017-001**

  Hardware consists of bracket, base, clamp, upright, arm, and mounting screws.

- **NEMA 4X Junction Box 76A4010-001**

  Waterproof surface mount box with terminal strip and cord grips for use with 1W1127 cable.

- **Interconnect Cable 1W1127**

  This cable is the same as the integral sensor cable. Specify required length in whole feet.

- **Sun Shield 1000G3088-001**

  Aluminum shield with gray painted enamel finish provides additional protection from harmful effects of direct sunlight.

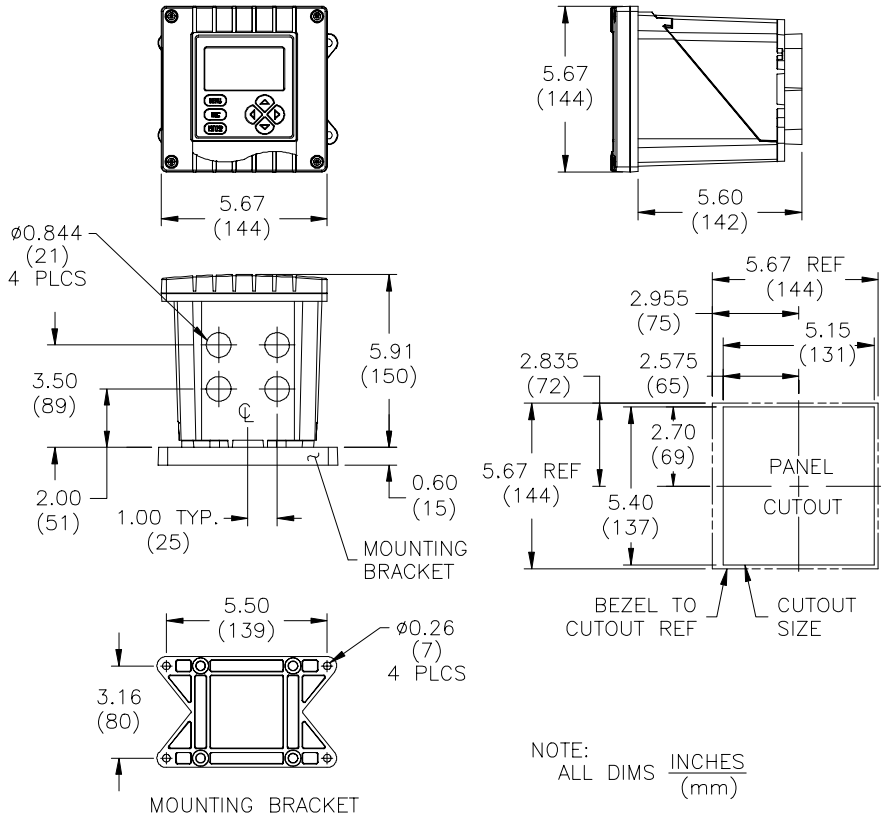
# Engineering Specification

1. The microprocessor-based system shall continuously and automatically monitor liquid level using ultrasonic technology, and calculate flow and volume based on a configured gauging structure (flume, weir, or user-definable).
2. The open channel flow analyzer shall have a built-in library of gauging structures, and shall have the capacity to create a 30-point user-definable flow/depth curve.
3. The open channel flow analyzer shall be operable in various languages.
4. The open channel flow analyzer shall have a resettable totalizer (volume) and a non-resettable totailizer (total).
5. The open channel flow analyzer shall have a graphical dot matrix LCD display with 128 x 64 pixels and LED backlighting. The main display character height shall be 1/2 inch (13 mm). Auxiliary information character height for volume, total, and analog output values shall be 1/8 inch (3mm).
6. The open channel flow analyzer shall display the measured flow, depth, volume, and total in user-selectable units, maximum flow and maximum depth for the gauging structure, air temperature, relay status, and diagnostic warning and error messages.
7. The open channel flow analyzer shall have a security passcode to restrict access to configuration settings and calibration data to only authorized personnel.
8. The open channel flow analyzer shall have automatic temperature compensation.
9. The open channel flow analyzer shall have user-test diagnostics for analog outputs and relays without requiring special test equipment.
10. The open channel flow analyzer shall be configurable through HART protocol.
11. The open channel flow analyzer shall have two isolated 0/4-20 mA analog outputs. Each output shall be assigned to represent the measured flow, depth, or volume. It shall be possible to enter parameter values to define the endpoints at which the minimum and maximum mA output values are desired.
12. The open channel flow analyzer shall have four relays that can be selected to operate as a dual-alarm, control, or Penstock control relay, operating in response to the measured flow, depth, or volume. Other relay function choices shall be flow pulse and system status operation.
13. The open channel flow measurement system shall consist of GLI International, Inc. Model U53A4-series analyzer and Model U53S ultrasonic sensor.

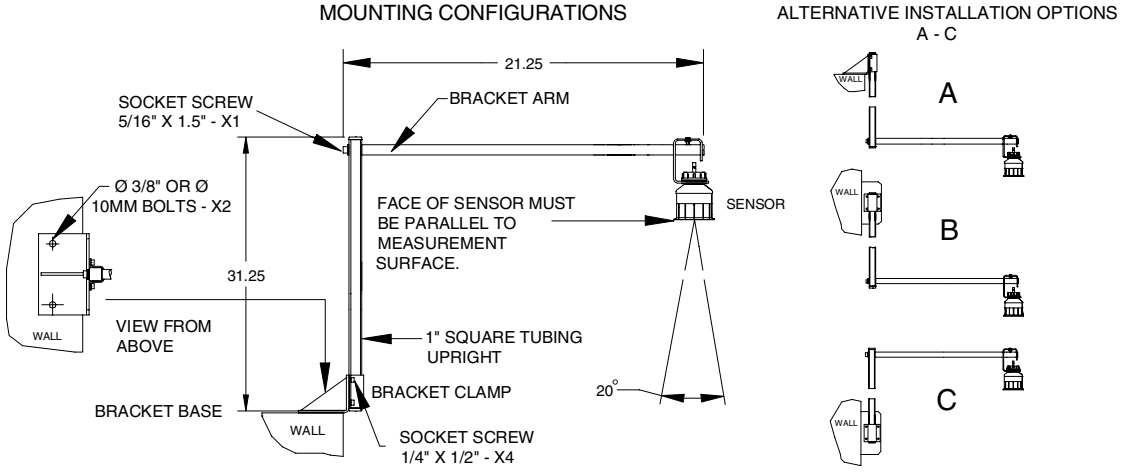
# Dimensions

**Inches (mm)**

**Model U53 Analyzer**




**Sensor Mounting Hardware 3004A0017-001**




**Data Sheet U53**


***Worldwide Headquarters and Sales:***

**GLI International, Inc.**
9020 West Dean Road
Milwaukee, Wisconsin 53224
U.S.A.

*Phone:* [414] 355-3601
*Fax:* [414] 355-8346
*E-mail:* info@gliint.com
*Web:* www.gliint.com

***Represented By:***