FICHA TÉCNICA DE PRODUTO

PRODUCT DATASHEET

HMI – Automação e Instrumentação, Lda.

LST400
Ultrasonic level / open channel flow transmitter

Measurement made easy

Reduced installation cost
— Easy access terminations
— Integrated echo display makes for easy troubleshooting

High functionality on standard product
— 4 to 20 mA output with HART 7
— 5 configurable relays / 8 A
— Configurable as open channel flow meter
— Preconfigured flow curves for most common channels
— 21 Point linearizer for calibration of non-linear vessels
— Pump control and cycling
— Automatic variable gain & power for difficult applications
— Integrated analytical software

Wide range of applicability
— Water and wastewater
— Power
— Mining and metals
— Food and beverage
— Pharmaceutical
— Paper and pulp

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ABB

LST400
## Ultrasonic level / open channel flow transmitter

The LST400

The LST400 is an ultrasonic level transmitter capable of measuring liquid level or solid applications up to 15 m (50 ft.) or flow rates in all types of open channel flow applications. The transmitter has a single 4 to 20 mA DC analog output with HART 7 and five (5) relay outputs. A transducer is fitted to the top of a silo or tank, facing down towards the material being measured.

The transmitter's microprocessor simultaneously fires an electronic pulse the transducer and starts a timer. The transducer converts this electronic pulse to an acoustic pulse, which is directed toward the surface of the material being measured. When the acoustic pulse contacts the surface of the material, energy is reflected back to the transducer, which converts this reflected energy back to an electronic pulse. This pulse is sent back to the microprocessor, which stops the timer and determines the 'time of flight' of the signal. By combining the speed of sound through air and the 'time of flight' of the pulse, the microprocessor accurately determines the level of the product. Powerful software removes false echoes from the signal and electronic filters remove ambient noise.

Save time on installation

LST400 comes standard with HART digital communication and with a easy to use graphic display.

— HART provides you with digital communication over existing plant infrastructure, really simplifying configuration and installation
— The integrated graphic echo display makes troubleshooting easy. The echo screen shows the echo and diagnostic information that most instruments require specialized software and a computer to get access to.
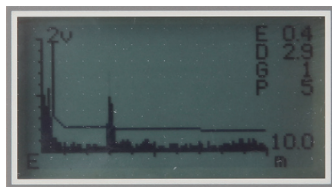
— The easy to use menu makes configuration a simple 1 minute task. All the settings required to start is in the first page of the menu, requiring no further setup for the majority of applications.
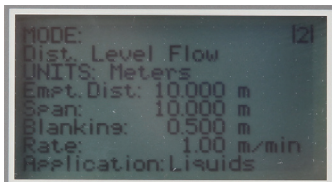
Works in the most difficult conditions

LST400 has an advanced algorithm automatically adjusting the instrument to work in the most difficult conditions.

— LST400 can vary pulse size for optimal performance at short and long distances
— Pulse length can be adapted, to ensure pulses can travel through the air even in the presence of dust
— The receiver gain can be increased to make sure the smallest of echoes can be detected easily

LST400 automatically adjusts these settings, ensuring the best performance can be achieved in all conditions.

High functionality as standard

Instead of the usual range of options available on ultrasonic sensors, LST400 includes everything you need in one. It comes standard with 5 relays, open channel flow, AC and DC power, HART communication, and all sensors work with the standard LST400 transmitter.

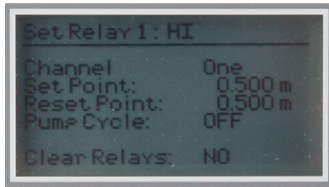### Easy-access installation terminals

Easy access to the terminations ensures rapid and cost-effective installation. The wall-/pipe-mount version has been designed to ensure that cable connection is simple and convenient. Ingress protection of the electronics section is retained even when the terminal compartment cover is opened.

Fig.1: Terminal access on the LST400

Pump control using relays

LST400 has five relays as standard, eliminating the need for controllers in basic control applications. Pump control is easy to configure and requires no special skills to program pump control functions.

```
Set Relay 1 : HI

Channel           One
Set Point:        0.500 m
Reset Point:      0.500 m
Pump Cycle:       OFF

Clear Relays:     NO
```

When it is important to keep the loads to the pump balanced we can use pump cycling. If the same pump always switches on first and then switches off last, it will carry a much larger load than any of the other pumps. This will mean earlier need for maintenance on this first pump. At the same time the other pumps will be underutilized. LST400 has two different modes to ensure the running time of the pumps is balanced. These are referred to as First In First Out (FIFO) and Rotate Pump Cycling.

Example

In the following example we can see a system of 3 pumps being cycled. 3 pumps are set up with the same Set and Reset settings, the only difference being the cycling mode. In this example we can see how the pumps behave at each point and how the work load is balanced between the pumps.
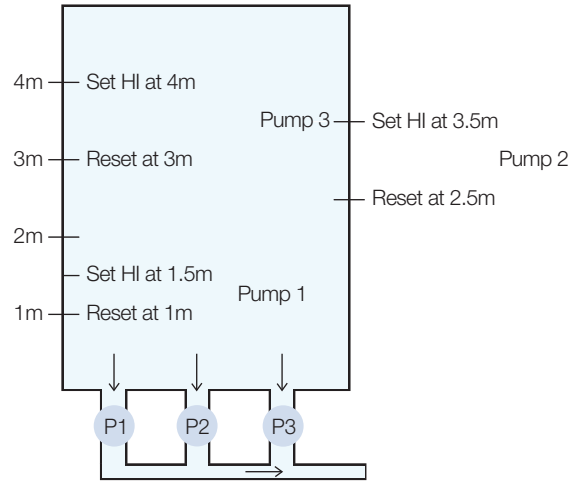

Fig. 2: Example of a pump cycling system

First In First Out(FIFO)

	Level	P1	P2	P3		Level	P1	P2	P3
Seq.1	1.3m	×	×	×	Seq.6	2.2m	×	×	√
Seq.2	2.2m	√	×	×	Seq.7	0.8m	×	×	×
Seq.3	3.6m	√	√	×	Seq.8	1.8m	√	×	×
Seq.4	4.3m	√	√	√	Seq.9	0.8m	×	×	×
Seq.5	2.8m	×	√	√	Seq.10	1.8m	×	√	×

Rotate Pump Cycling

	Level	P1	P2	P3		Level	P1	P2	P3
Seq.1	1.3m	×	×	×	Seq.6	2.2m	√	×	×
Seq.2	2.2m	√	×	×	Seq.7	0.8m	×	×	×
Seq.3	3.6m	√	√	×	Seq.8	1.8m	×	√	×
Seq.4	4.3m	√	√	√	Seq.9	0.8m	×	×	×
Seq.5	2.8m	√	√	×	Seq.10	1.8m	×	×	√

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Open channel flow

In the water industry we often encounter open channels. Open channels are an effective may to distribute water. Using a man-made structure with an open surface, water can flow freely relying only on the force of gravity. There are no pumps used and no pressure applied. Over many years, studies have been done to experimentally establish the relationship between level and the flow through an open channel. It is therefore possible to use a level meter to measure the flow through this channel by measuring the level and using the preconfigured relationship. This conversion is performed by using using the 21-point linearization function on the LST400. LST400 is preconfigured with the most common weirs and flumes and has the capability to program custom channels.

The most important setup needed in the instrument is the shape of the channel. An Empty Distance and a Span is also configured, this along with the calculated Maximum Flow value is then used to accurately calculate the flow at any point along the span.

Terminal connections

Power

LST400 can be powered using either AC power or 24V DC power. When using AC power, connect power to either 220V or 110V, Neutral to N and Ground to PE.
When using DC power, 24VDC PWR-IN
In both power modes, make sure to have PE connected to ground.

Relays

There are 5 relays on LST400, connectors are marked Relay 1, Relay 2, Relay 3, Relay 4 and Relay 5
The relay connections are marked as NO (Normally Open), NC (Normally Closed) and COM (Common)

Transducer

The Black wire is the temperature sensor signal
The Shield is the common ground used for both temperature and signal line
The Blue wire is the measurement signal

Analog output

4-20mA (labeled HART) is loop powered. There is no power on this port unless it is supplied. A resistor is needed to allow current to flow through the loop.

Loop power can be provided from
— 'LoopPwr from AC-IN'. Can be used to supply power to the current output if the AC power source is used. The power supplied here is isolated.
— 'LoopPwr from DC-IN'. Can be used to supply power to the current output if the DC power source is used. The power supplied here is not isolated.
— External loop power can also be used when using the instrument on an existing HART network.
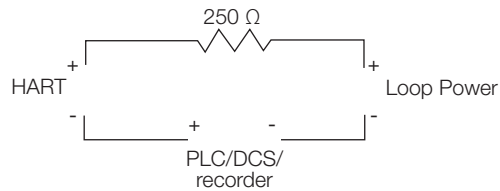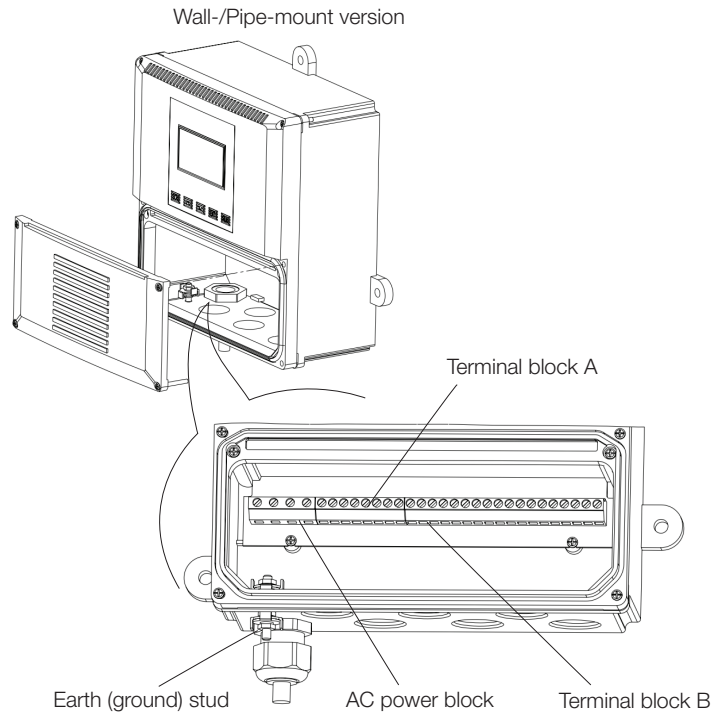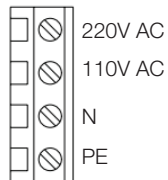

Fig. 3: Standard anolog output connection diagram

LST400
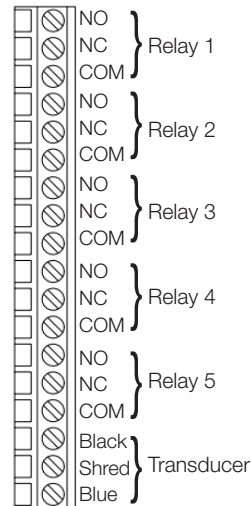## Ultrasonic level / open channel flow transmitter

Terminal connections

Wall-/Pipe-mount version

Terminal block A

Earth (ground) stud   AC power block   Terminal block B

AC power block

	220V AC
	110V AC
	N
	PE

Terminal block A

	+	} 24V DC power in
	-	
	+	} Loop power out
	-	From DC In
	+	} Loop power out
	-	From AC In
	+	} HART
	-	

Terminal block B

	NO	} Relay 1
	NC	
	COM	
	NO	} Relay 2
	NC	
	COM	
	NO	} Relay 3
	NC	
	COM	
	NO	} Relay 4
	NC	
	COM	
	NO	} Relay 5
	NC	
	COM	
	Black	} Transducer
	Shred	
	Blue	
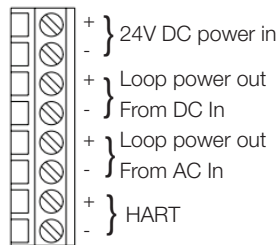
Specification

General

Inputs
One level transducer with integrated temperature sensor

Range
0.5m to 15m

Accuracy
0.25% full span with temperature compensation or 3mm (whichever is greater)

Repeatability
0.15% full span

Temperature compensation
NTC 10kΩ thermistor
Range –40 to 80°C (-40 to 176°F)

Measurement modes
Level
Distance
Linearized level (21-point linearizer)
Open channel flow with preconfigured flow curves for most common channels

Rate of change
0.03 to 65 ft / minute; 0.01 to 20 m / minute

Display

Type
128 x 64 dot graphic display

Energy-saving function
Backlit LCD configurable as ON or Auto-Off after 1-6 minutes

Relay output

Number of relays
Five supplied as standard

Set point adjustment
Configurable as high/low set point

Hysteresis
Configurable as reset point

Cycling options
Programmable for First in First Out (FIFO) or Cycle Mode

Relay contacts
Single-pole changeover
Rating 8A, 115/230V AC, 8A DC

Analog output

Output ranges
4 to 20mA
Analog output programmable to select 3.6mA, 4mA, 20mA, 21mA or hold last value in case of system failure

Accuracy
±0.25% FSD, ±0.5% of reading (whichever is the greater)

Resolution
0.1% at 10mA, 0.05% at 20mA

Maximum load resistance
750Ω at 20mA

Communications
HART 7 as standard

Access to functions

Direct keypad access
Measurement, maintenance, configuration, diagnostics and service functions
Performed without external equipment or internal jumpers

Mechanical data

Wall-/Pipe-mount versions transmitter
IP65 / NEMA 4X, Glass Loaded Polycarbonate
Dimensions 192mm high x 230mm wide x 94mm deep
(7.56 in. high x 9.06 in. wide x 3.7 in. deep)
Weight 1kg (2.2 lb)

Cable Entry Types
7 x knockouts suitable for M20 or 1/2" NPT cable glands
Supplied with 5 x M20 or 5 x 1/2" NPT cable glands

Power supply

Voltage requirements
110 V AC or 240V AC ±15%, 50/60 Hz, 5VA
20 to 30V DC, 4 VA

Environmental data

Operating temperature limits
-20 to 65°C (-4 to 149°F)

Storage temperature limits
-25 to 75°C (-13 to 167°F)

EMC

Emissions and immunity
Meets requirements of EN61326-3 (for an industrial environment)

Approvals, certification and safety

CE Mark
EMC Directive 2006/95/EC (IEC 61010-1)
LV Directives 2004/108/EC (IEC 61326-3 for an industrial environment)

General safety
EN61010-1

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Sensor specifications

| Type	S15	F15	C15
Model			
Design	For use on liquids and bulk solids up to 8m. Suitable for potable and waste water applications	For use in bulk solid level measurement up to 15m range. Foam face improves acoustic matching for better performance on solids.	Corrosion resistant housing ideal for chemically aggressive environments
Measurement range	0.5 to 15m	0.5 to 15m	0.5 to 15m
Acoustic window material	Glass reinforced epoxy	Glass reinforced epoxy	PVDF
Housing material	Glass filled polyester	Glass filled polyester	PVDF
Beamwidth (@ -3 dB)	7°	7°	7°
Operating frequency	41kHz	41kHz	41kHz
Process temperature limits	-40°C to 90°C	-40°C to 90°C	-40°C to 90°C

Dimensions

Dimensions in mm (in.)

Wall-/Pipe-mount version

Sensor

61mm (2³/₈ in.) OD vertical or horizontal post
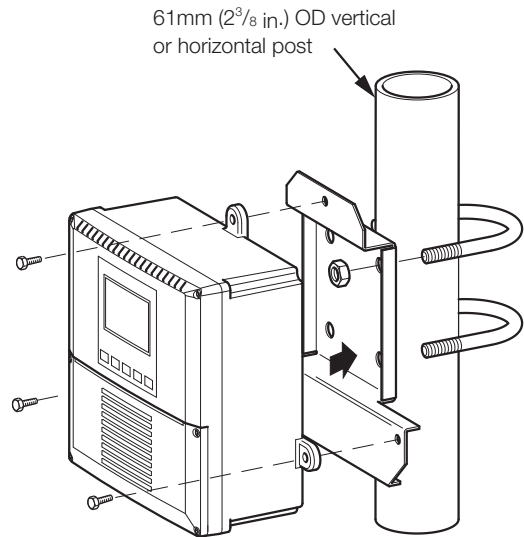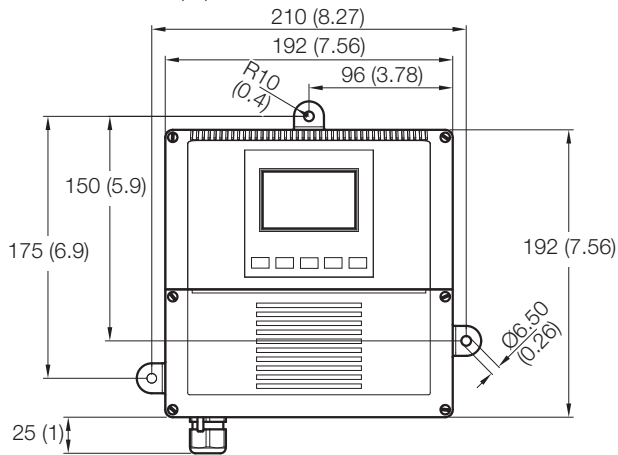
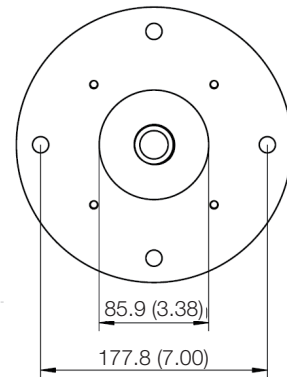Pipe-mount detail
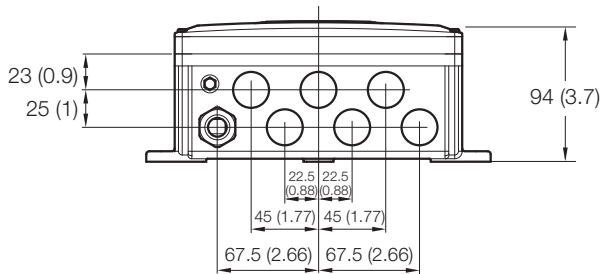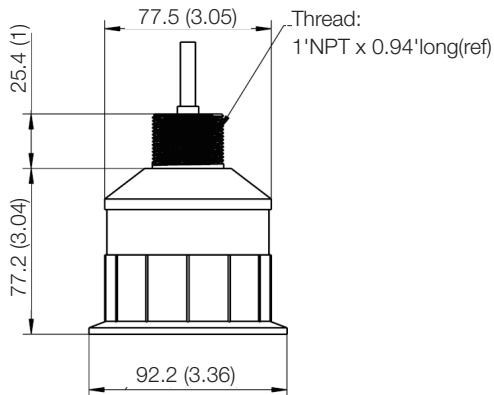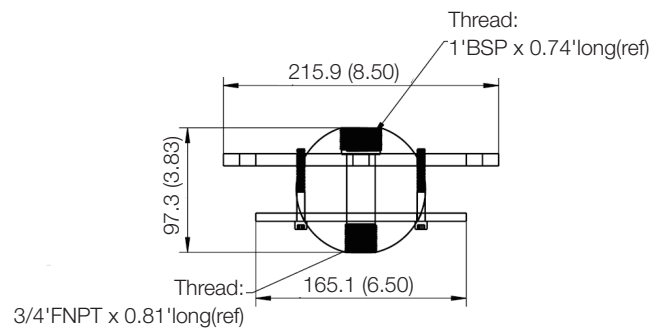
Aiming kit

LST400
Ultrasonic level / open channel flow transmitter

Ordering information

Basic ordering information for LST400

Some updates to the product options. The product code stays the same, only options are added. Also 1 new sensor is added. Here they are:

LST400	X	X	X	X	X	X
Explosion protection certification						
General Purpose	Y0					
Sensor type and range						
Standard transducer ,15 m range		S15				
Foam face transducer ,15m range, for solids		F15				
Corrosion resistant transducer, 15 m range		C15				
No transducer		Y00				
Process connection type						
1 in, NPT, 0.94 in, long			N1			
Housing material / cable glands						
Polycarbonate / 2 pieces. metric, M20 x 1.5, cable glands mounted				P3		
Polycarbonate / 2 pieces. 1/2 in. NPT threads, cable glands mounted				P6		
Power supply						
115 to 230 V AC or 24 V DC					A1	
Out signal						
HART digital communication and 4 to 20 mA						H1

Additional ordering information for LST400

Add one or more codes after basic ordering information to select all required options

		X	X	X	X	X	X	X	X
Signal cable length									
Without signal cable	SC0								
10m (approx. 30ft.)	SC2								
20m (approx. 66ft.)	SC4								
30m (approx. 98ft.)	SC6								
40m (approx. 131ft.)	SC8								
50m (approx. 164ft.)	SCA								
Sensor options									
Aiming kit		SEK							
Flange Options									
Flange, 3 in. ANSI / ASME connection, PVC			FA3						
Flange, 4 in. ANSI / ASME connection, PVC			FA4						
Flange, 6 in. ANSI / ASME connection, PVC			FA6						
Flange, 80 mm connection, PVC			FD3						
Flange, 100 mm connection, PVC			FD4						
Flange, 150 mm connection, PVC			FD6						
Bracket Shape / Material									
For pipe mounting / Stainless steel				B2					
Device Identification Plate									
Adhesive label with TAG no.					TC				
Certificates									
Inspection certificate for calibration with test report						CR			
Shipping Certificates									
Certificate of origin							GS1		
Attested certificate of origin							GS2		
Documentation Language									
English								M5	
Chinese								M6	

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HMI – Automação e Instrumentação, Lda.

Contact us

ABB Engineering (Shanghai) Ltd
Process Automation
No.5, Lane 369, Chuangye Rd.,
Pudong New District,
Shanghai 201319, P. R. China
Tel: +86 21 6105 6666
Fax: +86 21 6105 6677

ABB Inc.
Process Automation
125 E. County Line Rd
Warminster PA 18974-4995, USA
Tel: +1 215 674 6000
Fax: +1 215 674 7183

ABB Limited
Process Automation
Howard Road
St. Neots
Cambridgeshire PE19 8EU
UK
Tel: +44 (0)1480 475321
Fax: +44 (0)1480 217948

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