



## ULTRASONIC LEVEL METERS ULM-53



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## USED SYMBOLS

To ensure maximum safety of control processes, we have defined the following safety instructions and information. Each instruction is labeled with the appropriate pictogram.



### Alert, warning, danger

This symbol informs you about particularly important instructions for installation and operation of equipment or dangerous situations that may occur during the installation and operation. Not observing these instructions may cause disturbance, damage or destruction of equipment or may cause injury



### Information

This symbol indicates particularly important characteristics of the device.

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## 1. SAFETY



All operations described in this instruction manual have to be carried out by trained personnel or by an accredited person only. Installation, commissioning, operation and maintenance of the capacitive level sensors has to be carried out in accordance with this instruction manual; the provisions of regulations in force regarding the installation of electrical equipment have to be adhered to.

Improper use, installation or set-up of the sensor can lead to crashes in the application, (overfilling of the tank or damage of system components).

The manufacturer is not responsible for improper use, loss of work caused by either direct or indirect damage, and for expenses incurred at the time of installation or during the period of use of the level sensors.

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## 2. PACKING, TRANSPORTATION AND STORAGE

Equipment ULM-53 is packed in a cardboard wrap and the whole consignment is placed in a cardboard box. The cardboard box is suitably filled to prevent mechanical damage during transport. Let the device packed up till the use to prevent possible damage.

Transport to the customer is realized by forwarding company. Upon receipt, please check whether the shipment is complete and corresponds to the extent of the order, or whether during the transport did not occurred the damage of the packaging or the equipment. The device apparently damaged during transport do not use and contact the manufacturer to resolve the situation.

If the device is transported further, then only wrapped in the original packaging and protected against shocks and weather. Store the device in its original packaging in a dry place, sheltered from the weather, with humidity up to 85% without the effects of chemically active substances. Storage temperature range is from -20 °C to +60 °C.



Level meters variants ULM-53\_-02, 06, 10 are fitted with protective caps at the ultrasonic transducer to prevent damage. Before commissioning, remove the caps!

### 3. MEASURING PRINCIPLE

The ULM® ultrasonic level meters are compact measurement devices containing an ultrasonic transmitter and an electronic module. Using an transmitter, level meters transmit the series of ultrasonic pulses that spread towards the level surface. The transmitter recuperates reflected acoustic waves that are subsequently processed in the electronic module. Based on the period during which the individual pulses spread towards the level and back, this period is averaged by the electronics that performs temperature compensation and subsequently a conversion to an output current (voltage).

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### 4. RANGE OF APPLICATION

For continuous non-contact level measurement of liquids (water solutions, sewerage water, etc.), mash and paste materials (sediments, sticks, resins etc.) in closed or open vessels, sumps, reservoirs and open channels. In case the level of bulk-solid materials is measured, the measurement range is reduced.

All setting-up is done using two buttons positioned in the upper part of the sensor. The level meter is equipped with optical state indication (STATE) and with a setting-up process (MENU). The level meter can output current or voltage signals. They are manufactured in model versions for non-explosive areas (N) and explosive areas (Xi).

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### 5. FEATURES OF VARIANTS

**ULM-53\_-02\_-** measuring range from **0.25 m to 2 m**, plastic PVDF (Polyvinylidene fluoride) transmitter and plastic body, process connection with thread G 1".

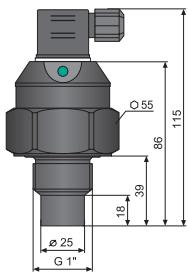
**ULM-53\_-06\_-** measuring range from **0.25 m to 6 m**, plastic PVDF transmitter and plastic body, process connection with thread G 1½".

**ULM-53\_-10\_-** measuring range from **0.5 m to 10 m**, plastic PVDF transmitter and plastic body, aluminium alloy –"Xi" version or PP (Polypropylene) – "N" version flange.

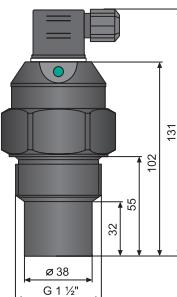
**ULM-53\_-20\_-** measuring range from **0.5 m to 20 m**, with plastic PVDF transmitter and plastic body (PP+HDPE), aluminium alloy flange.

## 6. DIMENSIONAL DRAWINGS

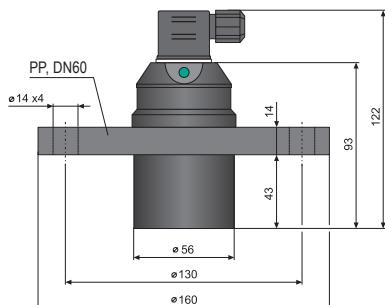
ULM-53\_-02\_-



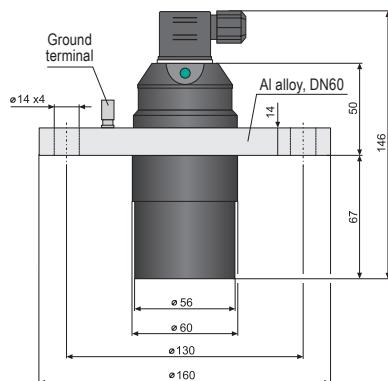
ULM-53\_-06\_-



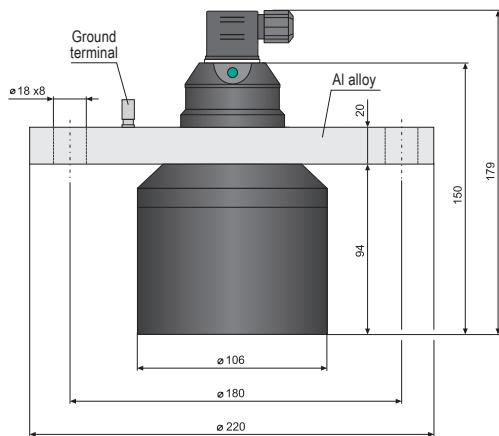
ULM-53N-10\_-



ULM-53Xi-10-I



ULM-53\_-20\_-



## 7. INSTALLATION INSTRUCTIONS

- Install the level meter in a **vertical position** into the upper lid of the tank (vessel) or reservoir using a lug, a fastening nut or a flange in such a way that the ULM axis is perpendicular to the level of the measured liquid (Fig. 1).
- Minimum dimension parameters when installing into a lid or a ceiling of a tank are listed in Fig. 3.
- When installing in an **open channel** (reservoir, drain and the like), install the level meter onto a console to the expected maximum level as close as possible.
- In compliance with the measurement principle, no signals reflected in the area directly below the level meter (the so-called dead zone) can be evaluated. The dead zone (Fig. 2) determines the **minimum distance** possible between the level meter and the highest surface level. Medium minimum distance parameters are listed in chapter on „Technical specifications“.
- It is **necessary** to install the level meter in such a way that the bin level does not interfere with the dead zone when filled up to the maximum. If measured level interferes with the dead zone, the level meter will not work properly.

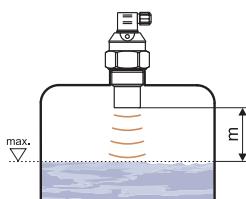


Fig. 2: Level meter dead zone

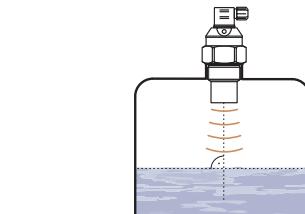


Fig. 1: Recommended installation in the tank

ULM-53-02;10	$d > 1/12 c$ (min. 200 mm)
ULM-53-06	$d > 1/8 c$ (min. 200 mm)
ULM-53-20	$d > 1/10 c$ (min. 200 mm)

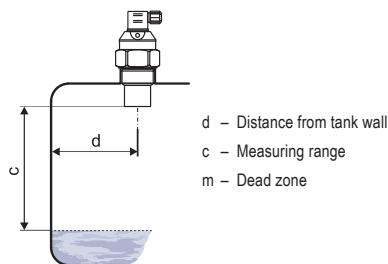


Fig. 3: Installation distance from the tank wall

- In case the maximum surface level in the tank interferes with the dead zone, the level meter has to be mounted into a higher **installation neck**. Subsequently, the tank can be filled nearly up to the maximum volume. The neck's inner surface has to be even and smooth (without edges and welded joints), the inner edge should be rounded in the position point where the ultrasonic waves leave the pipe. Choose the largest possible neck's diameter, but keep the neck's height as low as possible. Recommended dimensions of the neck are listed in Fig. 4.

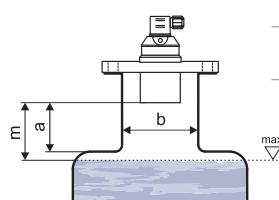
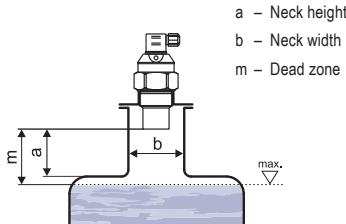


Fig. 4: Possible installation of the installation neck

ULM-53-02;06	$a < 3b$ $b > 100 \text{ mm}$
ULM-53-10	$a < 1,5b$ $b > 100 \text{ mm}$
ULM-53-20	$a < 1,5b$ $b > 150 \text{ mm}$

g) Foam on the level absorbs the acoustic wave reflection which might cause **malfunction** of the level meter. For mounting find the location where the foaming is as low as possible (Fig. 5).

h) Emitted acoustic signal must not be affected by **near objects** (ladders, mixers, propellers, etc.), stream of filling, air flow, etc. (Fig. 6).

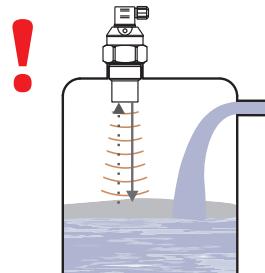


Fig. 5: Thick foam on the surface

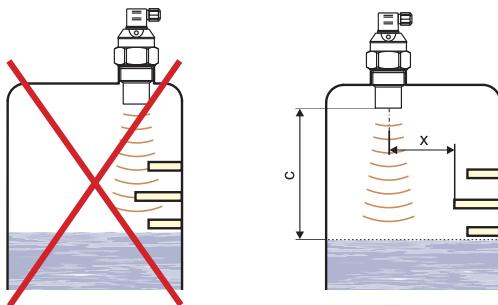


Fig. 6: Minimum distance of the level meter to nearby objects in the tank

ULM-53-02;10	$x > 1/12 c$ (min. 200 mm)
ULM-53-06	$x > 1/8 c$ (min. 200 mm)
ULM-53-20	$x > 1/10 c$ (min. 200 mm)

$x$  – distance to the edge of the longest object  
 $c$  – measurement range of the level meter

i) Do not install the level meter in or above the **filling point** (Fig. 7).

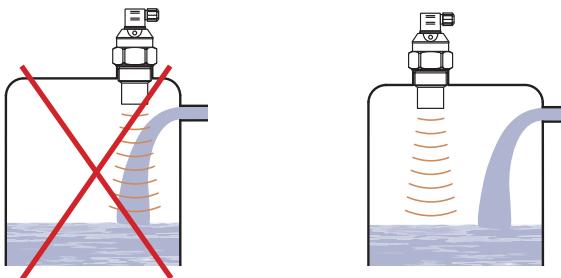


Fig. 7: Level meter installation outside the influence of filling circulation

j) In case the level of bulk-solid materials is measured, the measurement range is **reduced**. We recommend to consult the use with the manufacturer.

- k) The level meter must **not be installed** in places with direct solar radiation and must be protected against weather conditions.
- l) In case the installation at places with direct solar radiation is inevitable, it is necessary to mount a **shielding cover** above the level meter (Fig. 8).
- m) If possible, insert the cable **from above** and let a draining loop in order to avoid intrusion of humidity (Fig. 9).
- n) The cable bushing as well as the connector have to be **tightened sufficiently** to prevent penetration of moisture.
- o) To lower the minimum distance to the medium measured, a **reflection board** made from solid, even and smooth material can be installed together with the level meter (Fig. 10). Subsequently, the tank can be filled nearly up to the maximum volume. The solution is suitable for open tanks and reservoirs.
- p) Scattering or attenuation of the ultrasonic signal can result if the surface level has been moderately stirred or rippled as a consequence a stirrer's operation, inflow of liquid and the like. Consequently, measuring range or unreliable level meter's functioning **might follow** (Fig. 11).
- q) False surface reflections of the ultrasonic signal might result as a consequence of **rotating mixer's blades** that ripple the surface level and thus cause unreliable level meter's functioning (Fig. 12).
- r) The level meter should not be installed at places where ultrasonic signal **false reflections** caused by stirrer blades might occur (Fig. 13).

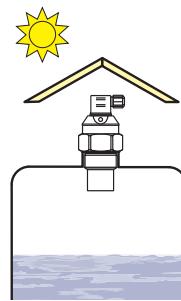


Fig. 8: Direct solar radiation shielding cover

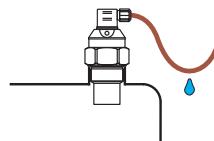


Fig. 9: Prevention to avoid intrusion of humidity

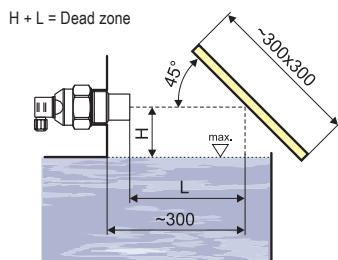


Fig. 10: Reflection board

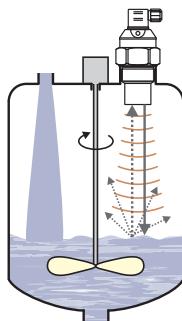


Fig. 11: Moderately stirred surface

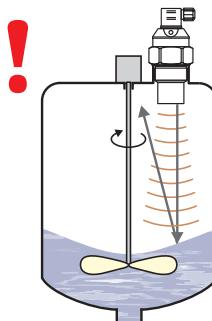


Fig. 12: Intensely stirred surface

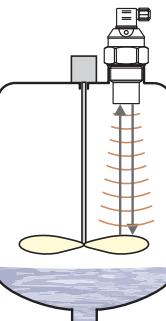


Fig. 13: False reflection caused by mixer blade

- s) Horn adapter ST-G1 (ULM-53\_02) and ST-G1,5 (ULM-53\_06) for improved transmitted signal reception can be used in open channels, sumps, tanks, etc.
- t) Horn adapter increases the radiation directivity of acoustic waves, improves reception of weak echoes (unstable level surfaces, solid materials, etc.) and reduces the risk of false reflections.
- u) The horn adapter is installed to level meters via process connection G1" (ST-G1) or G1½" (ST-G1,5).

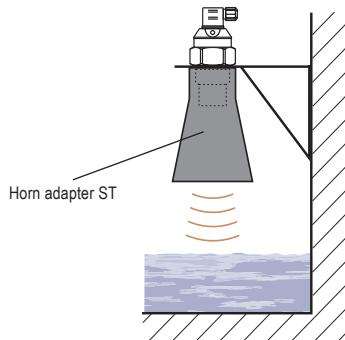


Fig. 14: Horn adapter installation

## 8. ELECTRICAL CONNECTION

The ultrasonic level meter is designed to be connected to supply unit or to controller through two or three-wire cable with outer diameter 6  $\div$  8 mm (recommended cross section of cores 0.5 mm<sup>2</sup> to 0.75 mm<sup>2</sup>) by means of connector which is included in delivery. Connection diagram and inner view of the connector as shown in Fig. 15 and 16.

**Comments:**

BK – black      BN – brown  
BU – blue      NC – not connected

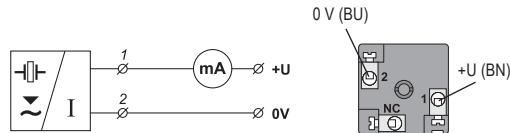


Fig. 15: Level meter connection diagram ("I" version) and the inside of the connector socket

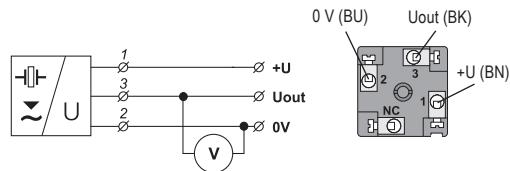


Fig. 16: Level meter connection diagram ("U" version) and the inside of the connector socket



**Make the electric connection in voltage-free state!**

**With regard to possible occurrence of electrostatic charge on non-conductive parts of the level meter, metallic flanges of the ULM-53Xi-10 and 20 (for explosive areas) level meters must be grounded with ground terminal!**



*In case of strong electromagnetic interferences (EMI), parallel cable ducting with power lines, or when cable length exceeds 30 m we recommended to use shielded cable.*

## 9. SET-UP ELEMENTS

### Button “DOWN”

- Set-up mode access
- Direct set-up to value 4 mA (0V)
- Decreasing of values by predefined pitch

### Button “UP”

- Set-up mode access
- Direct set-up to value 20 mA (10V)
- Increasing of values by predefined pitch

### LED indicator “STATE”

- Signalling of measuring mode



Fig. 17: Full view of ultrasonic level meter

- Signalling of set-up mode access

## 10. STATUS AND FAILURE SIGNALIZATION

LED	Color	Function
“STATE”	Green	<b>Slow flashing</b> (1 ... 2 s, depends on the measuring interval) – reception of reflected signal (echo) from the measured level. Correct function. <b>Fast blinks</b> – the measured value is in “dead zone” of the level meter, or the ultrasonic transmitter is polluted. <b>Dark</b> – no echo reflection. Wrong medium type or incorrect installation (malfunction).
“MENU”	Yellow	<b>Slow blinks</b> – signalization setting limit 4 mA (0V). <b>Fast blinks</b> – signalization setting limit 20 mA (10V). <b>Three short blinks</b> – signalization factory default setting

## 11. OPERATIONAL MODES

The level meters can either work in the “basic” mode that measures the level height (Fig. 18), or in the “inverse mode” that measures distances (Fig. 19).

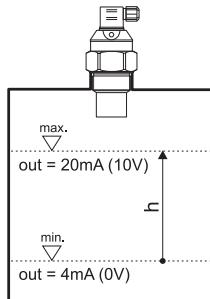


Fig. 18: Basic mode (measurement of level height)

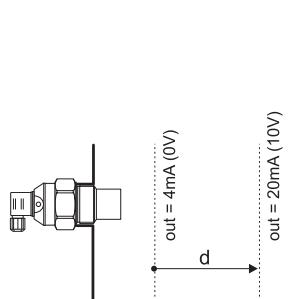


Fig. 19: Inverse mode (distance measurement)

## 12. SETTING UP

After the level meter has been installed, set it up using the “DOWN” and “UP” buttons (see Fig. 17). The LED indicator “MENU” indicates the on-going set-up procedure of the level meter. You can set up the “basic mode”, which measures the level height (Fig. 18) and set up the “inverse mode” to measure distances (Fig. 19).

### 12.1. BASIC MODE

#### Low margin (4 mA or 0 V) setting up

1. The tank fills up to the level required
2. Press the “DOWN” button for at least 2 seconds to activate the set-up mode (the LED indicator “MENU” blinks slowly). Keep the “DOWN” button pressed for another 3 seconds to directly set the value to 4 mA (0 V). In this case, item 3 can be omitted.
3. Press the “DOWN” and “UP” buttons to accurately set-up an arbitrary value stepwise (hold the relevant button to increase the adjustment step gradually).
4. Press both buttons simultaneously for at least 1 second to confirm the values set.
5. Further adjustment can't be performed sooner than 2 sec. after both of the buttons have been released.

#### High margin (20 mA or 10 V) setting up

1. The tank fills up to the level required
2. Press the “UP” button for at least 2 seconds to activate the setting-up mode (the LED indicator “MENU” blinks fast). Keep the “UP” button pressed for another 3 seconds to directly set the value to 20 mA (10 V).

3. Press the “DOWN” and “UP” buttons to accurately set-up an arbitrary value stepwise (hold the relevant button to increase the adjustment step gradually).
4. Press both buttons simultaneously for at least 1 second to confirm the values set.
5. Further adjustment cannot be performed sooner than 2 seconds after both of the buttons have been released.

## 12.2. INVERSE MODE

### Low margin (20 mA or 10 V) setting up

1. The tank fills up to the level required
2. Press the “UP” button for at least 2 seconds to activate the setting-up mode (the LED indicator “MENU” blinks fast). Keep the “UP” button pressed for another 3 seconds to directly set the value to 20mA (10V).
3. Press the “DOWN” and “UP” buttons to accurately set-up an arbitrary value stepwise (hold the relevant button to increase the adjustment step gradually).
4. Press both buttons simultaneously for at least 1 second to confirm the values set.
5. Further adjustment cannot be performed sooner than 2 seconds after both of the buttons have been released.

### High margin (4 mA or 0 V) setting up

1. The tank fills up to the level required
2. Press the “DOWN” button for at least 2 seconds to activate the setting-up mode (the LED indicator “MENU” blinks slowly). Keep the “DOWN” button pressed for another 3 seconds to directly set the value to 4mA (0V).
3. Press the “DOWN” and “UP” buttons to accurately set-up an arbitrary value stepwise (hold the relevant button to increase the adjustment step gradually).
4. Press both buttons simultaneously for at least 1 second to confirm the values set.
5. Further adjustment cannot be performed sooner than 2 seconds after both of the buttons have been released.



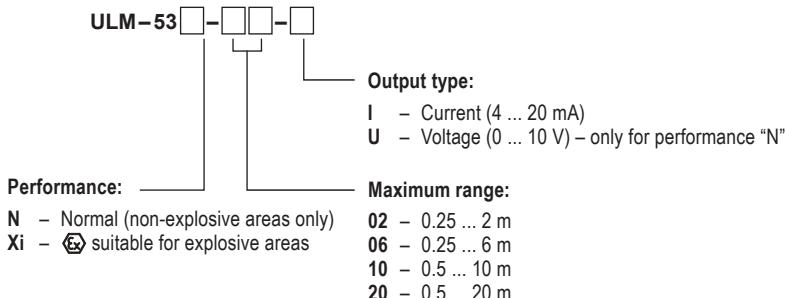
*In case the level appears in the dead zone (the LED indicator “STATE” blinks fast), the setting-up mode terminates instantly and is inaccessible as long as the level stays within the dead zone.*

*In case no button is pressed during the “setting-up mode” for as long as 20 seconds, the level meter returns to the measuring mode. Newly adjusted values will not be saved.*

### Factory defaults settings

1. Disconnect the level meter from the power supply (eg. by disconnecting the connector).
2. Without power supply simultaneously press the “DOWN” and “UP” buttons.
3. Connect the power supply, the “DOWN” and “UP” buttons still hold down.
4. Wait approx. 2 sec. for 3 short flashes of LED “MENU”. Then, release both buttons.
5. Now the level meter is set in default settings (range). The default values are listed in the table on page 20.

## 13. ORDER CODE



## 14. ACCESSORIES

### Standard (included in the price)

- 1 pc of seal  
(only for ULM-53\_–02, 06)
- 1 pc of connector IP67 socket

### Optional (for extra charge)

- Fixing nut G1" and G1 1/2"
- Horn adapter ST–G1 and ST–G1,5

## 15. SAFETY, PROTECTION, COMPATIBILITY AND EXPLOSION PROOF

The level meter ULM-53 is equipped with protection against reverse polarity and output current overload.

Protection against dangerous contact is secured by low safety voltage that complies with EN 33 2000-4-41.

Electromagnetic compatibility according to EN 55022/B, EN 61326/Z1 and EN 61000-4-2 to 6.

Explosion proof of ULM-53Xi type complies with the following standards: EN 60079-0 : 2007;

EN 60079-11 : 2007 ; EN 60079-26 : 2007 and examined by FTZÚ-AO 210 Ostrava - Radvanice certificate No.: FTZÚ 09 ATEX 0119X.

Supplied electrical equipment matches the requirements of valid European directives for safety and electromagnetic compatibility. The declaration of Conformity for the above mentioned product was issued.

### Special conditions for safe use ULM-53Xi

The device is designed for connection to isolating repeater IRU-420.

When the other approved supply unit is used, whose output parameters satisfy above mentioned output parameters, it is necessary to have a galvanic separation or, if supply unit without galvanic separation is used (Zener barriers), it is necessary provide potential equalization between sensor and point of barrier earthing.

For application in zone 0 the present explosive atmospheres - mixture of air with flammable gases, vapour or mists must comply:  $-20^{\circ}\text{C} < \text{Ta} < +60^{\circ}\text{C}$ ;  $0.8 \text{ bar} < p < 1.1 \text{ bar}$



The device must be installed in such a way, to prevent mechanical damage of sensor face

## 16. USE, MANIPULATION AND MAINTENANCE

The level meter does not require any personnel for its operation. Follow-up displaying device is used to inform the technological entity operating personnel on the measured substance level height during the operation. Maintenance of this equipment consists in verification of integrity of the level meter and of the supply cable. Depending on the character of the substance measured, we recommend to verify at least once per year the clarity of the ultrasound transducer emitting field and to clean it, respectively. In case any visible defects are discovered, the manufacturer or reseller of this equipment must be contacted immediately.



**It is forbidden to perform any modifications or interventions into the ULM-53 level meter without manufacturer's approval. Potential repairs must be carried out by the manufacturer or by a manufacturer authorized service organization only.**

**Installation, commissioning, operation and maintenance of the ULM-53 level meter has to be carried out in accordance with this instruction manual; the provisions of regulations in force regarding the installation of electrical equipment have to be adhered to.**

## 17. GENERAL CONDITIONS AND WARRANTY

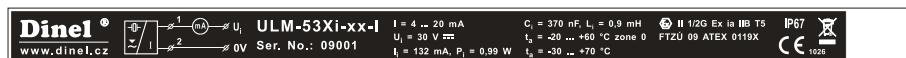
Dinel, s.r.o. guarantees for the period of three (3) years that the product has the characteristic as in technical specification is mentioned. The guarantee can be invoked only when the product is completed by original invoice and guarantee list. This guarantee does not cover the damages resulting from misuse, improper installation or incorrect maintenance.

This guarantee cease when user or the other person makes any changes on the product or the product is mechanically or chemically damaged, or the serial number is not readable.

In the case of rightful complaint we replace the product or its defective part.

## 18. MARKING OF LABELS

Level meters label data ULM-53Xi-02-I and ULM-53Xi-06-I:



Symbol of producer: Dinel logo®

Internet address: [www.dinel.cz](http://www.dinel.cz)

Connection scheme and labelling of wires:  $U_i$  ;  $0V$

Level meter type: ULM-53Xi-02-I, ULM-53Xi-06-I

Serial number: Ser. No.: xxxx – (from the left: production year, serial production No.)

Output current range:  $I_o = 4 \dots 20 \text{ mA}$

Limit operating parameters:  $U_i = 30 \text{ V}$ ,  $I_i = 132 \text{ mA}$ ,  $P_i = 0.99 \text{ W}$ ,  $C_i = 370 \text{ nF}$ ,  $L_i = 0.9 \text{ mH}$

Ambient temperature range for the zone 0:  $t_a = -20 \dots +60^\circ\text{C}$

Ambient temperature range:  $t_a = -30 \dots +70^\circ\text{C}$

Label of non-explosive device:

Performance: II 1/2G Ex ia IIB T5

Number of certificate of intrinsically safety: FTZÚ 09 ATEX 0119X

Protection class: IP67, Compliance mark: CE

Number of authorized person examining control of system quality: 1026

Electro-waste take-back system mark: 

Level meters label data **ULM-53Xi-10-I**:

<b>Dinel®</b>		<b>ULM-53Xi-10-I</b>	$I = 4 \dots 20 \text{ mA}$	$C_i = 370 \text{ nF}$ , $L_i = 0,9 \text{ mH}$	 II 1/2G Ex ia IIB T5	IP67	
www.dinel.cz		Ser. No.: 09001	$U_i = 30 \text{ V} \text{ ---}$	$I_{\text{a}} = -20 \dots +60^\circ\text{C}$ zone 0	FTZÚ 09 ATEX 0119X	CE	1026

Symbol of producer: Dinel logo®

Internet address: [www.dinel.cz](http://www.dinel.cz)

Connection scheme and labelling of wire:  $U_i$  ;  $0V$

Level meter type: ULM-53Xi-20-I

Serial number: Ser. No.: xxxx – (from the left: production year, serial production No.)

Output current range:  $I_o = 4 \dots 20 \text{ mA}$

Limit operating parameters:  $U_i = 30 \text{ V} =$ ,  $I_i = 132 \text{ mA}$ ;  $P_i = 0,99 \text{ W}$ ;  $C_i = 370 \text{ nF}$ ;  $L_i = 0,9 \text{ mH}$

Ambient temperature range for the zone 0:  $ta = -20 \dots +60^\circ\text{C}$

Ambient temperature range:  $ta = -30 \dots +60^\circ\text{C}$

Label of non-explosive device: 

Performance: II 2G Ex ia IIA T5

Number of certificate of intrinsically safety: FTZÚ 09 ATEX 0119X

Protection class: IP67, Compliance mark: CE

Number of authorized person examining control of system quality: 1026

Electro-waste take-back system mark: 

Level meters label data **ULM-53Xi-20-I**:

<b>Dinel®</b>		<b>ULM-53Xi-20-I</b>	$I = 4 \dots 20 \text{ mA}$	$C_i = 370 \text{ nF}$ , $L_i = 0,9 \text{ mH}$	 II 2G Ex ia IIA T5	IP67	
www.dinel.cz		Ser. No.: 09001	$U_i = 30 \text{ V} \text{ ---}$	$I_{\text{a}} = -20 \dots +60^\circ\text{C}$	FTZÚ 09 ATEX 0119X	CE	1026

Symbol of producer: Dinel logo®

Internet address: [www.dinel.cz](http://www.dinel.cz)

Connection scheme and labelling of wire:  $U_i$  ;  $0V$

Level meter type: ULM-53Xi-10-I

Serial number: Ser. No.: xxxx – (from the left: production year, serial production No.)

Output current range:  $I_o = 4 \dots 20 \text{ mA}$

Limit operating parameters:  $U_i = 30 \text{ V} =$ ,  $I_i = 132 \text{ mA}$ ;  $P_i = 0,99 \text{ W}$ ;  $C_i = 370 \text{ nF}$ ;  $L_i = 0,9 \text{ mH}$

Ambient temperature range for the zone 0:  $ta = -20 \dots +60^\circ\text{C}$

Ambient temperature range:  $ta = -30 \dots +60^\circ\text{C}$

Label of non-explosive device: 

Performance: II 1/2G Ex ia IIA T5

Number of certificate of intrinsically safety: FTZÚ 09 ATEX 0119X

Protection class: IP67, Compliance mark: CE

Number of authorized person examining control of system quality: 1026

Electro-waste take-back system mark: 



Real label size is 175 x 11 mm.

## 19. SPECIFICATIONS

TECHNICAL DATA – LEVEL METER		
Measuring range <sup>1)</sup>	ULM-53_-02_-	0.25 ... 2 m
	ULM-53_-06_-	0.25 ... 6 m
	ULM-53_-10_-	0.5 ... 10 m
	ULM-53_-20_-	0.5 ... 20 m
Current supply	ULM-53_-__-U	12 mA
Supply voltage	ULM-53N-__-__	18 ... 36 V DC
	ULM-53Xi-__-I	18 ... 30 V DC
Current output ULM-53_-__-I		4 ... 20 mA (limit values 3.9 ... 20.5 mA)
Voltage output ULM-53N-__-U		0 ... 10 V (limit values 0 ... 10.2 V)
Resolution		< 1 mm
Accuracy (within the total range)	ULM-53_-06_-;10_-;20_-	0.2%
	ULM-53_-02_-	0.3%
Temperature error		max. 0.04% / K
Beamwidth (-3 dB)	ULM-53_-02_-;10_-	10°
	ULM-53_-06_-	14°
	ULM-53_-20_-	12°
Ambient temperature range	ULM-53_-02_-;06_-	-30 ... +70°C
	ULM-53_-10_-;20_-	-30 ... +60°C
Measuring period	ULM-53_-02_-	0.6 s
	ULM-53_-06_-	1.0 s
	ULM-53_-10_-	1.8 s
	ULM-53_-20_-	5.0 s
Averaging (can be modified according to agreement)		4 samples
Short time temperature stress resistance		+90°C / 1 hod.
Max. operation overpressure (on transmission surface)		0.1 MPa
Limit operating parameters <sup>2)</sup> (for the Xi version only)		Ui=30V DC; li=132mA; Pi=0.99W; Ci=370nF; Li=0.9mH
Failure indication	echo failure – basic mode	3.75 mA (0 V)
	echo failure – inverse mode	22 mA (10.5 V)
	level in dead zone – basic mode	22 mA (10.5 V)
	level in dead zone – inverse mode	3.75 mA (0 V)
Protection class		IP67
Recommended cable		PVC 2 x 0.75 mm <sup>2</sup> (3 x 0.5 mm <sup>2</sup> )
Maximal current output load resistance (at U = 24 V DC)		R <sub>max</sub> = 270 Ω
Minimal voltage output load resistance		R > 1 kΩ
Delay between supply power rise time and first measurement	ULM-53_-02_-;06_-;10_-	3 s
	ULM-53_-20_-	5 s
Delay between power supply rise time and full emission output	ULM-53_-02_-;06_-;10_-	30 s
	ULM-53_-20_-	45 s
Weight	ULM-53_-02_-	0.20 kg
	ULM-53_-06_-	0.25 kg
	ULM-53_-10_-	0.65 kg
	ULM-53_-20_-	2.80 kg

1) In case the level of bulk-solid materials is measured, the measurement range is reduced.

2) Allowed temperature range in the zone 0: -20°C ... +60°C; allowed pressure range in the zone 0: 80 ... 110 kPa.

AREA CLASSIFICATION (according to EN 60079-10 and EN 60079-14)	
ULM-53N_--_	Performance for non-explosive areas
ULM-53Xi-02-I ULM-53Xi-06-I	Explosive proof – suitable for explosive areas (combustible gases or vapours) Ex II 1/2G Ex ia IIB T5 with isolating repeater (IRU-420), the whole level meter – zone 1, front head part – zone 0
ULM-53Xi-10-I	Explosive proof – suitable for explosive areas (combustible gases or vapours) Ex II 1/2G Ex ia IIA T5 with isolating repeater (IRU-420), the whole level meter – zone 1, front head part – zone 0
ULM-53Xi-20-I	Explosive proof – suitable for explosive areas (combustible gases or vapours) Ex II 2G Ex ia IIA T5 with isolating repeater (IRU-420) the whole level meter – zone 1

FACTORY DEFAULT				
	ULM-53_-02	ULM-53_-06	ULM-53_-10	ULM-53_-20
Min. measuring range (20 mA)	0.25 m	0.25 m	0.5 m	0.5 m
Max. measuring range (4 mA)	2 m	6 m	10 m	20 m



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The lastest version of this instruction manual can be found at [www.dinel.cz](http://www.dinel.cz)

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ISO 9001

