

CPK-U-53



- ultrasonic level sensors
- for limit level measurement of liquids (even if polluted), mash and paste materials in open or closed vessels, sumps, open channels, drains, etc.
- variants of level meter with adjustment by two buttons or by magnetic pen
- state indication by two LEDs
- PNP transistor / open collector output or two-state current switch
- wide choice of electric connection via connectors, cable glands or protective conductor
- reception of reflected ultrasonic signal from level can be improved using horn adapter



The **CPK-U-53** ultrasonic level sensor are compact measurement devices containing an ultrasonic transmitter and an electronic module. Using an transmitter, level sensor transmit the series of ultrasonic pulses that spread towards the level surface. The transmitter receives 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. The output of the CPK-U-53 sensor consists of a PNP transistor with an open collector or a two-state current switch 4 mA / 20 mA.

Thanks to the contactless measuring principle ultrasonic level meters are suitable for continuous measurement or limit level sensing of liquids, waste water, sludge, suspensions, adhesives, resins in various open and closed vessels, sumps, open channels and drains. Use for organic solvents or substances, which contain organic solvents, should be consulted with the manufacturer.

Usability for level measurement of solid materials is limited, there is a shorter measuring range. We recommend using the level meter for such a medium to consult with the manufacturer. Setting is carried out either using two buttons or a magnetic pen or by remote setting in case of Modbus RTU output. The device is equipped with optical indication of its state (RUN) and the setting process (STATE). It is manufactured in design for normal (N) atmosphere.

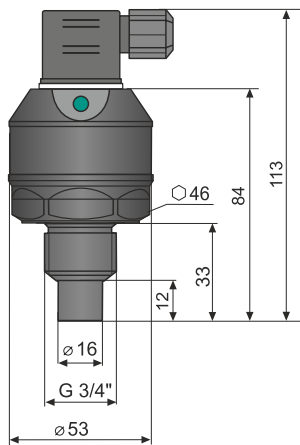
VARIANTS OF LEVEL METERS

- CPK-U-53N-01**— measurement range 0.1 m to 1 m, all-plastic design, source of PVDF (polyvinylidene fluoride), mechanical connection with thread G ¾"
- CPK-U-53N-02**— measurement range 0.2 m to 2 m, all-plastic design, source of PVDF, mechanical connection with thread G 1"
- CPK-U-53N-06**— measurement range 0.2 m to 6 m, all-plastic design, source of PVDF, mechanical connection with thread G 1 ½"
- CPK-U-53N-10**— measurement range 0.4 m to 10 m, all-plastic case, source of PVDF, mechanical connection with thread G 2 ¼"

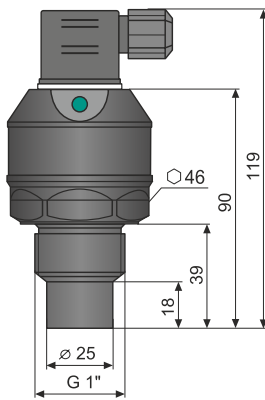


DIMENSION DRAWINGS

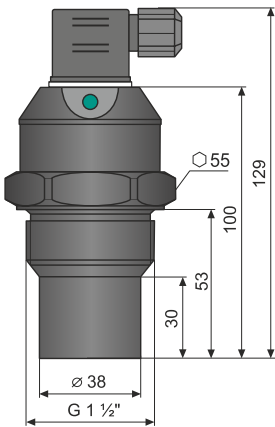
CPK-U-53N-01



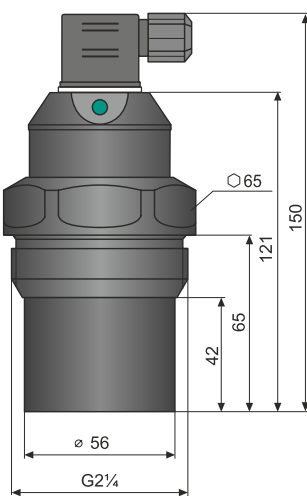
CPK-U-53N-02



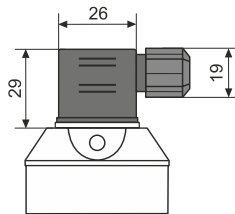
CPK-U-53N-06



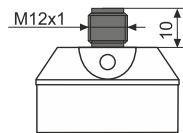
CPK-U-53N-10



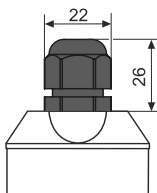
Variant "G" with connector ISO



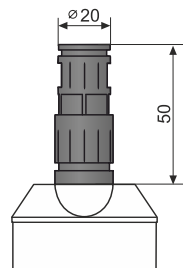
Variant "C" with connector M12



Variant "B" with standard cable gland



Variant "H" with outlet for protective conductor



Technical specifications		
Measuring range ¹⁾	CPK-U-53N-01-_ CPK-U-53N-02-_ CPK-U-53N-06-_ CPK-U-53N-10-__	0,1 ... 1 m 0,2 ... 2 m 0,2 ... 6 m 0,4 ... 10 m
Supply voltage	CPK-U-53N-__-__	18 ... 36 V DC
Current supply	CPK-U-53N-__-__-P CPK-U-53N-__-__-S	max. 12 mA disconnected 4 mA / connected 20 mA
Current output	CPK-U-53N-__-__-P	PNP transistor with an open collector (max. switch current 300 mA) two-state current switch 4 mA / 20 mA
Voltage output	CPK-U-53N-__-__-S	
Resolution		< 1 mm
Accuracy (within the total range)	CPK-U-53N-01 in area 0,1–0,2 m / 0,2–1,0 m CPK-U-53N-02; -06 CPK-U-53N-10	0,3 % / 0,2 % 0,15 % 0,2 %
Temperature error		max. 0,04% / K
Beam width (-3 dB)	CPK-U-53N-01-__ ; 02-__ ; 10-__ CPK-U-53N-06-__	10° 14°
Ambient temperature range	CPK-U-53N-01-__ ; 02-__ ; 06-__ CPK-U-53N-10-__	-30 ... +70°C -30 ... +60°C
Measuring period	CPK-U-53N-01-__ ; 02-__ CPK-U-53N-06-__ CPK-U-53N-10-__	0,6 s 1,0 s 1,8 s
Averaging		4 measurement ³⁾
Short time temperature stress resistance		+90°C / 1 hod.
Max. operation overpressure (on transmission surface)		0,1 MPa
Recommended cable		PVC 2 x 0,75 mm ² (3 x 0,5 mm ²)
Failure indication	echo failure – basic mode echo failure – inverse mode level in dead zone ⁴⁾ – basic mode level in dead zone ⁴⁾ – inverse mode	3,75 mA / 0 V 22 mA / 10,5 V 22 mA / 10,5 V 3,75 mA / 0 V
Protection class	CPK-U-53N-__-__-__-T CPK-U-53N-__-__-__-G-M, L	IP67
	CPK-U-53N-__-__-__-C-M, L	IP67 ⁵⁾
	CPK-U-53N-__-__-__-B-M, L CPK-U-53N-__-__-__-H-M, L	IP68
Minimal voltage output load resistance		R _{min} > 1 k
Maximal current output load resistance	at U = 24 V DC at U = 22 V DC at U = 20 V DC	R _{max} = 270 R _{max} = 180 R _{max} = 90
Delay between supply power rise time and first measurement	CPK-U-53N-01-__ ; 02-__ ; 06-__ CPK-U-53N-10-__	5 s 9 s
Process connection	CPK-U-53N-01-_ CPK-U-53N-02-_ CPK-U-53N-06-_ CPK-U-53N-10-__	thread G ¾“ thread G 1“ thread G 1½“ thread G 2¼“
Weight	CPK-U-53N-01-_ CPK-U-53N-02-_ CPK-U-53N-06-_ CPK-U-53N-10-__	0,20 kg 0,20 kg 0,25 kg 0,65 kg

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

²⁾ Allowed pressure range in the zone 0: 80 ... 110 kPa.

³⁾ From the last six measurements are taken out extreme values MAX and MIN, then the remaining four measurement was performed arithmetic average.

⁴⁾ Dead zone = blind zone = blocking zone.

⁵⁾ Protection class IP68 can be achieved when a special connector is used.



Materials

sensor part	type variant	standard material
Housing	all	plastic PP
Electro-acoustic transducer	all	plastic PVDF
Cable gland	all	plastic PA

AREAS OF APPLICATION

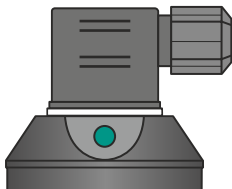
Thanks to the proximity principle employed, the devices are suitable for continuous measurement of the level of liquids, waste water, sludge, suspensions, adhesives, resins in various open and closed vessels, sumps, open channels and drains.

Applicability for measuring the surface level of loose materials is limited, the range of measurement is shorter there. We recommend that the suitability of the level meter for measuring bulk-solid materials is consulted with the manufacturer.

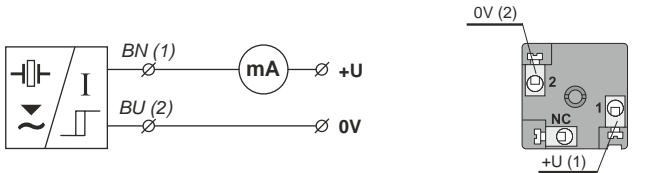
ELECTRICAL CONNECTION

Connection through ISO connector

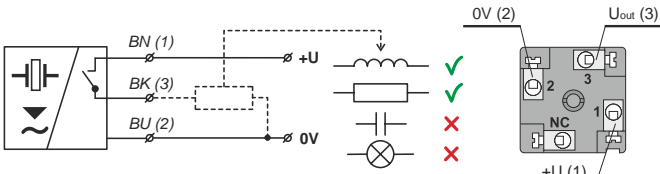
The CPK-U-53 level sensor with a G type cable gland are connected to processing (display) units by means of a cable with an outer diameter of 6 to 8 mm (recommended wire cross-section 0.5 to 0.75 mm²), via a detachable ISO connector with inner screw terminals, which is part of the delivery. The connection diagram and the inner view of the connector are shown in figures on the right. Non-detachable connector IP67 with PVC cable 5 m long can be supplied as an extra option.



View of the connector ISO



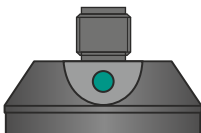
Connection diagram of the CPK-U-53 sensor with S type output (two-state current switch 4 mA / 20 mA)



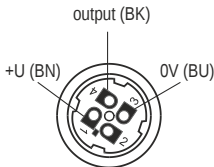
Connection diagram of the CPK-U-53 sensor with P type output (PNP) with an open collect

Connection through M12 connector

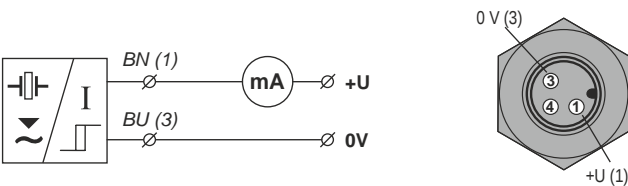
The CPK-U-53 level sensor with a C type cable gland are connected to processing (display) units by means of a cable with an outer diameter of 4 to 6 mm (recommended wire cross-section 0.5 to 0.75 mm²), via a connector socket with a moulded cable (2 or 5 m long) or via a detachable connector socket without a cable (see accessories), the connector is not basic part of the sensor. In this case connect the cable to the inner socket pins under figures on the right.



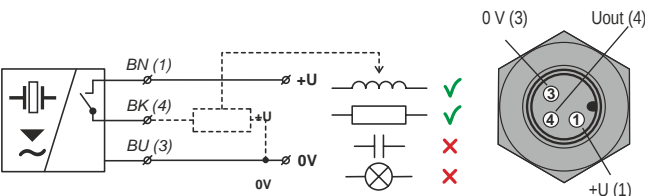
View of the connector M12



Inside view of the connector socket



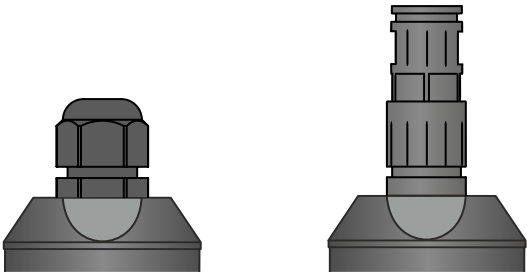
Connection diagram of the CPK-U-53 sensor with S type output (two-state current switch 4 mA / 20 mA)



Connection diagram of the CPK-U-53 sensor with P type output (PNP) with an open collector

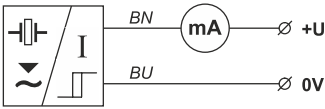
Connection via standard cable gland or gland for protective hoses

The CPK-U-53 level sensor with a B or H type cable gland are connected to processing (display) units by means of a fixed PVC cable 5 m long. PG 11 (B) or plastic bushings with a thread for protective hoses (H) can be used as a cable gland. Connection diagrams are shown in figures on the right.

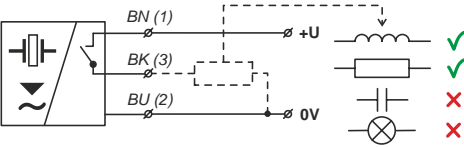


View of the standard cable gland

View of the cable gland for protective hose



Connection diagram of the CPK-U-53 sensor with S type output (two-state current switch 4 mA / 20 mA)



Connection diagram of the CPK-U-53 sensor with P type output (PNP) with an open collector

- Legend:**
- BK – black
 - BN – brown
 - BU – blue



Wiring operations shall only be carried out without voltage!



It is also necessary to design and take measures to reduce the effects of static electricity to a safe level in the wiring.

Installation in explosive atmospheres needs to be carried out in compliance with EN 60079-14 (Electrical installations for explosive gaseous atmospheres – Part 14: Electrical installations in dangerous areas other than mining) and possibly also in compliance with other standards relating to the area concerned.



The supply source should be preferably designed as a stabilized source of safe voltage 18 V to 36 V DC, which is part of the downstream processing or display system.

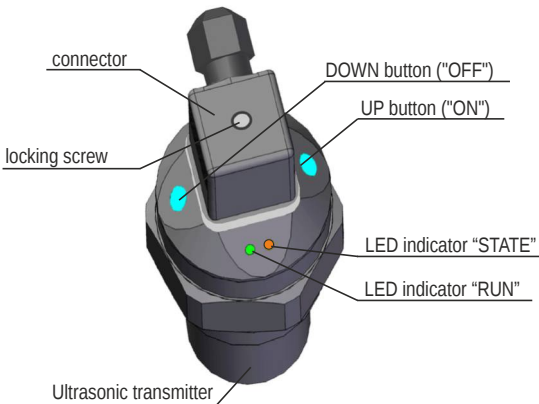
In case of strong ambient electromagnetic disturbance, parallel run of the input cable with the power line or its length exceeding 30 m, we recommend using a shielded cable.

SETTINGS

Device type with setting using buttons

The measuring range is setup by means of two buttons "DOWN" and "UP". The "DOWN" button is used to enter to the setting mode (setting the 4 mA or 0 V limit) and to decrease the output current or voltage. The "UP" button as an opposite function (setting the 20 mA or 10 V limit and increasing the output current or voltage). Values are confirmed by simultaneous pressing of both buttons for about 1 sec. The setting process is indicated by yellow "STATE" LED indicator.

For detailed information please read at the instructions manual.



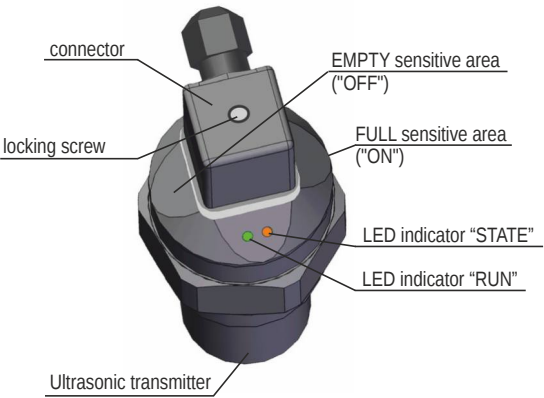
Key parts of the measuring device (version with buttons)



Device type with setting using a magnetic pen

The measuring range is setup by touching of the magnetic pen to sensitive spots "EMPTY" and "FULL" . The "EMPTY" spot is used to enter to the setting mode (setting the 4 mA or 0 V limit) and to decrease the output current or voltage. The "FULL" spot as an opposite function (setting the 20mA or 10V limit and increasing the output current or voltage). Values are confirmed by touching of the magnetic pen to the sensitive spot for about 3 sec. The setting process is indicated by yellow "STATE" LED indicator.

For detailed information please read at the instructions manual.



Key parts of the measuring device
(version with magnetic pen setting)

FUNCTION AND STATUS INDICATION

LED indicator	Colour	Function
"RUN"	green	short flashing (repeated depending on the measurement interval approx. 1 ... 2 s) - correct function, receipt of signal (echo) reflected from the measured surface fast flashing – the measured surface is in the dead zone of the level sensor or the ultrasound transducer is dirty o – the level sensor is not capable of receiving the echo. Incorrect installation or malfunction
"STATE"	orange	Output status indication <ul style="list-style-type: none">o – sensor output is disconnected (OFF)on – sensor output is connected (ON) Indication setting <ul style="list-style-type: none">slow flashing – setting indication for the disconnected statusfast flashing – setting indication for the connected status3 short flashes – setting confirmation

ORDER CODE

CPK-U-53N - - - G - - - - K

maximum range:
01 : 0,10 ... 1 m
02 : 0,20 ... 2 m
06 : 0,20 ... 6 m
10 : 0,4 ... 10 m

output type:
P : PNP switching transistor with an open collector
S : two-state current switch 4 mA / 20 mA

cable length in m
(only for variants with connection type "B" and "H")

control units:
T : setting using buttons
M : setting using a magnetic pen

connection method:
G : connector ISO
C : connector M12
B : standard cable gland
H : cable gland for protective hose



CORRECT SPECIFICATION EXAMPLES

CPK-U-53N-02-G-P-G-T

(N) Performance for non-explosive areas; (02) maximum range 0,2 ... 2 m; (G) process connection pipe thread; (P) PNP switching transistor with an open collector; (G) connection method ISO connector; (T) set-up elements buttons.

CPK-U-53N-10-G-P-C-M

(N) Performance for non-explosive areas; (10) maximum range 0,4...10m; (G) process connection pipe thread; (G) PNP switching transistor with an open collector; (C) connector M12; (M) setting using a magnetic pen

ACCESSORIES

standard (included in the level sensor price)

- 1x seal (for CPK-U-53_ 01; 02; 06; 10)
- 1x connector with IP 67 coverage (for versions with an ISO connector)
- 1x magnetic pen (for device type adjusted with a magnetic pen)

optional – for a surcharge (see catalogue sheet of accessories)

- plastic fastening nuts PUM-G0,75; PUM-G1; PUM-G1,5; PUM-G2,25
- horn adapter ST-G0,75 (thread G3/4"), ST-G1 (thread G1"), ST-G1,5 and ST-G2,25
- stainless steel or steel nipples NN-G1; ON-G1, NN-G1,5; ON-G1,5
- socket ELWIK 4012 K PG7 or ELKA 4012 K PG7
- connector with IP67 protection (type GAN-DADE 7A) with 5 m cable (for current output and ISO type connector)
- connector with IP67 protection (type GAN-DAEE 7A) with 5 m cable (for voltage output and ISO type connector)
- protective hose (for version with "H" type terminal)

SAFETY, PROTECTIONS AND COMPATIBILITY

Level sensor is equipped with protection against electric shock on the electrode, reverse polarity, output current overload, short circuit and against current overload on output.

Protection against dangerous contact is provided by low safety voltage according to 33 2000-4-41. Electromagnetic compatibility is provided by conformity with standards EN 55011/B, EN 61326-1 and EN 61000-4-2 to 6.

A declaration of conformity was issued for this device in the wording of Act No. 90/2016 Coll., as amended. Supplied electrical equipment matches the requirements of valid European directives for safety and electromagnetic compatibility.

PACKINGS, SHIPPING AND STORAGE

The CPK-U-53 device is supplied packaged in a cardboard box that protects it against mechanical damage.

When handling and during transport, it is necessary to prevent impacts and falls.

The CPK-U-53 electrical device must be stored in dry enclosed areas with humidity up to 85%, free of aggressive vapours at temperatures between -20°C and 60°C, and must be protected against the effects of weather.

