

<p>Ekorex – Consult, spol. s r.o. Company Registration Number: 47451394</p>	<p>Operating Instructions Liquid Level Pickup</p>	<p>NK 00802/LBA</p>
<p>Na Lužci 657 Lázně Bohdaneč</p>	<p>Type LBA-XX.XX.XX</p>	

<p>Operating instructions are approved on behalf of the manufacturer by:</p>	<p>Date, stamp, signature</p>
<p>Petr Kohoutek – managing director</p>	<p>November 1, 2017</p>

Instructions contain texts, directions and pictures necessary for safe putting into operation, application, mounting and dismantling, maintenance, installation and adjustment.

These operating instructions are delivered together with each apparatus.

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1. PRINCIPLE AND APPLICATION

1.1 Principle

The float pickup is composed of a head, a carriage, a neck, a guide tube and a float. The liquid level is picked up by a float that moves freely along the tube, and carries along a carriage by means of a magnetic coupling. The magnets placed in the float and the carriage creates a magnetic coupling. In case of a choppy level, extreme temperatures, etc., a carriage with a reinforced magnetic coupling is applied. The carriage is (placed in the guide tube) connected with the device head by a stainless wire strand. The carriage is carried along with the magnetic field of the float and transmits the level movement to the device head. The gearing shows the instantaneous level on circular a scale, possibly by means of other electronic instrumentation of the level gauge regulates the liquid in a determined level. It provides a proportional ohmic, current output signal by means of an ohmic transmitter or by means of a converter with a potentiometer.

1.2 Product Application

Float Pickups (hereinafter PS): are intended for measuring and regulation of liquid levels in open and also in closed tanks, or in pressure storage tanks. Some types of devices can measure the medium up to the surroundings in the zone 0. The protection IP 65 enables a safe measuring in the surroundings with aggressive substances. The level gauge is a mechanical-electrical device whose construction enables to create a series of different device types with different utility characteristics by means of a unit-built way.

Single devices types

Device Head – Basic Information:

- 1.21 Basic variants of head instrumentation and the possibility of a head application in the following surroundings:
- 1.21.1 The device intended for a local indication operates without an outer power supply, without electrical instrumentation.

2. DESCRIPTION

The float pickup has in case of different combinations the following basic components:

2.1 Device Head

The float gauge head is an instrument case with two pointers that show the level on a scale ranged 5 meters, 10 meters or 20 meters. The level is transmitted by means of the carriage placed in the magnetic field of the float. The standard carriage for the guide tube of diameter of 38 mm has the marking LBV026/070, and with a reinforced magnetic coupling LBV026/130. The standard carriage for the guide tube of diameter of 20 mm has the marking LBV015/040, and with a reinforced magnetic coupling LBV015/70. The head is created by an aluminium casting with inlets. The head is usually produced in two basic dimensions with a type marking of LBH250/175 and LBH170/220. The device can also be placed in the head LBH310/225 (the numerical value of the first triad expresses the head diameter in mm, and the second triad the head depth).

2.2 Guide Tube

The guide tube is stainless. The guide tube (usually – "the guide rod") is closed in the bottom part and it divides the device inside part from the medium. The tube is also suitable for an application in pressure tanks up to about 3.5 MPa. The maximum length of the stainless workmanship is 20,000 mm. The tube has usually the outer diameter of 20 mm for the workmanship up to 5,000 mm. The tube has usually a diameter of 38 mm for a choppy level and for the height from 5,000 mm. We recommend to anchor the stainless tube from 3,000 mm, according to the way of tanks filling and in case of a choppy liquid level.

The guide rod can also be equipped only with a collar (a low building-up – non applicable in pressure tanks).

2.3 Neck

The neck is a connecting component equipped with a collar and a rotative flange. The flange enables the guide tube fastening to the tank flare and at the same time the device turning in a position suitable for mounting and reading the scale. The flange is usually DN50 PN16 according to the ČSN standard 13 11 60. The neck DN50 PN40 with a collar of tongue/groove can be for pressure tanks.

2.31 The neck usual workmanship is 120 mm.

2.32 We can offer a neck of max. 3,000 mm for some cases (a possibility of embedding in liquid, a lowly placed tank, the head raising in an area with a lower explosiveness degree, a high temperature in a tank, etc.)

2.4 Float

Different types of the float are determined by the manufacturer for different liquid density. The floats have type markings LBP134/180, LBP082/216 for the tube of a diameter of 20 mm up to 5,000 mm. The floats have type markings LBP310/220, LBP225/250, LBP225/220/M3, LBP225/250/T3 for a tube of a diameter of 20 mm up to 5,000 mm. The first three numbers of the float numerical marking express a float diameter and the other three numbers the float height including the float tube. The following marking expresses for example LBA225/220/4 – a special float (a quadruplet) intended for liquid gases with the applicability up to about 3.5 MPa.

3. OPERATING CONDITIONS

3.1 Operating Conditions

3.11 The design enables to provide a safe operation in the following areas according to the ČSN standard EN 3303 00:

- a) Cold

- b) Hot
- c) Zone 0, zone 1, zone 2 (for certain types of devices)
- d) Dusty
- e) wet

3.12 Protection	IP65
3.13 Atmospheric pressure in the surroundings of the device head	from 86 to 106 kPa
3.14 Measured medium:	density from 0.3 to 4 kg.dm ⁻³
3.15 Operating overpressure in the place of measuring - in the stainless workmanship	max. 2.2 MPa
If the float is not intended for that pressure it is necessary to place it outside the tank during the tests.	from - 50°C to +120°C
3.16 Temperature in the place of measuring	special workmanship from -150°C to +350°C
3.17 Operating position	it is perpendicular with the head in the upper position
3.18 Special workmanship - operating position	it is perpendicular with the head in the bottom position

4. PERFORMANCE DATA

- 4.1 Measuring range in the stainless workmanship max. 20,000 mm
- 4.2 Range on a scale for local measuring 0 - 5 m, 0 - 10 m, 0 - 20 m
- The range on the scale expresses at the same time the basic range for a determination of the pickup error.
- 4.3 Special workmanship – a range on the scale for local measuring can be a scale marked also in different units, and precisely under an agreement with the manufacturer
for example in liters, m³, ...etc.
- 4.4 Measuring accuracy for local measuring is +0.2% of the range from 0 to 5 meters
+0.1% of the range from 0 to 10 meters
+0.05% of the range from 0 to 20 meters
- 4.5 Non-sensitivity during float moving upwards or downwards (a level change in one direction)
max. + 8 mm
- 4.6 Non-sensitivity during a change of the float movement direction
 - 4.61 During tank filling max. + 15 mm
 - 4.62 During tank discharging max. + 10 mm

Comment - during the output signal evaluation it is possible to compensate those repeated non-accuracies in the control system.

5. OTHER DATA

- 5.1 Operation type it is permanent
- 5.2 Data on the product – performance and meteorological data according to the par. 5.31, 5.32
- 5.3 Device Marking
- 5.31 Manufacturing plate (placed under a glass of the device scale):
 - a) manufacturer identification including address
 - b) device type LBA-XX.XX.XX
 - c) manufacture year for example 2002
 - d) serial manufacture number manufacture Nr

- e) manufacturer indication – of the product origin country – Made in the Czech Republic
- b) 5.32 Summary plate (placed on a back cover, possibly on the device side):
The summary plate can contain other necessary complementary data – for example a wiring diagram, information of indication on the plate of a built-in component, etc. - this information is stated on the device back cover
It usually contains the following information:
 - a) reference number of the manufacturing component of the technical documentation - NKO0802/ LBA (effective operating instructions)

6. STORAGE, DELIVERY AND TRANSPORTATION

6.1 Storage

It is possible to stock the device in the ambient temperature from -20°C to $+40^{\circ}\text{C}$ with the ambient relative humidity of max. 75 %.

6.2 Delivery

The device is delivered with the following documentation: Operating instructions NKO0802 / LBA including enclosures and possibly other documentation agreed between the manufacturer and the client.

6.3 Transportation and Storage

The devices are delivered in a packing that guarantees a stability after a mechanical and temperature influences effect.

The device is delivered in a following state:

After a completion and output checking the float from the guide rod, a pin of the rod are dismantled. The inlets are tightened and sealed. The magnetic carriage is packed in a paper band, it is inserted in the measuring head flare and it is tied up to the head neck together with the pin and sealing by a string. The bottom part of the head flange is sealed up by a tape. Covers earthings are connected in the head. The head of the LBH250/175 or LBH310/225 type has connected inner covers earthings and the head covers screwed on. The head of the LBH170/220 type has only covers screwed in.

The device is delivered in a packing with the indication of the manufacturer and of the client.

6.4 Recycling

It is possible to separate every float gauge to single kinds of the applied materials and to provide their stocking and a subsequent liquidation according to the principles of the Security of the Waste System SM-15 directions.

7. MECHANICAL PART INSTALLATION, DISMANTLING AND SETTING-UP, PUTTING INTO OPERATION

7.1 The Guide Rod and Float Installation

7.11 Generally

To check the space for placing the rod and the float before the installation. It is necessary to choose the space for placing the guide rod so that the liquid inlet do not unfavourably influence the measuring accuracy. In case of a choppy level it is recommended to protect the measuring space by a covering plate, possibly to create a continuous vessel via a guide rod by means of an inserted tube (it has to have such a big diameter not to prevent a free passage of the float).

7.12 Guide Rod

It is necessary to clean up the guide rod and in case that the head installation would be done immediately it is necessary to provide a coverage of the guide rod flange. The space above the connecting flange DN50 PN16 or above the union nut has to enable to insert the guide rod to the opening in the flange. The guide rod dimensions correspond to the drawing documentation and to the technical data for a local indication.

7.13 Float

After rotative flange of the guide rod fastening to the connecting flange, insert the float (with the control welded-on piece towards the head) in the guide rod and insert the locking pin in the opening in the tube. To lock the pin against falling-out by bending in the groove. To check the passing clearance

for the float along the whole length of the guide rod. The float has to have enough space for a free passage during measuring, and nothing has to obstruct a free passage even in case of a choppy level or a rod deflection.

The guide rod and float are dismantled in a similar way. Before dismantling it is necessary to check whether there is not a pressure, dangerous vapors, etc. in the tank.

7.2 Device Head Installation and Dismantling

7.21 Mechanical Part Installation and Setting-up

The LBH head is packed in a plastic packing. The sealing and the pin for locking the guide rod is fastened on it. To dismantle the back cover and possibly the front one before the installation. To eliminate sealing and carriage locking. To check the inner mechanics function by carriage drawing out. To clean up the guide rod in its whole inner length by means of an installation spring, and to place sealing on the flange.

7.22 Carriage Installation in the Tube

To put the LBH head close to the flange. To draw the carriage carefully out in that way that you secure a free passage of the wire strand from the float gauge head by one hand. During handling it is not allowed to move with the carriage in an abrupt way nor to release the wire strand because it could be knotted.

To insert the carriage carefully in the opening in the guide rod. To slide the magnetic carriage through the flange space into the non-magnetic guide rod by means of an installation spring. Then to lower the carriage by drawing the wire strand out from the LBH head and to check a free passage of the carriage in the tube along the whole length. At the moment the carriage remains to stand on the edge of the upper zone of the magnetic coupling, to draw about one meter of the wire strand out by one hand and to draw the carriage out about 300 mm above the magnetic coupling by the other hand. To shift the hand that keeps the carriage by a quick movement downwards so that the carriage pass through the upper edge of the magnetic field to the centre of the coupling thanks to its own weight. After that handling there are two possibilities that can happen with the carriage. To verify whether the carriage holds firmly in the magnetic coupling by wire strand slackening and subsequent drawing-out. If you do not feel its weight on the wire strand it is placed in a right operation position. In case that the carriage hangs on the wire strand and it fell through below the bottom edge of the field of force of the magnetic coupling it is easy to overcome the resistance of the bottom edge of the coupling by drawing up, and to draw the carriage in its centre. To check the carriage placing by drawing up by a force (about 0.15 kg for the type with a rod diameter of 20 mm and 0.45 kg for the type with a rod diameter of 38 mm). If it is not possible to draw the carriage out, the installation has been made correctly.

7.23 Carriage Dismantling

On the contrary during the float gauge head dismantling, to draw slowly by a bigger force until the carriage is released from the magnetic coupling. The carriage and the float are held by means of the magnetic coupling with a force (about 0.15 kg for the type with a rod diameter of 20 mm and 0.45 kg for the type with a rod diameter of 38 mm). In case of a double magnetic coupling the force is 1.6 times bigger. After that check to shift the carriage along the whole length of the guide rod and to observe the device operation. If device scraping, possibly considerable pointers twitching occurs, to dismantle and check the inner space of the guide rod and the device head. If it is not about a common defect (for example some impurity in the tube, in the device head, wire strand knotting or jumping out the winding drum) the manufacturer makes the repair.

7.24 Pickup Head Installation

To fasten the device head to the guide rod so that an access to the scale and also to the electrical equipment of the device be provided. To set up the device pointers. In case that you want to keep the zero state for the float placement at the stop pin, to check the pointers placement at the zero, possibly to shift them by loosening the screw.

It is more advantageous for the user to set up the measuring at the real state. To provide a tank filling of about 500 mm and to measure a real state by "a measuring bar". To loosen the pointers screws and to set up the measured value reduced of about 4 mm by means of small and big pointers according to the scale. To set up the measuring to the middle value by displacing the pointers and by that you also reduce the real measurement error. To fasten the front cover after pointers tightening.

7.24 Error Correction

The magnetic coupling operates against a float free movement in the liquid (a friction between the rod and the carriage, a friction between the float and the rod), and causes the difference in

measuring in case of a level movement downward and upward. That difference is according to the float and the measured medium type up to +15 mm in the extreme positions at the moment of a change of the movement direction. After about 30 minutes (in case of a choppy level – less than 30 min), possibly after float starting to move in a certain direction that error comes back to a usual non-sensitivity limit – about + 8 mm (that limit is influenced by a kind of the measured liquid, of the surroundings, etc.)

As that inaccuracy is regularly repeated you can measure that error by comparing the data measured for example by a measuring bar and by a concrete float pickup. The measured device non-sensitivity is directly proportional to the float gauge output signal. You can make an error compensation by software or by a compensation table.

8. ELECTRICAL PART SETTING-UP, MAINTENANCE SERVICE AND REPAIRS

Generally: To install and set up the electrical part according to the device type and the required equipment of the device back board. A connection is enabled thanks to one or more connection terminal boards with the described terminal connectors. To connect the earthing cable by means of a pressing lug to the back board with the appropriate marking. To make the connection according to the connection table fixed on the device back cover.

8.1 Pickup of the LBA-XX.XX.XX.XX type Setting-up (only switches)

To proceed in the following way during setting up the level of the microswitches contacts switching:

- to take the device head down from the connection flange and to put it on the side close to the tube neck
- to draw the carriage out from the magnetic coupling and to insert slowly the wire strand in the device head
- h1(h2) – usually the min. level, h4 (h3) – usually max. level

8.11 H1, h2, h3, h4 Levels Setting-up

- according to the pointers to override downwards to the required h2 level
- to loosen two screws of the cams holder and to shift the entering edge of the cam so that the S2 microswitch contact be switched
- according to the motion direction during a tank discharge to observe the cams movement and to choose that cam edge that has to provide switching, and upon the movement downwards it is about the entering edge against the microswitch roller
- after the level setting-up to tighten the cam and to check the setting-up correctness by repeating to enter the edge
- to set up the h1 level in the same way by continuing in the same direction

8.12 Two levels switching setting-up – by means of one cam switch (it is composed of two plates). There is a cam available for each level (a plate stamping). To ride for example to the max. level. To loosen for example the S4 microswitch cam and to distribute the cam entering edges one against the other. To use one entering edge of that cam for the upper level switching. To tighten slightly the cams and to ride to (on) the level of the bottom level switching. To loosen the screw, to hold the cam already set up and to use the second cam entering edge for switching the bottom level, and to tighten again both cams. One switch can give you the information of the state of for example the crash states both in the upper and the bottom level.

8.13 Another application of the cams

You can also apply the cams upper edges during the level measuring.

8.14 Setting-up Check

After finishing the setting-up to ride the whole measured range by a movement of the wire strand, and to check the contacts switching against the level shown by the pointers on the connected meter. To check also the cams switching so that the second entering edge for example of the S4 cam do not switch on entering the h1 level from the second side of the entering edge. To check subsequently the cams switching so that the second entering edge for example of the S1 cam do not switch on entering the h4 level from the second side of the entering edge. Setting-up Hysteresis – max. 2% of the range.

8.2 Pickup of the LBA-XX.XX.XX.XX type Setting-up (switches and electric output)

8.21 Switches setting-up is mentioned in paragraph 8.1

8.22 During the device electric output setting-up to proceed in the following way:

To connect the measuring instrument to the output from the Aripot board and to connect the supply voltage. You can make dismantling and stocking of the head in a similar way as during contacts setting-up. To shift out the wire strand at the bottom level set up according to the reality (the state when the float lies at the stop pin – to read that level of the scale), and to stop the movement in the extreme position of the float operation. To put the screwdriver in the groove of the interwheel (the coupling) in the device mechanics, and to set up the extreme stop position by turning by means of a mechanical coupling (the transmitter shaft turns over). To enter slowly the value of the electric signal by means of the coupling so that it corresponds to the bottom level set up at the device pointers. In case of setting-up with a full tank to assemble the pickup and to enter the electric value corresponding in conversion to the range from 0 (4) to 20 mA, from 0 to 10 V, from 0 to 100 (1000) Ω , by turning the coupling a bit. For the range mentioned in the questionnaire (for example from 0 to 4,225 mm = from 4 to 20 mA) the converter board is set up from the manufacture. The output can be adjusted on the location by means of multirevolutions potentiometers (marking ZERO / SPAN). The pickup with the ohmic output is adjusted only by the mechanical coupling.

During the pickup setting-up check to ride to the real level corresponding to the set up pointers by means of the mechanical coupling. To ride slowly the whole measured range and to check whether the signal level corresponds to the value of the pointers. Only in case of a deviation in the upper position to set up the output electric signal of the converter by means of the potentiometer. You have to repeat that step in both extreme positions several times and precisely until the signal bottom and upper level is the same as the state of the device pointers.

8.8.3 Device Closing after Setting-up

To lower the carriage to the magnetic coupling and to check its positioning by lifting it a bit. To check the sealing seating in the flange and to mount the device back to the flange. To check cables positioning, to tighten the inlets. If you require other inlets than a common standard you have to mention that in the questionnaire. To put the cover sealing and the sealing rubber rings under the screws and to fasten the float gauge back cover.

8.4 Maintenance Service and Maintenance

8.41 Common check and maintenance (after about a year of the operation)

Usually to check only the conformity of the state of the pointers, of the output signal, and of the measured realities for example by a measuring bar.

8.42 Basic maintenance (after about three years of the operation)

To check the conformity of the state of the pointers, of the output signal, and of the realities measured for example by a measuring bar. According to the recommended period of the device operation and according to the conditions in which it operates to make subsequently also a basic maintenance.

To unscrew the device back cover and the screws of the head neck. To put the device close to the tube neck and to pull the carriage out. To dry out and to clean up the guide tube by means of a spring. To check visually the mechanics state at the device back board. If no rusting areas can be seen on the components to tighten the screws, to check the terminal board state. To adjust the device electric parameters according to the input measuring result. To substitute the head sealings, rubber o-rings according to their state, and to tighten the inlet. To lower the carriage to the magnetic coupling and to mount it again. If some rusting areas can be seen on the components of the back cover, or the device sealing has been damaged to make a medium repair.

8.43 Device Medium Repair (after about 6 years of the operation)

The medium repair is made by the manufacturing plant. The device is dismantled and a check of all device components is done. Gearings are oiled, the coupling, the spring, the wire strand, the carriage according to its state, the microswitches and the transmitter, are substituted. All sealings are substituted.

8.44 The device service life and the maintenance (according to requirements and service life of the spring mechanics)

We recommend the period of the recommended basic maintenance according to the surroundings in which the float gauge operates (humidity, acids and petrols vapours, blistering weather and ambient changes, machines vibration, service life of the spring mechanics, etc.). I recommend min. one-year middle maintenance in a very "hard" operation (it is valid for the above

mentioned surroundings). In case of a frequent device operation you have to proceed from the max. service life of the device spring. If you apply the device for example for expansion vessels you have to substitute the device spring before completing about 15,000 cycles in the device range. We recommend to make a regular maintenance and possibly a regular wire strand and spring substitution for measuring tanks with a frequent change of the movement.

8.45 Complet overhaul and substitution of the device equipment, of the range, etc.

We recommend to make a complet overhaul and a change of the devices equipment (the unit-built system enables that) in the manufacturing plant, and precisely also with the possibility of a change or repair in the course of the delivery day to the manufacture (it depends on the device state and the repair extent).

We recommend to make the float gauges mounting by means of mounting centres whose list is possible to find in the supplier commercial section.

8.46 The manufacturing company, possibly the companies authorized by it that have an authorization to the mounting issued by the manufacturer, provide the product mounting. The repairs of Lbx-XX.XX.XX are exclusively made by the manufacturer.

Otherwise the client loses the warranty for the device, and the manufacturer does not accept the warranty of its safe use.

8.5 The manufacturer reserves the right of changes of the technical parameters.

8.6 The manufacturer or the companies authorized by him that have an authorization for that, make the maintenance service and mounting. It is possible to agree the companies list and possibly the mounting or the maintenance service right in the company registered office.

9. QUALITY WARRANTY

10.1 The manufacturer warrants the device for 12 months in accordance with the Commercial Code (§ 429 and subsequent ones). The defects arisen in the warranty period provably thanks to a defective material or defective workmanship, will be repaired for free if the device is sent in the original or equivalent packing to the manufacturer. If the repair is made at the client's place the journey and the time loss will be invoiced according to the manufacturer's price list.

The warranty is not applied to the defects caused by a non authorized intervention in the device, by non-observance of technical and operating conditions specified by the manufacturer, by a forcible mechanical damage and by a bad sequence during the installation. By an installation made by a company non-authorized to the device installation.

10.3 The manufacturer reserves the right of changes in the product design, changes in the documentation. Possible changes will be mentioned in the document enclosed to a concrete product.

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