

| | | |
|---|--|----------------------|
|  | TECHNICAL PRODUCT DOCUMENTATION | ER5-1543 |
| | | Page: 1 Pages: 16 |

LEVEL SWITCHES
TYPE ERH-01...04-16

| | | |
|---|--|----------------------|
|  | TECHNICAL PRODUCT DOCUMENTATION | ER5-1543 |
| | | Page: 2 Pages: 16 |

CONTENTS

| | PAGE |
|---|-----------|
| 1. INTRODUCTION | 3 |
| 1.1. SECURITY INSTRUCTIONS | 3 |
| 1.1.1. Application | 3 |
| 1.1.1.1. Application limitations to the explosion-risk zones and/or rooms | 3 |
| 1.1.2. Definitions used in description | 3 |
| 1.1.3. Allowed activities range | 3 |
| 1.1.4. Power supply connection | 3 |
| 1.1.5. Instructions and warnings | 3 |
| 1.2. SUBJECT OF TECHNICAL PRODUCT DOCUMENTATION | 4 |
| 1.3. APPLICATION, MARKINGS ACC. TO SWW AND PKWiU | 4 |
| 1.4. CONSTRUCTION AND WORKING RULES | 4 |
| 1.4.1. Construction | 4 |
| 1.4.2. Working rules | 4 |
| 1.5. CONNECTED DOCUMENTS | 5 |
| 2. TECHNICAL DATA | 6 |
| 3. ORDERING METHOD AND EXAMPLE OF ORDERING | 7 |
| 4. MAINTENANCE INSTRUCTION | 8 |
| 4.1. ASSEMBLY INSTRUCTION | 8 |
| 4.2. STARTING AND SERVICE INSTRUCTION | 15 |
| 4.2.1 Preparing products for starting | 15 |
| 4.2.2 Maintenance instruction | 15 |
| 4.3 CONSERVATION INSTRUCTION | 15 |
| 4.4. INDUSTRIAL SAFETY INSTRUCTION | 16 |
| 5. STORAGE AND TRANSPORT TERMS | 16 |
| 6. SETS DELIVERY | 16 |
| 6.1. Spare parts | 16 |
| 7. GUARANTY TERMS | 16 |

| | | |
|---|--|----------------------|
|  | TECHNICAL PRODUCT DOCUMENTATION | ER5-1543 |
| | | Page: 3 Pages: 16 |

1. INTRODUCTION

1.1 SECURITY INSTRUCTIONS

1.1.1 Application

Level switches type ERH-01...04-16 are designed for automatic control, signalling or controlling of fixed liquid level limit value in open or closed (pressure) vessels, within wide range of pressures and temperatures.

The electric controllers are equipped with an electric output which according to the needs can be used in signalling, interlocking, controlling or automatic control circuits. They may be commonly used on ships with unwatched marine power plant, having unlimited steaming range, in power plants, in agriculture, etc.

1.1.1.1 Application limitations to the explosion-risk zones and/or rooms

Rooms and spaces wherein the explosive mixtures of flammable gases and flammable liquids vapours with air occur are included among IIB Explosion subgroup, T4 temperature class.

1.1.2. Definitions used in description

- **Operator** – person, who use product according to application (PN-EN 61010-1, July 2004),
- **Technical inspection** - person or group of people responsible for using and conservation of product, this person has to assure of well special training for OPERATORS (PN-EN 61010-1, July 2004).

1.1.3. Allowed activities range

- **For operator** – level switches using.
- **For technical inspections** – activities like for operator, mechanical and electrical assembly and activities connected with controlling.

1.1.4 Power supply connection

Assembly and starting works should be done only by electricians with qualifications or staff instructed by them – according to actual law rules of electrotechnics.

1.1.5 Instructions and warnings

Body damage and/or serious material damages might be formed if user doesn't keep of instructions and warnings. Servicing staff have to be instructed and acquaint with whole safety instructions and warnings. For well and safe level switch's working there has to be assured right transport, storage, assembly, starting and conservation's instruction.

Main attentions of safety in mentioned operation and maintenance manual were marked as pictograms:

| | |
|---|---|
|  | <p>This sign means: Pointer.</p> <p>„Pointer” indicates on action or any process important for well-working of product.</p> <p>Material damages might be formed if user doesn't keep of instructions.</p> |
|  | <p>This sign means: Warning.</p> <p>„Warning ” indicates on action or any process, which might be danger for staff or makes material damages if those aren't made correctly.</p> |

1.2. SUBJECT OF TECHNICAL PRODUCT DOCUMENTATION

Technical product documentation subject is using, construction and assembling of level switches.

1.3. APPLICATION, MARKINGS ACC. TO SWW AND PKWiU

Level switches are designed for two-position signaling of minimum and maximum of liquid.

Marking acc. to Polish Classification of Products and Services (PKWiU): 26.51.70.0

Marking acc. to Systematic Products Specification (SWW): -0918-239

1.4. CONSTRUCTION AND WORKING RULES

1.4.1. Construction

The level switch is the two basic assemblies separated by a diamagnetic baffle:

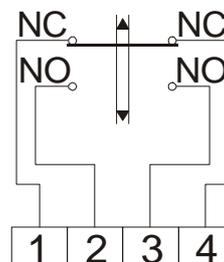
- a relay unit which is the transducing part of the device unified for all the types. The intermediate magnet, whose magnetic pole is directed with the like magnetic pole of the float magnet, and miniature micro-switch are enclosed in fireproof body made of plastic (Ultramid BASF A3X2G5) and sealed with insulating compound (Arathane CW5631/XB5610). The micro-switch transmits electric pulses as a result of the magnet lever operation on a button switching the switch contacts. The external wires (conductors) are connected to the switch terminals through the threaded M20x1.5 cable gland, characteristic PTB 02 ATEX 1115X II2 G/D Ex e II (PFILITSCH)
- a float unit which is the level switch sensor. Depending on application of the level switch, float unit is made different for each type and the float can be in a shape of cylinder with hemispherical bowls or shape of sphere. The permanent magnet is mounted directly, or by means of leverage, to the float; the magnet pole is directed with the like magnetic pole of the intermediate magnet of the level switch relay unit. The float unit magnet is protected with a housing. Holes are made in the level switch body for bearing pins.

1.4.2. Working rules

The NC – NC contacts (1;4) are closed at minimum level.

When the level rises, the NC – NC contacts (1;4) remain closed until the maximum level is reached. At the moment when the maximum level is reached, a „blink-like” switching takes place, that is, opening of the NC - NC contacts and closing the NO - NO contacts (2;3); the NO – NO contacts (2;3) are closed until the float reaches minimum level.

Electric circuit diagram



One should connect the equal potentials from the same source to the micro-switch NC (normally closed) and NO (normally open) terminals

| | | |
|---|--|----------------------|
|  | TECHNICAL PRODUCT DOCUMENTATION | ER5-1543 |
| | | Page: 5 Pages: 16 |

1.5. CONNECTED DOCUMENTS

| | |
|---------------------------------|---|
| PRS Rules. Publication no. 11/P | Environmental test of vessels equipment 2002. |
| PN-EN 60654-1:1996 | Measuring and control devices of industrial processes – Working conditions – Climatic conditions. |
| PN-EN 60529:2003 | Protection degrees assured of housing (Code IP) |
| PN-EN60079-0:2006 | Electric devices in explosion-risk zones – General requirements and researches |
| PN-EN 13463-1:2003 | None-electric devices in explosion-risk zones. |
| PN-EN13463-5:2005 | None-electric devices in explosion-risk zones - Part 5: Protection using construction safety type “c” |
| PN-EN 60079-1 :2004/AC:2006 (U) | Electric devices in explosion-risk zones – Flameproof enclosures „d” |
| PN-EN 60079-7 (U): 2004 | Electric devices in explosion-risk zones – Protection degree „e” |
| EEC Directive 73/23/EEC | Low voltage equipment, Official Journal L177, 26/03/73 p.29, |
| PN-EN 61010-1:1999 | Safety requirements of electric measuring devices, automation and laboratory devices. General requirements. |
| PN-EN 61010-1:1999/A2 :1999 | Safety requirements of electric measuring devices, automation and laboratory devices. General requirements. (Change A2) |

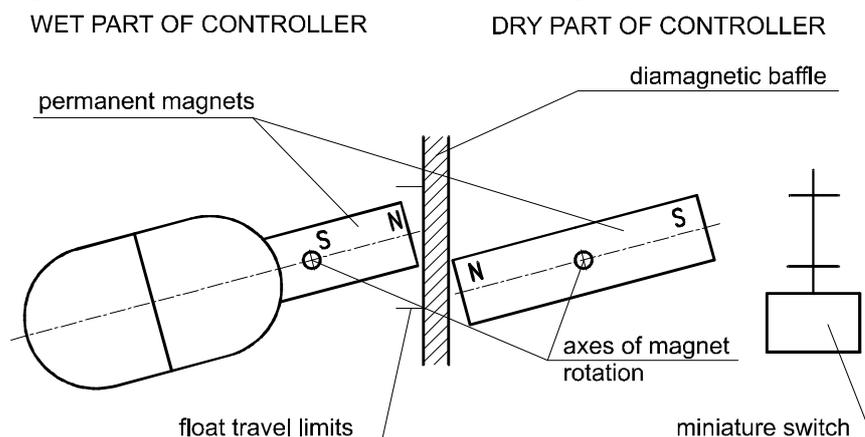
2. TECHNICAL DATA

The technical data are shown in Table 1.

| Item no. | Parameter | Unit type | ERH-01-16 ERH-01-16.1 | ERH-02-16 ERH-02-16.1 | ERH-03-16 ERH-03-16.1 | ERH-04-16 ERH-04-16.1 |
|----------|--|-------------------|--|--|---|--|
| 1. | Switching hysteresis | mm | 10 20 ±15% 30 | 10 20 ±15% 30 | min 50 ±15% max 250 ±2% min 100 ±15% max 400 ±2% | min 32±15% max 1350±2% |
| 2. | Maximum liquid temperature | °C | 100 70 | 100 70 | 100 70 | 100 70 |
| 3. | Maximum operating pressure | MPa | 4 0,2 | 4 0,2 | 4 0,2 | 1.6 0,2 |
| 4. | Nominal switching voltage U _e : AC-15 DC-13 | V | 230 V 50-60 Hz 220 V = | 230 V 50-60 Hz 220 V = | 230 V 50-60 Hz 220 V = | 230 V 50-60 Hz 220 V = |
| 5. | Rated continuous current I _{nc} | A | 6 | 6 | 6 | 6 |
| 6. | Nominal switching current I _e : • in AC15 category U _e 230V 50..60Hz • in DC13 category U _e 220V= | A | 2.5 0,3 | 2.5 0,3 | 2.5 0,3 | 2.5 0,3 |
| 7. | Switching durability • in AC15 category • in DC13 category | switchings | 85x10 ³ 30x10 ³ | 85x10 ³ 30x10 ³ | 85x10 ³ 30x10 ³ | 85x10 ³ 30x10 ³ |
| 8. | Mechanical durability | cycles | 10 ⁷ | 10 ⁷ | 10 ⁷ | 10 ⁷ |
| 9. | Ambient temperature | °C | -25 ... +70 | -25 ... +70 | -25 ... +70 | -25 ... +70 |
| 10. | Mass | kg | 1,8 | 2,0 | 2,1 | 3,0 |
| 11. | Minimum liquid density | g/cm ³ | 0.6 | 0.6 | 0.6 | 0.6 |
| 12. | Casing protection degree | IP | 66 | 66 | 66 | 66 |
| 13. | Explosion proof class symbol | - | II 1/2G c Ex dellBT4 Ga/Gb | II 1/2G c Ex dellBT4 Ga/Gb | II 1/2G c Ex dellBT4 Ga/Gb | II 1/2G c Ex dellBT4 Ga/Gb |

REMARK!

The switching hysteresis (dead zones) given in Table 1 apply to the liquid density of $1 \times 10^{-3}/\text{m}^3$. The maximum switching hysteresis of operation caused by a change in the liquid density amounts 1mm per $0.1 \times 10^{-3}/\text{m}^3$. The dead zones for the given liquid density are constant. Overall and assembly dimensions are given in the enclosed dimensioned drawings.



3. ORDERING METHOD AND EXAMPLE OF ORDERING

Ordering method of level switches type ERH-01-16, ERH-01-16.1 and ERH-02-16, ERH-02-16.1

In order please specify:

- level switch type, e.g.. ERH-04-16
- medium
- parameters
- measuring range.

Type: _____ ERH-01-16; ERH-01-16.1
ERH-02-16; ERH-02-16.1 (with arm protection before dirt)

Switching hysteresis:

- 1 switching hysteresis h=10 mm
- 2 switching hysteresis h=20 mm
- 3 switching hysteresis h=30 mm
- 4-0 Length of arm A=125 mm, B=125 mm
- 4-1 Length of arm A=185 mm, B=80 mm
- 4-2 Length of arm A=250 mm, B=125 mm
- 4-3 Length of arm A=140 mm, B=120 mm
- 4-4 Length of arm A=100 mm, B=120 mm
- 4-5 Length of arm A=120 mm, B=80 mm
- 4-6 Length of arm A=150 mm, B=80 mm
- 4-x Cranked arm on special order*

ERH -01-16 -1

Example of denotation:

ERH -01-16 - 1 level switch with switching hysteresis h = 10 mm

*For cranked arm type "L" the A+B=max. 1000mm and A/B=max.4mm cranked arm type "Z" has to be agreed with manufacturer.

Ordering of level switches type ERH-03-16

Type: _____ ERH-03-16; ERH-03-16.1
switching hysteresis min 50 mm max 400 mm

ERH -03-16 for IP66

ERH -03-16.1 for IP68

Example of denotation:

ERH-03-16 Level switch with set switching hysteresis min. 50 mm; max. 400 mm

Ordering of level switches type ERH-04-16

Type ERH-04-16 for IP66
ERH-04-16.1 for IP68

| | | |
|---|--|----------------------|
|  | TECHNICAL PRODUCT DOCUMENTATION | ER5-1543 |
| | | Page: 8 Pages: 16 |

4. MAINTENANCE INSTRUCTION

4.1. ASSEMBLY INSTRUCTION

Whole types of level switches have to be assembled for socket ferrules with connecting flanges (dimensions of connecting flanges are showed on picture behind).

Assembly and starting works should be done only by electricians with qualifications or staff instructed by them.

External conductor at diameter min/max 9,0 mm-13,0 mm has to go by gland M20x1,5 or in armoured pipe posses ends threading of thread M20x1,5; amroured pipe is screw in level switch thread instead of thread plug.

Wires have to be connected with clamps NC - NC, NO – NO depending of need. Compacted clamps NC are for minimum level. Grounding clamp is inside and outside head.

Proper assembly and usage conditions observance, according to application, provide for proper level switch operation in life expectancy period. The controllers do not require special care, except for conservation.

Operation range change in level switches type ERH-03-16 and ERH-04-16 requires shifting the limiters to a needed range, then one to stiffen the limiters by tight screwing the set screws home, or inserting of cotter pins.



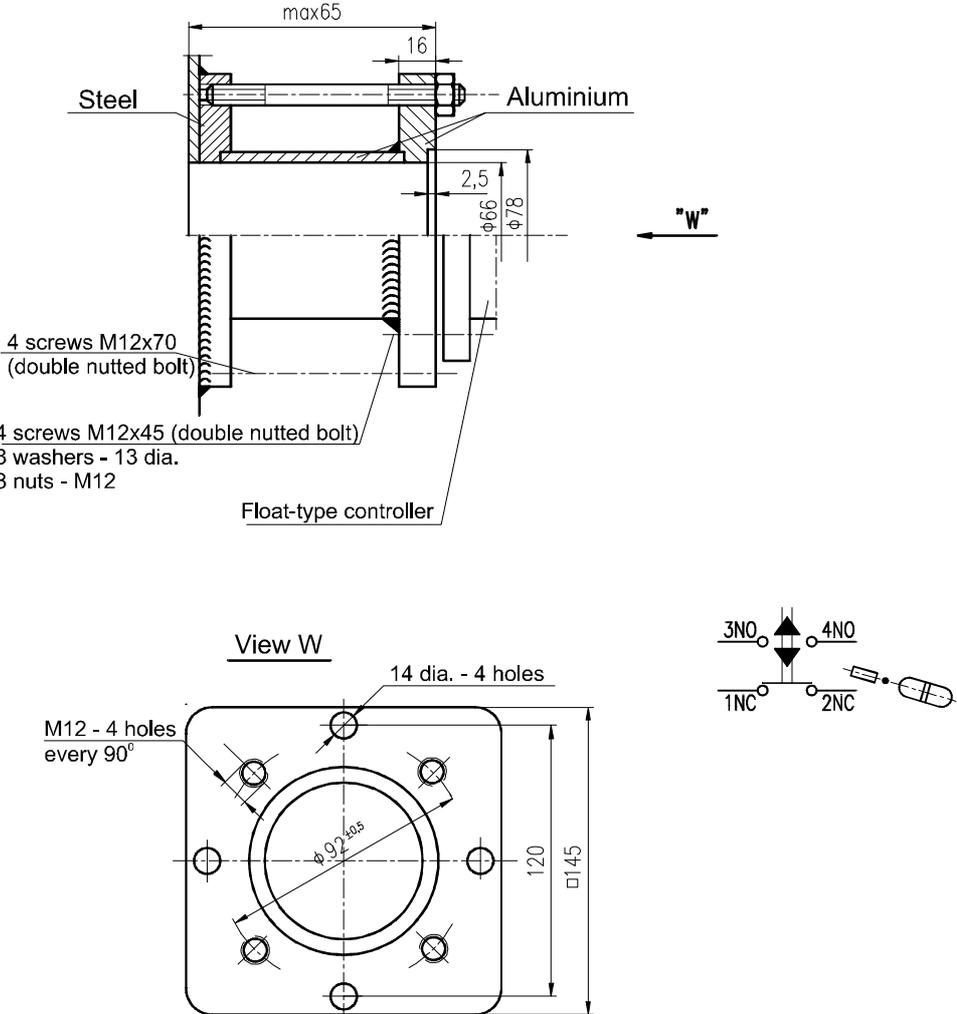
Installation has to be done carefully and according to explosion-proof norms and usage rules in explosion-proof zones.

If any explosion-proof rules are not observed it'll possible to make explosion. This situation may be dangerous for people and may done material losses.

It is impossible to make any manipulations during under-voltage of level switches in explosion-proof zones.

The cover which makes closed chamber of micro-switch should be seal with lead during using.

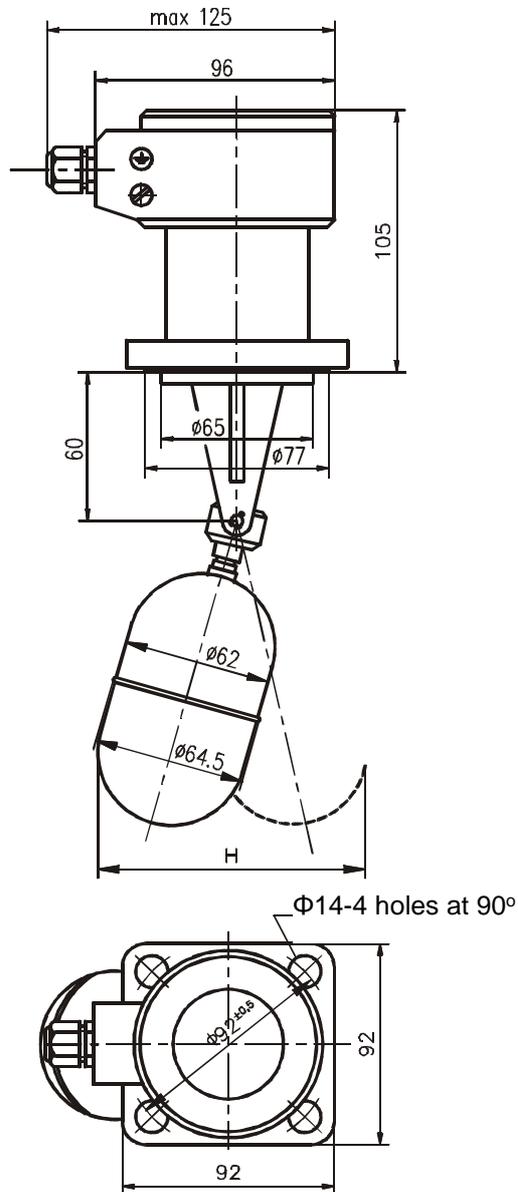
Example of connecting socket ferrule



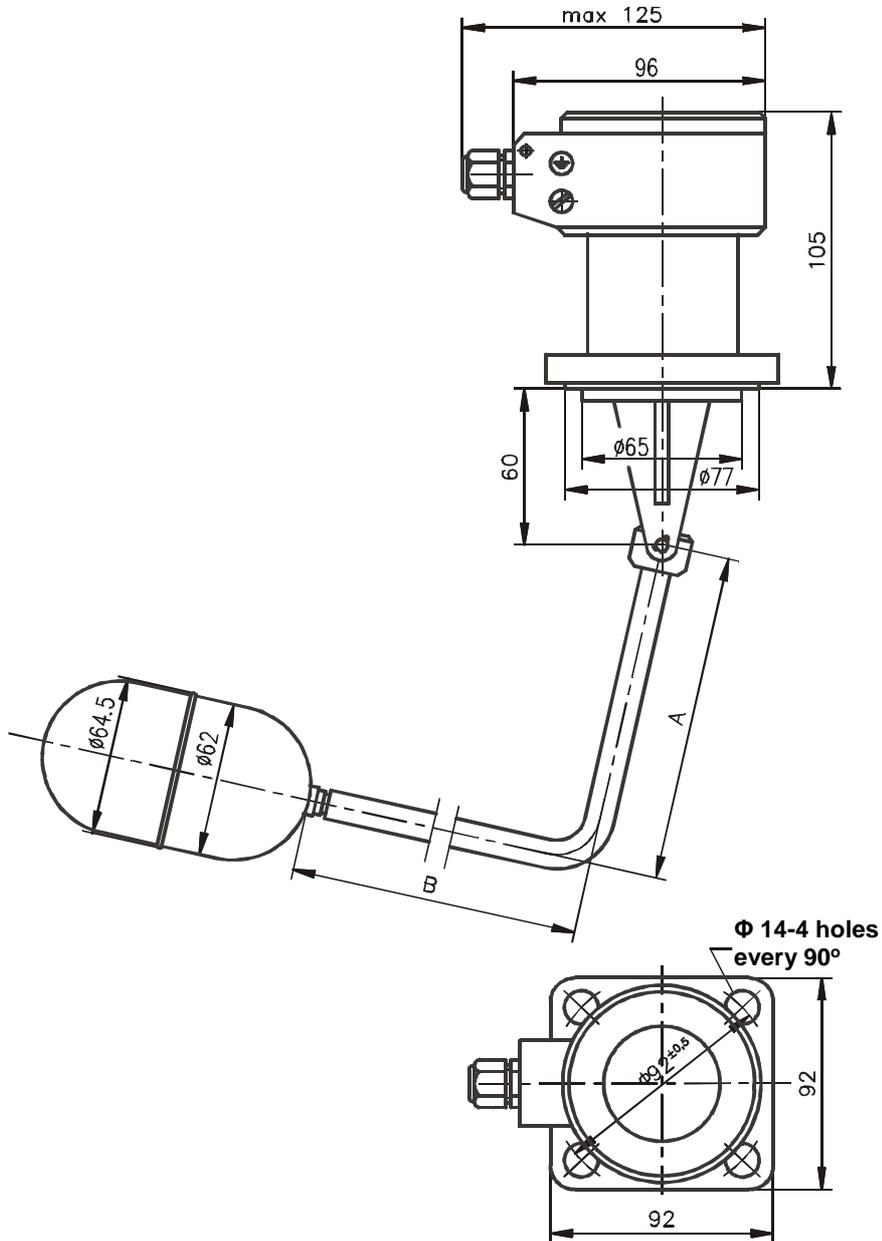
Manufacturer recommends to weld connecting flange directly to tank (without socket ferrule)

Dimension drawing of level switch type ERH-01-16, ERH-01-16.1

| Version | H [mm] | L [mm] |
|---------|--------|--------|
| -1 | 230 | 190 |
| -2 | 180 | 305 |
| -3 | 240 | 405 |

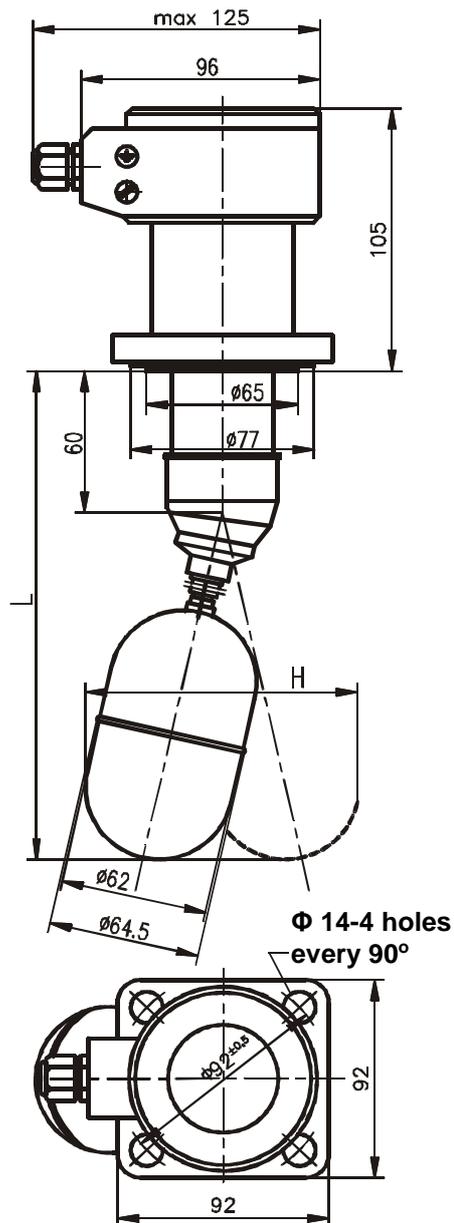


Dimension drawing of level switch type ERH-01-16-4, ERH-01-16.1-4

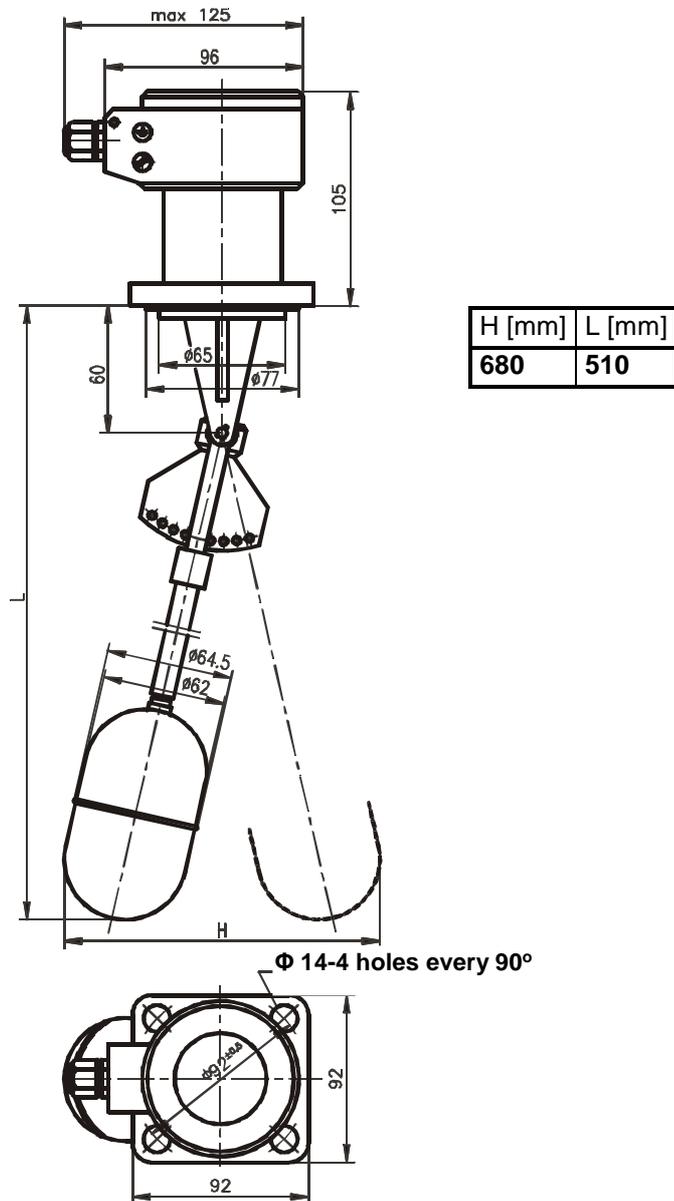


Dimension drawing of level switch type ERH-02-16, ERH-02-16.1

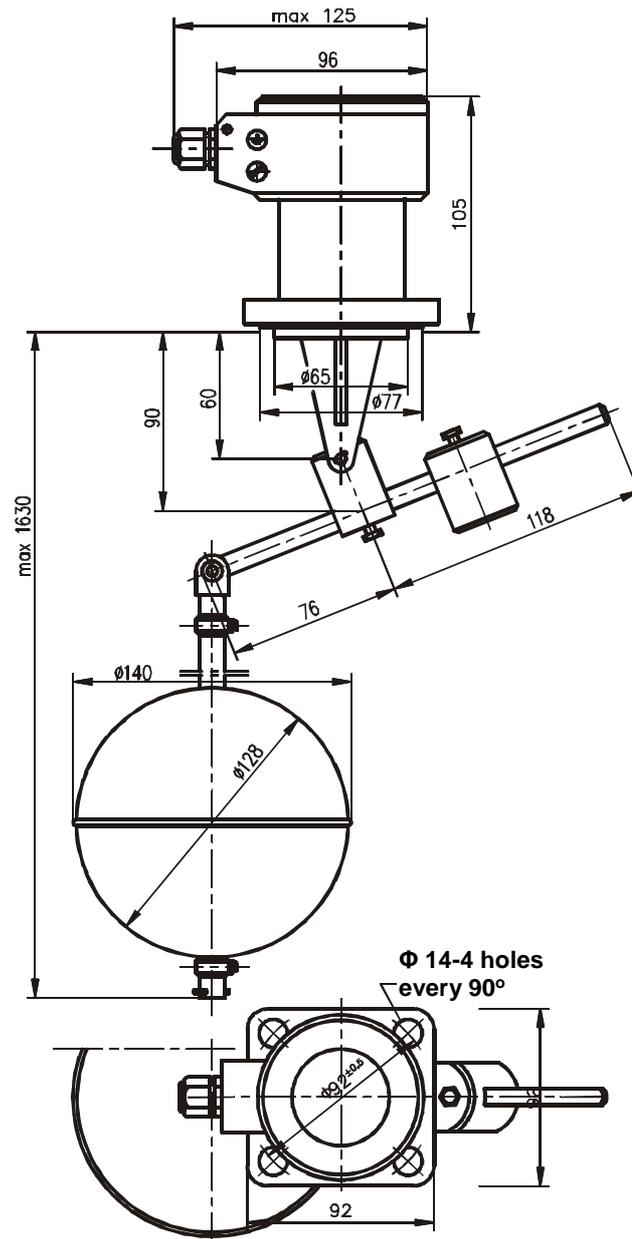
| Version | H [mm] | L [mm] |
|---------|--------|--------|
| -1 | 140 | 230 |
| -2 | 180 | 305 |
| -3 | 240 | 405 |



Dimension drawing of level switch type ERH-03-16, ERH-03-16.1



Dimension drawing of level switch type ERH-04-16, ERH-04-16.1



4.2. STARTING AND SERVICE INSTRUCTION

4.2.1 Preparing products for starting

Level switches might be assembled in closed rooms or in rooms which are protecting before effect of atmospheric conditions (like: rain, snow, and others) and free of excessive quantity of cooling fumes.

After unpacking of level switches and checking if everything outside is right, level switch has to be screw down into socket ferrule use leak stopper between socket ferrule and level switch. Manufacturer recommends to put gland down during assembly of level switch



1. **take off the leaden seal which holds down the nut**
2. **connect wires into micro-switch strip**
3. **if the connection was made correct turn the nut using spanner**
4. **seal with lead the nut once again**

4.2.2 Maintenance instruction

If electric circuit is made and electric lever works well, level switches will not require further maintenance.



It is impossible to make any manipulations during under-voltage of level switches in explosion-proof zones.
Any repairs have to be done by manufacturer or authorized service.
If someone else make the repairs the manufacturer will not bear the responsibility for safety and correct working of good.

4.3. CONSERVATION INSTRUCTION

Level switches have to be check very carefully once a year and user has pay attention on technical condition of parts, which are endangered on liquid working (float, pints, cotter pints, magnet housing, lever, etc.). Possibly impurities have to be eliminate especially out of magnet housing and gap between body and float lever.

Mentioned actions have to made more often for strong polluted liquids (e.g. periods might be determined by user or might be done during inspection of tank or fittings.

Settlings e.g. boiler scale, has to eliminated by mechanical or chemical method, but part of level switch couldn't damage.

After conservation level switch has to be assembled.

4.4. INDUSTRIAL SAFETY INSTRUCTION



Workers who make assembly of level switches on objects should have general knowledge of safety instruction and this document (IOM). Assembly can't be making if system is live.

Level switch might be zeroing or grounding – it depends on kind of object.

Marking screw helps in make mentioned actions.

| | | |
|---|--|-----------------------|
|  | TECHNICAL PRODUCT DOCUMENTATION | ER5-1543 |
| | | Page: 16 Pages: 16 |

5. STORAGE AND TRANSPORT TERMS

Level switches should be stored in warehouses free from any chemical fumes at temperature from 5°C to 30 °C and relative humidity of 30 to 80%.

Technical condition of level switches should be checked at least once a year.

Level switches should be stored in package protecting them against any mechanical damages. Packing of level switches is made of boxboard, acc. to the drawing no. ER3-1313.

Transport of level switches should be done in boxboards. During the transport level switches have to be disable.

6. SETS DELIVERY

The complete shipment of level switch type ERH-01...-04-16 includes:

- Operation and Maintenance Manual,
- Compatibility Declaration
- Guarantee Card,

6.1 Spare parts

On a special customer's request, the Producer will send against payment the below given spare parts, respectively to the ordered level switches type.

Table no. 2

| Item no. | Name of spare part | Level switch type | | | |
|----------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | | ERH-01-16 ERH-01-16.1 | ERH-02-16 ERH-02-16.1 | ERH-03-16 ERH-03-16.1 | ERH-04-16 ERH-04-16.1 |
| 1. | microswitch ER3-1536 | 1 pc | 1 pc | 1 pc | 1 pc |
| 2. | Completed float ER2-1024 | 1 pc | 1 pc | 1 pc | - |
| 3. | Completed float ER2-0565 | - | - | - | 1 pc |

7. GUARANTY TERMS

Guaranty terms are determined in guarantee card of Manufacturer – Aplisens-Controlmatica Ostrów Wlkp., Poland – guarantee card is added to the each piece of level switch.

ATTENTION: The right of introducing design changes in the product, without deteriorating of its operation parameters, is reserved.