

Level switches (controllers) for liquid levels limit states and other physical quantities, type SPC - 1K

including

DPZ-2R... two-state impedance converters (relays)
and **CZP-1...** electrode level sensors (probes)



User's manual

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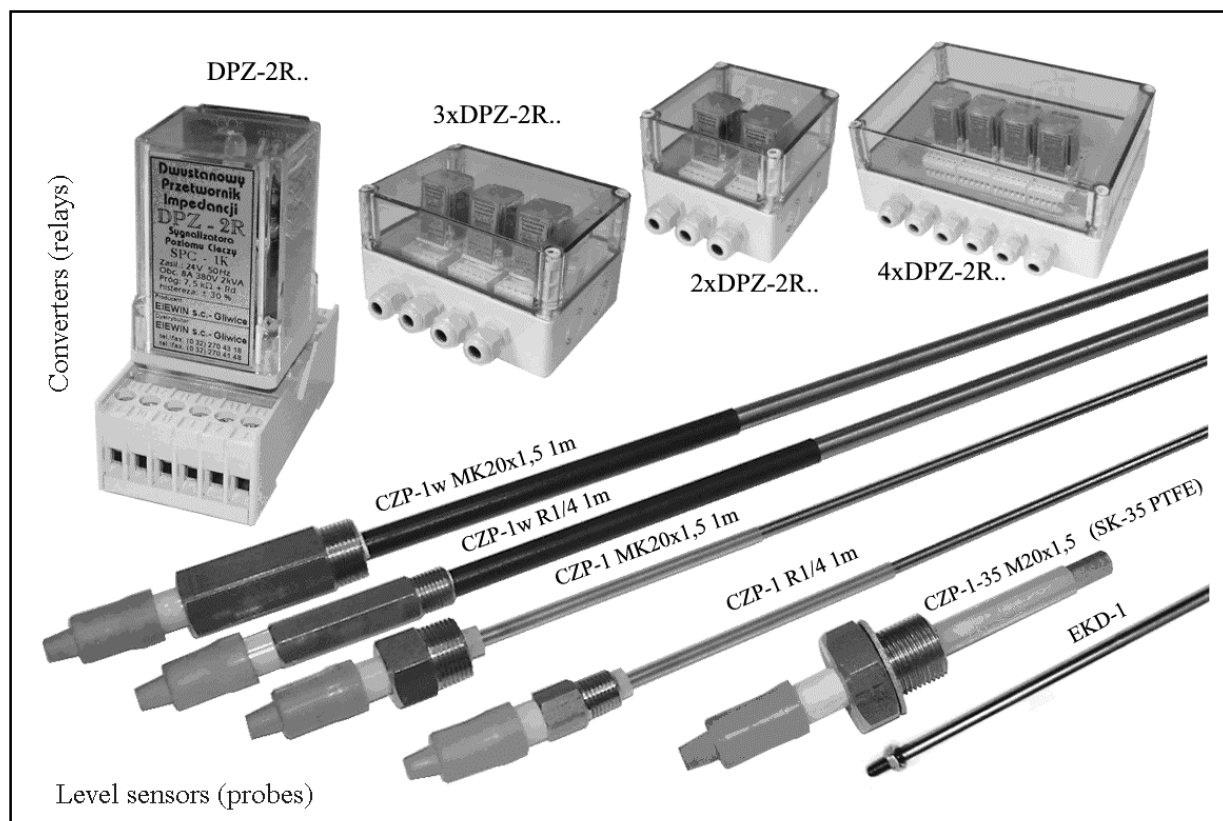


Fig. 1 SPC-1K level switches – view of selected unit types

1 Application

SPC-1K level switches are intended for use in signalling circuits and/or control of levels of media such as: water, waste water, pulps, syrups, emulsions, chemicals, drinks, milk, coal, wet sand and soil, moulding sand, farm produces etc. Do not use for fuels, oils, places where explosion hazard is present etc.

Intended for use in facilities such as: wells, pipelines, reactors and chemicals containers, sink basins and water discharge basins, intermediate pumping stations and oil traps for waste water, rooms with threat of flooding, pressure expansion vessels, boilers, autoclaves, silos etc.

The converters are intended for permanent incorporation into protective cabinets or housings while the sensors are designated for permanent installation in the unit where the medium level or presence (or absence) is to be signalled.

Detailed circuit and environmental conditions in which the level switch can be used are based on the further information and parameters to be followed.

The level switch and/or its assemblies are components intended for signalling and control systems. Before they are used a relevant technical design must be prepared to associate the level switch with the object and other components indispensable for the performance of the necessary functions. The design should be prepared by a specialist (e.g. an electrician) holding the necessary licenses. Both the design and the execution must meet the requirements and recommendations indicated in this manual and the requirements and recommendations of the regulations in force for the individual object. The circuit made according to the design should guarantee the safety of people, animals, property and environment.

2 Operation

The operation of the level switch is based on the impact of the of the sensor electrode with the electricity-conducting medium on the electric resistance (impedance) of that electrode against the container walls (or the counterelectrode).

3 Design

SPC-1K level switch is a selected set composed of an electrode level sensor, CZP-1 type (Fig. 3) and a two-state impedance converter DPZ-2R type (feeder-relay) - (Fig. 2).

Sensor (Fig. 3) has a casing with taper pipe or metric thread. A special electrode is embedded in the casing, properly isolated from the casing, with a thread clamp for connecting a conductor. The clamp is shielded with a heat-resistant flexible cap.

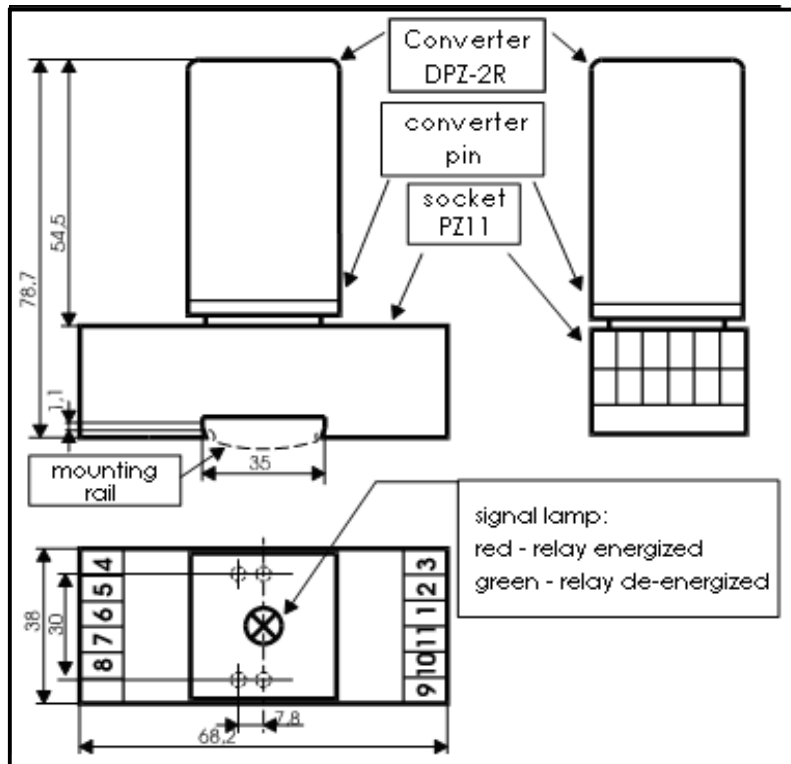


Fig. 2 Dimensions of DPZ-2R converter including PZ11 type Relpol socket.

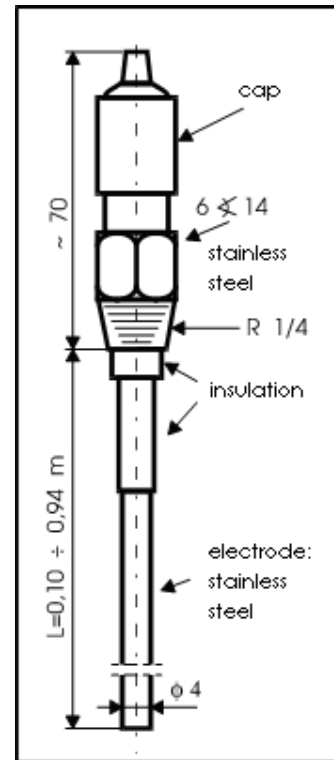


Fig. 3 Dimensions of CZP-1 R1/4 sensor (basic version)

The design of the converter (Fig. 2) is of a block type with a multipin (11-pin block) intended for standard 11-contact sockets (PZ-11 socket of Relpol-Żary is required or other socket with identical arrangement of terminals and of not worse electrical parameters).

Schematic and block diagrams of the entire level switch in two basic application circuits and the application functions of those circuits are illustrated in figures 4 and 5. The electric circuit can be powered from 230V AC network or with 24V AC current (terminals 4,5) or 12 or 24 V DC current (via internal converter; power supply: terminal 4: „+”, 5: „-”). Input circuits (terminals 9,10,11,1,2,3) are isolated from the power supply by a low-power separating transformer (Tr) (also where DC is used). The circuit includes a transistor-based detecting amplifier (Wd) and a bistable amplifier (Wp) with hysteresis (flip-flop), output control relay (P) and signal lamps (optical level switches) (Sz) and (Sc)

The detecting amplifier (Wd) is interfaced with the bistable amplifier (Wp) by a delay element composed of a resistor (Ro) and a delay capacitor (Co). The switching delay can be increased using an external capacitor (Cd). The delay value without the use of the Cd capacitor is optimal for most of the applications.

Auxiliary alternative voltage (Up) is derived from the secondary winding of the separating transformer (Tr) and supplied to a measuring divider formed of an internal range resistor (Rzk) and an external range resistor (Rd) and the measured impedance of the CZP-1 sensor. The divider tap is connected to the input of the detecting amplifier (Wd). The control impedance that composes the measuring divider (the impedance of the CZP-1 sensor) has an impact, depending on its value, on the level of the alternating output voltage of the detecting amplifier (Wd) and hence it correspondingly biases the flip-flop (Wd).

The control impedance values for which the relay states are changed (equal to switching resistance values) are a result of the total value of the internal range resistor (Rzk) and the additional range resistor (Rd) (and optionally an additional reducing resistor Rdr connected to the terminals 2-11).

The value of the internal range resistor (Rzk) (7.5 kΩ) is selected so as to allow the level switch to meet the requirements of the most of typical applications with a zero value of the additional external range resistor (Rd).

The flip-flop switching points (expressed as switching resistance values) are selected in such a way that their average arithmetic value (median; threshold) for both basic application circuits (Fig. 4 and 5) is approximately the same. Consequently, the switching resistance values for a specified Rd value, for both application circuits, are the same (this simplifies the selection of the Rd resistor).

The flip-flop (Wp) controls the output electromagnetic relay (P) including 1 pair of switching contacts constituting a voltage-free output of the entire level switch and controls the signal lamps (optical level switches).

The red lamp (Sc) goes on when the electromagnetic relay is energized while the green lamp (Sz) goes on to indicate that the relay is de-energized (it is the other way round for **DPZ-2Rzp** version).

The possibility to swap the range resistor and the sensor impedance in the measuring divider circuit allows a free selection of one of the above application circuits by the user. The minimum level signalling circuit (Fig. 4) enables the output relay once the level exceeds the required minimum. The circuit is suitable to indicate the minimum level because the drop of the liquid level in the tank below the required minimum level results in a state of output terminals identical to that when no power is present, which causes that any possible power failure is indicated as an emergency and so is the drop of the liquid level below the warning minimum level. The operation of the circuit shown in Fig. 5 is opposite. The consequence of such solutions is a simplification of the level switch and high reliability.

The converter is a universal block of permanent, unchanged parameters the features and parameters of which can be adjusted over a wide range by the user via an external connection and an attachable additional range resistor (R_d) and/or reducing resistor (R_{dr}) and optionally an additional delay capacitor (C_d).

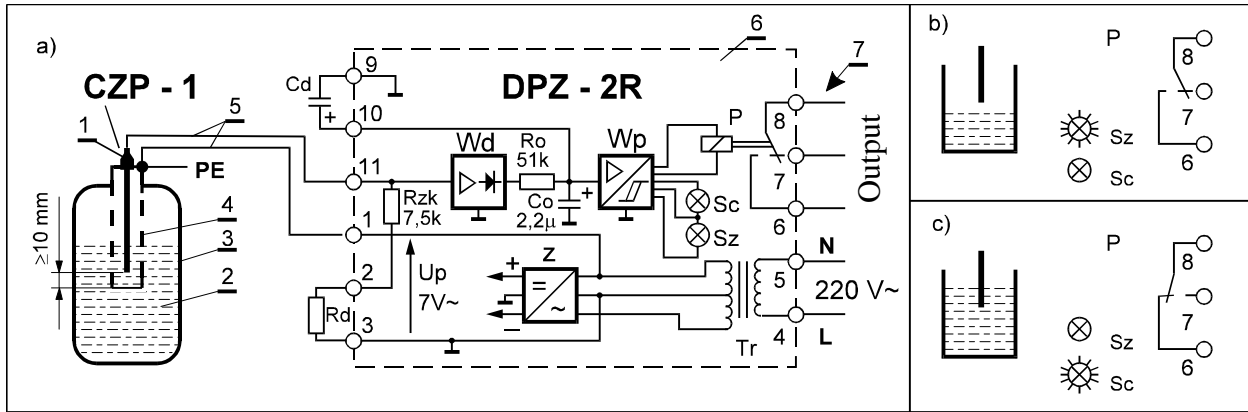


Fig. 4 Inversion-type “minimum level” signalling circuit.

- Circuit diagram (position of output contacts Nos. 6,7,8 for power-off on terminals Nos. 4 -5).
- State of output contacts and the optical level switch for the electrode emerged above the surface.
- State of output contacts and the optical level switch for the immersed electrode.

1. CZP-1 sensor; 2. Conductive liquid; 3. Tank; 4. Sensor housing (according to DT-UC-90/WO-A/02 item 8.2.1) ; 5. Connection line; 6. DPZ-2R converter; 7. Level switch output; Sz – green lamp (optical signalling) ; Sc – red lamp (optical signalling) ; Rd – additional range resistor to set the range (sensitivity) of the converter; Cd – additional capacitor to set the switching time (above the nominal one) ; P – output relay.

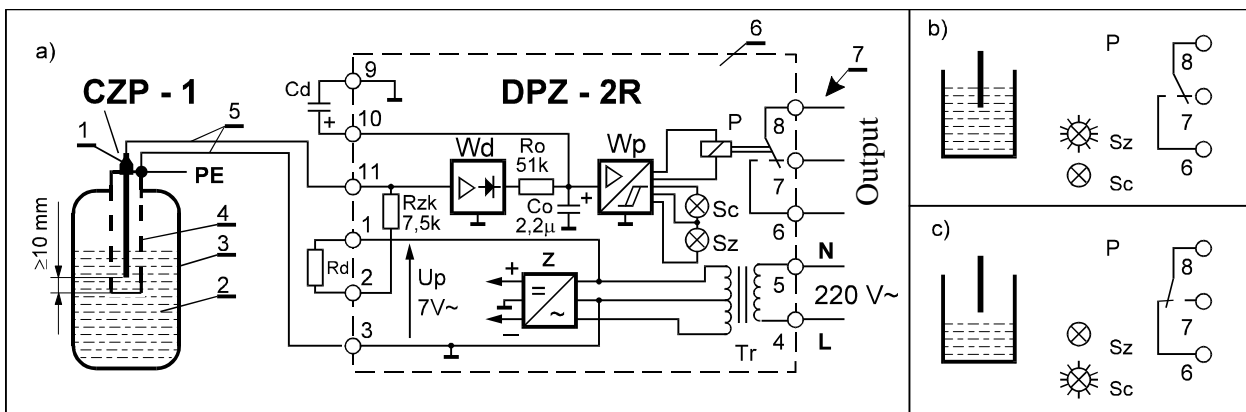
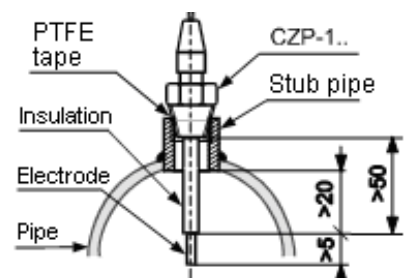


Fig. 5 Non-inversion-type “maximum level” signalling circuit – key: see Fig. 4

- Circuit diagram (position of output contacts Nos. 6,7,8 for power-off on terminals Nos. 4 -5)
- State of output contacts and the optical level switch for the immersed electrode.
- State of output contacts and the optical level switch for the electrode emerged above the surface.

Fig. 6 Sample installation of CZP-1R1/4.. sensor inside a pipe or a tank (it is recommended to follow the general principles illustrated in the figure also for installation of other sensor types



4 SPC-1K level switch parameters.

DPZ-2R.. converter		CZP-1 .. sensor (probe)	
Power supply Un; options 50Hz	230V 10mA; 24V 80mA	Liquid pressure *	≤ 4.0 MPa
Tolerance +10%, -15% DC	12V 70mA; 24V 30mA	Liquid temperature	≤ 250 °C (for water saturated vapour pressure)
Breaking (switching) capacity	8A; 250 V AC; 2 kVA (cosφ=1)	for CZP-1w version	≤ 100 °C (possible ≤ 250 °C)
Light signalling	red - ON ; green - OFF	„Moisturized” materials	1H18N9T*, PTFE (PE for ”-w” version 100°C)
for DPZ-2Rzp version	green - ON ; red -OFF	Connector thread * (taper type)	R1/4 or MK20 x 1.5; sealed with PTFE tape
Ambient temperature	-25 ÷ 55 °C	for CZP-1-35 type	M20x1.5 (straight type); flat gasket
Sensitivity (switching threshold)**	~ 7.5 kΩ + Rd (see Tab.1)	Electrode diameter	4 mm
Hysteresis (rel.to the switch.thresh)	~ ± 30% *	for CZP-1w type	8 mm
Time delay (τ ; sec.) *	$\tau = (<1) + (\sim Cd \cdot 5 \cdot 10^4)$	Electrode lengths [m]	L = 0.15 ; 0.45 ; 0.95 + 1.0 ; 2.0 ...
for DPZ-2Rzw version	$\tau_{ON} < 1$; $\tau_{OFF} = \sim 5$ sec.	Additional electrodes extending the sensor	EKD-1; Ø4; (in EKD-1w Ø8) L = 1 m (with threaded ends and a thread connector)
Voltage at the sensor	Very low (≤ 7 V~)	Insulation strength	1.0 kV (dry)
Insulating strength	2.5kV~ (4kV relay and transformer)	Terminal protection grade	IP 55 (IP67 if cap filled with silicone)
Protection grade	IP 00	Applied voltage at the sensor	≤ 50 V AC DC
Overvoltage category	II		

*Upon agreement the parameters can be changed to be made more stringent according to the user's requirements. If used for caustic liquids (e.g. acids) provide type, strength, and temperature of liquid in order to select an appropriate material of the electrode and housing.

** Converter sensitivity (switching threshold, range) = arithmetic mean of two resistance values for which the output relay is switched on and off, resulting from the resistance value of the additional range resistor Rd and optionally the reducing resistor Rdr.

The 12V DC and 24V DC versions are equipped with electrical isolation from the power supply; for those versions the „+” of the power supply must be connected to terminal 5, while the „-” must be connected to “4”.

Stub pipes with G1/4 or M 20x1.5 threaded holes can be supplied for the sensors (to be welded-in).

For CZP-1-35 sensor (which replaces the no longer used SK-35 probe) the electrode length is L= ~60mm – extended with an additional EKD-1 electrode.

5 Recommendations for installation and safety of use

⚠ Caution: Any works can be performed after this manual and the design referred to in Item 1 have been carefully read. The principles given in the manual and design must be followed. Non-compliance with the said principles may result in electric shock to persons and/or damage to the equipment.

Install the converters in cabinets or boxes which meet the requirements of the safety standards so that the terminals and other components connected to dangerous voltage are efficiently shielded preventing the occurrence of the dangerous voltage on the conductive components accessible to people and animals (connect metal cabinets or enclosures and other conductive components to the protective conductor). Connect the (metal) tank and/or the ground electrode to the protective conductor also.

⚠ Caution: Impedance of protective connections must be as low as possible so that in case of any short-circuit the voltage that might occur on the accessible conductive components does not exceed the value of 10V for the short circuit current equal to double rated current of the fuse used in the circuit protected.

⚠ Caution: Should any of the input circuits (terminals Nos. 9,10,11,1,2,3) be accessible to people and/or animals (this applying also to sensors connected to those terminals and/or other components which conduct electricity), 12V DC or 24V DC or 24V AC converters must be used and the circuits connected to the outputs (terminals Nos. 6, 7, 8) must be of safe voltage type (e.g. 24V). Where a higher voltage is to be used (e.g.230 V) additional protective impedance must be installed (e.g. protective differential switch). For versions supplied with voltage higher than safe voltage (e.g. 230V~), whole of the power must be supplied via protective differential switch. In addition to the above conditions quick-break fuses must be used in the power supply circuits connected directly or indirectly with the converters, corresponding to the power of the appliances connected but in any case of the rating not exceeding In=8A; such circuits must be equipped with an easily accessible, explicitly marked and easily identifiable switch compliant to PN-EN 60947-1

Install the switches in places free from risk of mechanical impact (this applying mainly to terminals) or use appropriate guards.

It is recommended to install the sensor in the upper (see example in Fig. 6) or side wall of the tank, or on extension arms, positioned vertically or obliquely down. Horizontal and other mounting positions are allowed for fairly clean liquids. Order sensors with extended insulation for heavily polluted liquids.

The sensor mounting hole should have an appropriate thread type (e.g. G 1/4 for R1/4; M20x1.5 for MK20x1.5) undamaged, without sharp edges, chips etc. Seal the pressure vessels sensor thread with thread teflon (PTFE) tape.

Cut the electrode to length before mounting the sensor. The length of the non-insulated electrode part should be ≥ 5 mm (recommended ≥ 50mm). Where an electrode ≥ 0.95m must be used extend it with additional EKD-1.. electrodes supplied to order (for lengths of approx. 2 m and more and/or strong liquid swirls the use of CZP-1w reinforced sensors is recommended. For heavy exposure purposes and dry loose materials use heavy duty CZP-1cG.. sensor (see category card CZP-1cG..).

Gaps between the sensors and the distance from the tank walls depend on the sensor type, its length and the condition of the liquid. For lengths up to approx. 0.45m for CZP-1 and up to approx. 1m for CZP-1w and where no swirl in the liquid is present the gaps can be up to several centimetres. Where heavy swirls occur and for longer sensors, gaps of several tens of centimetres and more may be necessary. A general principle: “the longer the electrode the further it is placed from the tank walls” should be followed (this does not apply to the ground electrode which, if used, may contact the tank wall). Where long electrodes are necessary with no possibility to increase the distance between them, sensors with extended insulation must be ordered.

If the electrodes and/or terminals are accessible to people and/or pets, guard them with protective cover or use converters powered with safe voltage (12V DC or 24 V DC or 24V AC), alternatively whole of the power must be supplied via protective differential switch.

Connect the sensors with the converters using 250V cables with Cu strands of cross-section ≥1.5 mm². For temperatures above 100°C use silicone- or teflone-coated conductors with heat-resistant strands e.g. nickel-plated strands. In damp places or where vapours are present (e.g. in intermediate pumping stations) thoroughly apply silicone grease on the terminal and the strand before pulling the rubber cap home. Protect the ground connection reliably against corrosion. the length of cables between the sensor and the converter may be from 1 m to 500 m (and over) depending on the conductivity of the liquid, additional resistor RD and the noise level. Typical values of maximum distances are listed in Table 2. Where longer cables are necessary with the liquid being of good conductivity (≥ 1 mS/cm), the sensitivity can be reduced by connecting an additional reducing resistor Rdr to the terminals Nos. 2-11 of the DPZ-2R converter. In such a case the sensitivity (in kΩ) is: $\{7.5 \cdot Rdr[k\Omega]\} : \{7.5 + Rdr[k\Omega]\} + Rd$; provided that: Rdr ≥ 0.5 kΩ.

For condensate and other liquids of poor conductivity such as e.g. distilled water, deionized water, oiled liquids etc. or for indication of water under oil the version DPZ-2Rzp is recommended (high sensitivity and resistance to noise; lengths of connections can be multiplied).

⚠ Caution: When designing the arrangement and lengths of connections the requirement of low impedance of protective circuits, defined earlier, must be taken into account.

Use **SP-50** probes (category card SP-50) to protect deep-well pumps from dry-run and DPZ-2R (if one) with $Cd \geq 100\mu F$. If the liquid is sloshing and an increased time delay causes no interference to the operation of the facility we recommend to use Cd in order that the sloshing does not unnecessarily switch the converter and other devices (asymmetric delay is possible in DPZ-2R/sw and DPZ-2Rzw). Additional components (Rd, Cd., Rdr), if necessary (supplied to order), must be attached to the converter terminals according to the above diagrams. Connections of the entire level switch must be made as per the above examples while taking into account the a.m. requirements. **Note:** strands (if more than one) of the same diameter should be inserted into one terminal.

⚠ Caution: All installation works must be carried out by adequately qualified persons holding the necessary licenses, after they have carefully read the user's manual and the design referred to in Item 1 and after they have got acquainted with the product. Conduct all electric works while the power is off. Mount the sensors on unheated and depressurized vessels which contain no substances detrimental to health.

⚠ Caution: – According to the conditions of the Technical Inspection the sensors of the level switches which act as switches and parameter limiters in pressure equipment protective automation devices which are installed in steam boilers and other pressure vessels should, according to the Technical Conditions of the Technical Inspection DT- UC - 90/WO -A/02, be mounted vertically in an enclosure with balancing holes, with the cylindrical part of the enclosure reaching min. 10 mm below the electrode tip, the smallest gap between the electrode and the enclosure being at least 5 mm (examples see Fig. 4 and 5).

⚠ Caution: - When using the level switch (or its components) for the pressure equipment (> 0.5 bar) which is subject to Directive 97/23/EC the said level switch must not be used as „protective equipment“ above category 1 as per that directive or, if used, it must be approached as cooperative components to be subjected (together with the final unit) for certification for conformity with that directive as the manufacturer provides no declaration of conformity with that directive for procedural reasons (this is how the level switch has been used for a number of years by e.g. steam boiler manufacturers in boiler limiter and water level controller circuits).

If the level switch is not used to perform the a.m. function of a protective equipment subjected to the pressure equipment directive 97/2/CE the above limitations are not necessary and it is sufficient to ensure the sensor mounting method described earlier in this text. Where CZP-1 sensors are used for clean liquids they can be even installed at the vessel bottoms (with the electrode directed upwards vertically or at an angle, but in any such case this must be agreed with the sensor manufacturer who must be provided with the information on the liquid type and other mounting conditions as the electrode insulation must be adequately adapted for such installation method because the level indication is performed at the insulation edge on the electrode).

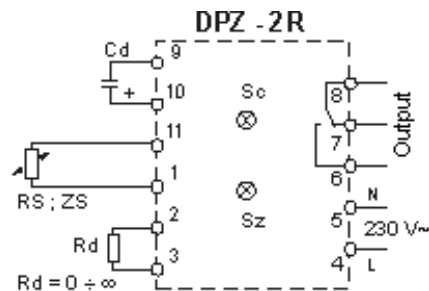
6 Level switch applications:

6.1. Steam boilers: - see Fig. 4 and 5 or 6.2.5; 6.2.6; 6.2.7

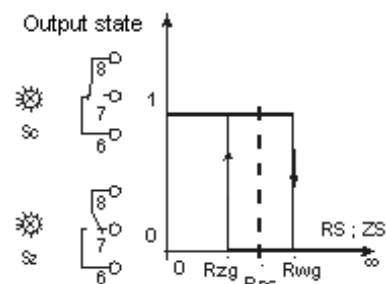
6.2. Other applications:

6.2.1. Inversion-type preset impedance value signalling circuit (minimum level signalling circuit):

a) Connection diagram



b) General characteristics



Sc – red lamp (optical level switch)
Sz – green lamp (optical level switch)
Cd – additional capacitor to set switching time (above the nominal value as per Item 4.)
Rd – additional range resistor
Rs – control resistance e.g. PTC thermistor, photoresistor; microcontacts etc.
Zs – control impedance e.g. electrodes in liquid

State 1 – output relay on; red lamp (optical level switch) is on (Sc), contacts Nos. 6,8 closed
State 0 output relay off; green lamp (optical level switch) is on (Sz), contacts 7,8 closed
Note: for DPZ-2Rzp version the colours of the optical level switches are opposite

c) Nominal switching resistance values:

Median switching resistance (converter sensitivity, threshold, range) Rps:

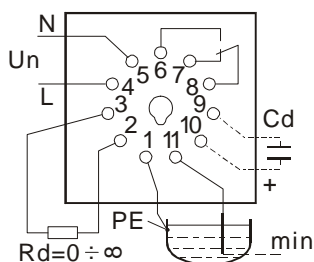
$Rps [k\Omega] = \{ 7.5 + Rd [k\Omega] \} \pm 30\%$ for: $Rd \leq 100 k\Omega$ (for $Rd > 100 k\Omega$ Rps is not normalized)

Limit enabling resistance (Rzg) and limit disabling resistance (Rwg):

for: $Rd \leq 100 k\Omega$: $Rwg [k\Omega] = \{ Rps [k\Omega] \times 1.3 \} \pm 20\%$; $Rzg [k\Omega] = \{ Rps [k\Omega] \times 0.7 \} \pm 20\%$

for: $Rd = \infty$: $Rwg = 4 M\Omega \pm 50\%$; $Rzg = 2.2 M\Omega \pm 50\%$

6.2.2. Circuit to signal the liquid level drop below the permissible minimum level.



Description:

– once the liquid level has dropped below the minimum, states of the output contacts (6, 7, 8) are as presented in the figure i.e. they are the same as when no power is present at terminals Nos. 4, 5

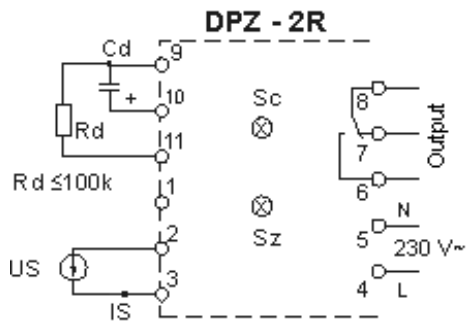
Used i.a. to protect pumps from dry-run, protect and control steam boilers.

Special converter (**DPZ-2Ropz**) can be supplied for deep-well pumps (with delayed pump restart).

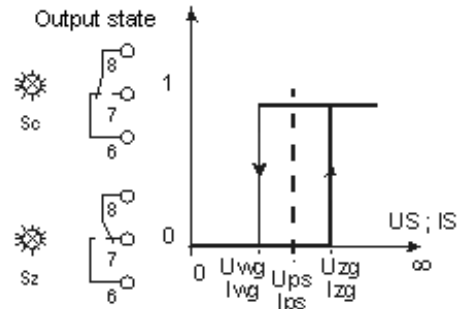
Multiple signalling circuits of that type can be used in one vessel.

6.2.3. Non-inversion-type circuit to signal the preset impedance or current value

a) Connection diagram



b) General characteristics



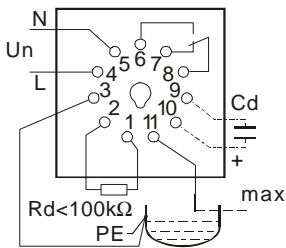
Sc – red lamp (optical level switch)
 Sz – green lamp (optical level switch)
 Cd – additional capacitor to set switching time (above the nominal value as per Item 4)
 Rd – additional range resistor
 US – control voltage e.g. output signal from circuits e.g. TTL, CMOS etc.

State 1 - output relay on; red lamp (optical level switch) is on (Sc), contacts Nos. 6,8 closed
 State 0 - output relay off; green lamp (optical level switch) is on (Sz), contacts 6,8 closed
Note : for DPZ-2Rzp version the colours of the optical level switches are opposite

c) Nominal switching values and maximum permissible switching values:

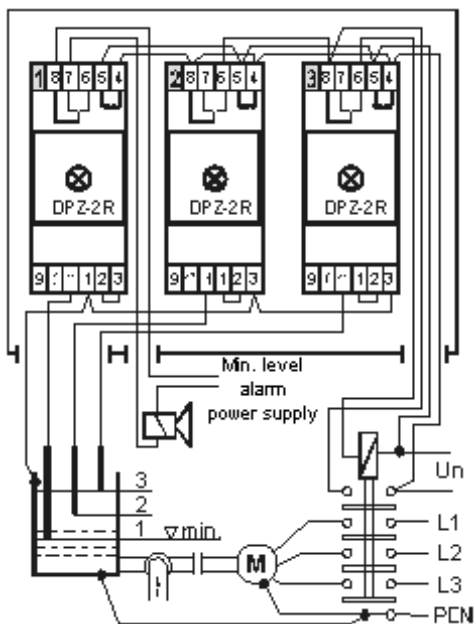
for: $R_d = \infty$ $U_{zg} = 2.5 \text{ V} \pm 50\%$ $I_{ps} \leq 0.05 \text{ mA}$ $U_S \leq 24 \text{ V}$
 $U_{wg} = 1.8 \text{ V} \pm 50\%$

6.2.4. Circuit to signal the liquid level rise above the permissible maximum level.

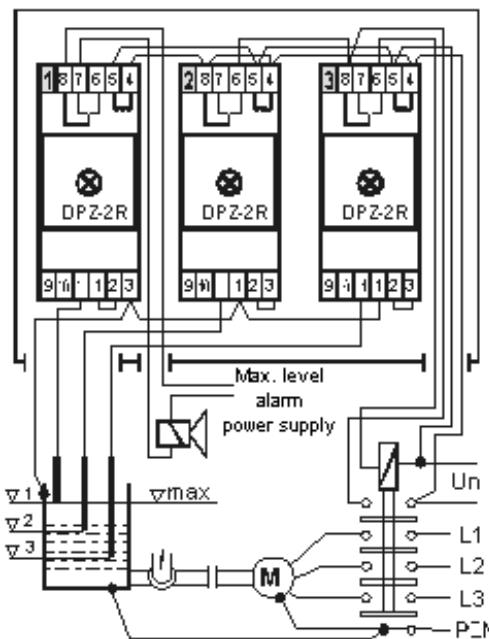


Description:
 - once the liquid level has risen above the maximum level, states of the output contacts (6, 7, 8) are as presented in the figure i.e. they are the same as when no power is present at terminals Nos. 4, 5.
 Applicable i.a. to:
 - provide signals and locking action to prevent vessels from overflowing,
 - signal the flooding of rooms,
 - signal leakage of various substances,
 Any number of signalling circuits can be used in one vessel at a time.

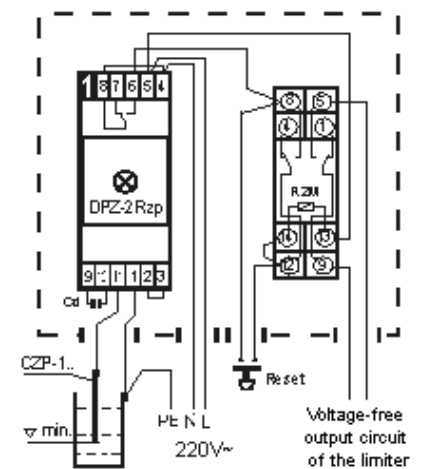
6.2.5. Water level control performed by filling, with minimum level signalling



6.2.6. Water level control performed by emptying, with maximum level signalling



6.2.7. Parameter limiter circuit for minimum level



Typical values of the additional (range type) Rd resistor for various liquid types and distances between the sensor and the converter (for operation with CZP-1 type sensor) are listed in Table 1. The Rd values given in Table 1 are not critical and can be changed to intermediate values according to the actual requirements, conductivity of the liquid and the liquid pollution level. In normal conditions it is sufficient to use Table 1.

Table 1

Pos.	Liquid type	Liquid conductivity [$\mu\text{S} / \text{cm}$]	Rd value * [$\text{k}\Omega$]	Maximum ** length of the line connecting the sensor with the converter	Comments
1	2	3	4	5	6
1	ordinary clean water, juices, acids, bases, salts, etc.	> 200	0 (jumper)	500 m	basic *** measurement range
2	rainwater, milk, waste water, etc.	> 100	10	100 m	
3	water condensate	> 20	100	20 m	
4	distilled water	> 2	$\geq 1 \text{ M}\Omega$	2 m	only for arrangement as per Fig. 4
5	distilled water	< 2	∞	2 m	only for arrangement as per Fig. 4 ****

* The additional range Rd resistor value determines the converter sensitivity i.e. determines the sensor circuit impedance value for which the relay output contacts are switched; the sensor circuit impedance value is based on i.a. how deep the electrode is immersed in the liquid and on the liquid conductivity; the additional range Rd resistor indicated under Pos. 1 above, is selected in such a way that the SPC-1 level switch operates effectively even for the liquid conductivity of one order of magnitude lower i.e. $20 \mu\text{S}/\text{cm}$ and for electrode immersion not more than 20 mm (according to the requirements of technical conditions of the technical inspection DT-UC-90/WO-A/02 item 8.3.2). For Rd values indicated in column 4 and for the liquid conductivity values given in column 3 the switching of the relay output contacts occurs for the sensor electrode immersion not exceeding 2 mm

** Recommended values although actually the binding requirements are as per WT SPC-1.

*** Applicable for i.a. steam boilers subject to Technical Inspection.

**** Can be used only after individual tests at the user's facility.

On request the manufacturer can offer variable adjustment resistors of the following ratings: $5\text{k}\Omega$, $10\text{k}\Omega$, $100\text{k}\Omega$, $1\text{M}\Omega$ and other; the resistors are connected to terminals as Rd or Rdr , and enable selection of any converter sensitivity.

Where liquids are used which form conductive coatings on the insulator or insulation coatings on the electrode the sensor must be cleaned periodically (e.g. with cleaning agents intended for sanitary facilities); cleaning must be performed in such a way as not to damage the insulation.

In more difficult conditions when problems are encountered during the start-up of the level switch due to adverse conditions (high temperature, heavy pollution, caustic medium, severe interference etc.) seek the advice of the manufacturer.

Typical time delay values τ based on the additional Cd capacitor capacitance (set through stepwise change of sensor impedance from zero to infinity or the other way round) are given in Table 2.

Table 2

Cd	0μ	47μ	100μ	220μ	1000μ
τ	< 1 sec.	~2.5 sec.	~ 5 sec.	~ 11 sec.	~ 50 sec.

(the Table is not applicable for DPZ-2Rzw and DPZ-2Rsw versions)

DPZ-2R converters can also be used for other applications e.g. as time elements, contact thermometer or contact manometer switching capacity amplifiers (also for liquid thermometers and manometers with built-in contacts (electrodes)), automatic light sensitive switches, power outputs controlled with TTL , CMOS (see example in 6.2.2) etc., as motor overheating protectors combined with **PTC thermistors** and other.

DPZ-2R converters can also operate, as level level switches, with any other level sensors/probes (of conductometric/ conductance types).

Where very strong interference is present (e.g. in direct vicinity of high power inverters) or if the distance between the converter and the tank is significant (including tanks with very low conductivity liquids) the manufacturer shall supply special converter types (DPZ-2Rzpp) resistant to very strong interference at very high sensitivity.

7 Orders

The following should be given in the order: name, type, version and quantity of DPZ-2R converters, size and type of sets in box housings, values and quantities of Rd, Rdr (optionally adjustable – see above) and Cd (if necessary) as well as quantity, type, version, thread type, insulation length, (if of non-standard type) and lengths of individual CZP-1 sensors (see Fig. 3 and 4) and, optionally, quantity of additional electrodes. Electrodes made of silver, platinum or hastelloy are available to be used for various media. Sensors for higher temperature and pressure values are also available.

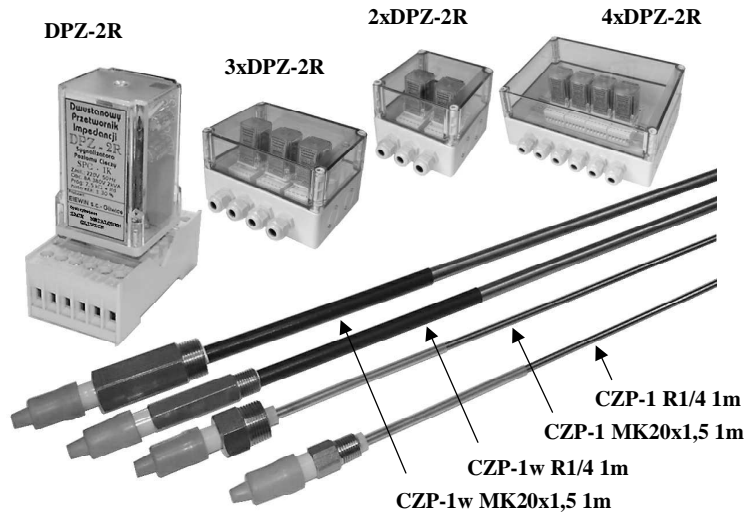
DPZ-2R converters can be supplied in tight (\geq IP-55) insulating box-type plastic enclosures (protection class II), with one ore more converters inside one enclosure, including contactors and other elements, according to the request of the ordering party.

Multi-line block designation: - e.g. 2xDPZ-2R - means 2 pieces of DPZ-2R in plastic IP 55 box enclosure with transparent cover

Multi-line block data:

Table 3

Number of lines	Enclosure dimensions	Spacing of mounting holes
1xDPZ-2R	75x125x100 (3 pieces of PG9 chokes)	60 x 110
2xDPZ-2R	125x125x100 (3 pieces of PG11 chokes)	110 x 110
3xDPZ-2R	125x175x100 (4 pieces of PG11 chokes)	110 x 160
4 ÷ 6xDPZ-2R	175x250x100 (6 pieces of PG11 chokes)	160 x 235
8xDPZ-2R	200x400x130 (10 pieces of PG11 chokes)	180 x 380



Views of various versions of SPC level switch assemblies

Note: - There is a possibility to provide ready-made assemblies incl. contactors (in box enclosures – see above) designed to perform defined functions e.g. level adjustment and signalling of minimum level. Control valves and pumps can also be supplied to form a set.

8 Warranty

Warranty is granted for the period of 12 months from the date of purchase according to the general rules. Justified claims, if any, will be handled after the product has been delivered to the manufacturer or distributor.

9 Declaration of conformity

The manufacturer declares that the product conforms to the essential requirements of the low voltage directive 73/23/EC and in particular the standard PN-EN 61010-1:1999 +A2:1999 and the directive 89/336/EC on electromagnetic compatibility and in particular the standards PN-EN 55014-1 and PN-EN 55014-2 - respectively harmonised with those directives.

The manufacturer reserves the right to modify the product.

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