



Signal Mont s.r.o.  
Kydlínovská 1300  
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# **INSTRUCTIONS FOR DESIGNING**

**SAFE GENERATOR OF OSCILATING SIGNALS - BZKS20**

**P 72 845**

č.v.: 72 845Ds1 ÷ Ds160

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## 01. INTRODUCTION

- 01.01 Safe generator of oscillating signals - BZKS20, No. 72 845 was authorized for use in Czech railways network by decree no. 58 143/03 – O14 issued on 14.7.2003 and established by the approval for use document - ZL18 / 2003 - SZ.
- 01.02 These „Instructions for designing, installation and maintenance of safe generator of oscillating signals - BZKS20" P 72 845 (thereinafter just instructions) contain basic information needed for use and provision of correct function of BZKS20.
- 01.03 Characteristics, solution and setup of BZKS20 predestinate its use for the latest and newly developed interlocking devices and that is why the concrete examples of external circuit wiring for its cooperation with other devices aren't mentioned in hints. The essential mechanical and electrical characteristics of BZKS20 must be respected at its particular application. It may be used only as separately authorized and introduced circuits utilizing BZKS20 to use it for control of the red road warning lights (BZKS20 can not be used without separate approval as simple replacement of the other component in authorized and established circuits, if these circuits directly ensure safety of railway transport – e.g. the circuit of the red road warning lights).

### 01.04 Abbreviations used in these instructions:

čl.	Reference to section number of instructions
DPS	printed circuit board
DKS	safe supervision of oscillative buses
EK	electronic encoder
EKM	electronic oscillator
kap.	Reference to chapter of instructions
deska	board – function block with electronics
KO	track circuit
LVZ	continuous ATP system
N	Supply (N 230 V AC, N 24 V DC)
PD	interconnection board
PZS	Light level crossing signalling device
S1, S2, S3, S4	power switch boards
SVK	terminal board of code choice
SZZ	station interlocking device
UAB	universal automatic block system
VSN	inputs of extension switches
ZI	impulse generator BZKS20
ZIP	impulse generator BZKS20 for use in PZS
ZIZ	impulse generator BZKS20 for signalling circuits supply

## 02. TECHNICAL DESCRIPTION OF BZKS20

- 02.01 **BZKS20** is fundamental schematic, constructional and technological innovation of electronic encoder EK-1 (No. 72 835), which was made since 1984 as a substitute for original electromechanical encoders and also as innovation of electronic oscillator EKM (No. 71 945) with help of the board of oscillative buses safe supervision. It is therefore intended for generation of oscillative signals (**0,9 Hz, 1,8 Hz, 3,6 Hz and 5,4 Hz**), which is used for additional encoding of KO in LVZ system.
- 02.02 Improvement and extension of **BZKS20** functional features enable its use also in applications, where it was not possible to apply EK or EKM – **chap.03**, e.g.:
- contactless switching of the road warning lightbulbs of PZS with frequency of 40 and 59 cycles/min.
  - implementation of power oscillative buses of **0,9 Hz, 1,8 Hz, 3,6 Hz** for oscillative supply of light signals with supervision of direct and backward bus.
  - direct encoding of KO without using TYS contacts.
- 02.03 The **BZKS20** circuits **itself** are placed on appropriate printed circuit boards. PCBs are inserted to the cabinet, formed by tight case from Al profile of the standardized proportions with inner grooves for lead of the particular boards. If the higher number of contacts is needed (variants for PZS), the basic cabinet can be extended by extension on the left side.
- 02.04 The **BZKS20** is supplied as constructional design variants listed below:
- No. **72 845 Ds01 ÷ Ds30**: this variant has the cabinet equipped with nibs and is intended for free standing (installation) on horizontal non-flammable pad (e.g. on the shelf of the universal relay element stand)
- No. **72 845 Ds31 ÷ Ds60**: this variant has the cabinet without nibs and the design of the front panel enables its assembly to the standard unit constructions for electronic devices (e.g. SCHROFF – vertical spacing of the fastening holes: 122,5mm – see annex **P03**)
- No. **72 845 Ds124 ÷ Ds130 (Ds154 ÷ Ds160)**: the variants of the previous two groups, supplemented with an extension in case of need of more switches (e.g. the variants for PZS).
- If there is a need to build in the BZKS20 to the standard relay element panel of the free coupling, the installation is performed by the help of extra ordered shelf 72 845 Ds750 (it has width of two NMS type relays for basic version) or shelf 72 845 Ds751 (it has width of three NMS type relays for design with extension). The shelves have to be placed always to the utmost left position because of the frame construction of the free coupling relay element panel.
- 02.05 The front panel of both designs is equipped with slides in place of the boards. This solution enables good visibility of diagnostic light indicators, enabling maintenance staff the easy optical verification of the **BZKS20** function. Mechanical design of the panel is universal in both cases - if some board is not inserted, there are none indications in operation underneath relevant slide. The seven design variants of the front panel with the necessary indication descriptions are created - regarding different board combination of particular BZKS20 generator variants, that is – **uni** Ds1 ÷ Ds20 (Ds31 ÷ Ds50) – **náv** Ds21 ÷ Ds23, Ds26 ÷ Ds28 (Ds51 ÷ Ds53, D 56 ÷ Ds58) – **přej.st.** Ds24, Ds29 (Ds54, Ds59) and **přej.ss.** Ds25, Ds30 (Ds55, Ds60) – **náv.+ss.** Ds66 (Ds76), , Ds86 (Ds96) - design with extension **přej.st.nást.** D 124, Ds129 (Ds154, Ds159) - **přej.ss.nást.** D 125, Ds130 (Ds155, Ds160).
- All data about variant number and its particular equipment are stated in the table of board configurations, painted directly on the front panel of the BZKS20 cabinet for greater lucidity.
- 02.06 An opening for easy access to all sockets for connectors is created in the rear panel of **BZKS20** for connection to electric energy supplies and also to controlled circuits. In case of using cabinet extension (variants for PZS), the rear panel is prolonged on overall cabinet width – it contains two open-

ings in that case, one for the cabinet and one for the extension and their mutual connection is done inside, via the opening in side wall of the cabinet.

The connector panels with fixed sockets for connectors are fixed in rear parts inside the cabinet and also the extension (variants for PZS). They serve for supply voltages connection, implementation of functional connection between **BZKS20** outputs and inputs of the particular switches (čl. 02.14) and for connection with device (see annex **P02a÷f**). The mutual connection between the basic cabinet and the extension is performed inside, via the opening in side wall of the cabinet.

02.07 Generator **BZKS20** is, when fully equipped, formed by up to five (seven in case of cabinet extension) boards:

1 pc. - power supply unit board **N** powered by **230V AC** or **24V DC** (see čl.07.02)

1 pc. - board of impulse sources **ZI, ZIP** or **ZIZ** (see čl. 07.03)

2 pcs. - board of power switches **S1, S2** (in case of use of only one board, the first board is always used and the unpopulated board, so-called **PD**, is used in a place of the second board); in case of cabinet extension, up to 4 pcs. of boards of power switches **S1 - S4** (čl. 07.06 ÷ 07.09)

1 pc. - interconnecting board **PD** - used only in case, that the **BZKS20** is equipped only by one board of power switch **S1** (see čl. 07.09)

1 pc. - board of safe supervisory circuit of oscillative buses **D** (čl. 07.12) in „oscillator" variant.

02.08 The two boards of power switches (**S1** and **S2**) can be placed in **BZKS20** cabinet as a maximum and also max. two boards (**S3** and **S4**) can be placed in extension cabinet.

02.09 The following versions of power switch boards are available:

**Sst** board of the power switches **st/sti** containing:

- two direct switches of alternating current
- two inverse switches of alternating current

**Sss** board of power switches **ss/ssi** containing:

- two direct switches of direct current
- two inverse switches of direct current

02.10 The direct switch is closed (on-state) in case that the control signal is brought on switch input (the switch is opened without excitation (off-state)).

The inverse switch is closed (on-state) in case that the control signal is not brought on switch input (the switch is closed without excitation).

02.11 If the technical development and service demands will require, it is possible to start production of other power switches design concerning the distinction of direct – inverse, perhaps even the combinations of two AC and two DC ones.

02.12 The power supply board **Ds100** is mounted for **BZKS20** powered by **230V AC**, the power supply board **Ds150** is mounted for **BZKS20** powered by **24V DC** (see čl.07.02 and tab.T1).

02.13 The following versions of the impulse source boards are available:

**ZI** board generating impulses with frequency of **0,9 Hz, 1,8 Hz, 3,6 Hz, 5,4 Hz**

**ZIP** board generating impulses with frequency of **0,651 Hz, 0,976 Hz**

**ZIZ** board generating impulses with frequency of **0,9 Hz, 1,8 Hz, 3,6 Hz, Z1,8 Hz** (**Z1,8 Hz** are impulses delayed toward impulses of 1.8 Hz).

02.14 The function of power switches is controlled by signals taken from outputs of impulse source board and brought on appropriate inputs for the control of the switches. The inputs itself are connected so that the pair of appropriate switches is always controlled by one input, i.e. in basic version the boards **S1** and **S2** contain two pairs of simultaneously working switches with galvanic separation, which can be in case of need interconnected to create the function of change-over contacts (see annex. **P01**). Selection of the key frequency for control of appropriate power switches pair is carried out by jumpers on so-called „code selection terminal board (SVK)". By inner wiring of **BZKS20** is however given that the one power switch in this pair is always on **S1** board and the second on **S2** board (see čl. 07.09, 07.10) and also that one switch is always **direct** and the other is **inverse**. If only board **S1** is mounted, the function of change-over contact can be obtained by connection of the

appropriate key frequency on, in parallel interconnected, inputs of the direct and inverse power switch of the same board.

- 02.15 Outputs of the particular switches are constructed with mutual galvanic separation.
- 02.16 The part of **BZKS20** cabinet is grounding terminal, fixed inside of the cabinet (see čl. **05.10**).
- 02.17 Particular BZKS20 variants respect distinction based on:
- the way of installation (see čl. **02.04**)
  - the used boards of switches, eventually the board of safe supervisory circuit of oscillative buses (see čl. **02.07**)
  - the supply voltage (see čl. **05.01, 05.02**)
  - the cabinet: basic version or cabinet with extension (letter **N** in labelling of variants).
- 02.18 The labelling of the product results from enclosed table **T 01**  
Example of the product labelling:  
The safe generator of oscillating signals BZKS20 – 3.4 BN No. 72 845 Ds129  
**BZKS20** = *type of product*  
**3** = *first digit of the variant labelling - variant of the installation way*  
**4** = *second digit of the variant labelling – variant of the boards combination – see annex No.1.*  
*Table of BZKS20 generator variants*  
**B** = *letter of the variant labelling - power supply*  
**N** = *second letter of the variant labelling – labelling of cabinet with extension.*
- 02.19 The way of installation:
- 1, 3, 5** = BZKS20 cabinet is equipped nibs and is intended for free installation - **Ds1 ÷ Ds30, Ds66, Ds86, Ds124 ÷ Ds130**
- 2, 4, 6** = design of the cabinet front panel enables mounting the generators to the standard unit constructions (ALMES, SCHROFF) for electronic devices - **Ds31 ÷ Ds60, Ds76, Ds96, Ds154 ÷ Ds160** (without nibs).
- 02.20 The combination of power switch boards and the board of the safe supervisory circuit of oscillative buses - second digit of the variant labelling: See the table "Summary of BZKS20 variants" in annex.
- 02.21 The supply voltage (letter of variant labelling: čl. **02.07, 05.01, 05.02**)
- S** = power supply with nominal voltage of **230V AC** (supply **N 230V**)  
**B** = power supply with nominal voltage of **24V DC** (supply **N 24V**).
- 02.22 The way of use in the relay element panel of the free coupling is not solved as a new variant. The basic variant of the design with nibs is used and placed on extra hereto intended shelf – Ds750 (No. 72 845) for basic variants of BZKS20 with width of two NMS type relays (or Ds751 (No. 72 845) for variants of BZKS20 with extension with width of the three NMS type relays). It must be however ordered separately.

### 03. APPLICATION

- 03.01 The BZKS20 is intended above all as the source for additional track circuit encoding for LVZ, eventually for other devices, which can fully use features of BZKS20 (čl. **02.01, 02.02**). If circuits, the BZKS20 is used as a part of it, directly ensure the safety of railway transport – e.g. circuit of the red road warning lights, these circuits must be separately approved and established for use (BZKS20 can not be used without approval as direct replacement of the other components in approved and established circuits).
- 03.02 Using BZKS20 as direct replacement of encoders of **EK-1** series is essentially possible with use of external circuits and extensions (adapters) of original EK-1. It is impossible to use it for four-aspect



- maximum power consumption **10 W**

It is also recommended to supply control circuit of power switches from external DC source of 24V for this variant of BZKS20.

#### 05.03 BZKS20 Output

- output code frequencies of **ZI** **0,9 Hz; 1,8 Hz; 3,6 Hz; 5,4 Hz**
- output code frequencies of **ZIZ** **0,9 Hz; 1,8 Hz; 3,6 Hz; Z1,8 Hz**
- output code frequencies of **ZIP** **0,651 Hz and 0,976 Hz** (40 cycles/min and 59 cycles/min)
- code frequency operational tolerance **±1 %**
- Secured code frequency tolerance **±15 % for outputs 0,651 Hz - 3,6 Hz**
- switching ratio **1 : 1**

The impulse can be prolonged and simultaneously the pulse gap shortened as far as by half of switched current period when using AC switches. From this reason when the BZKS20 is used as the source of oscillation 0,9 Hz and 1,8 Hz for SZZ, the ZIZ variant is used in accordance with annex P 1.06. The output NS IV is delayed in comparison with NS II by 10 ms, so the undesirable micro-glimmer of signal light bulbs is eliminated (see output ZIZ - Z1,8 Hz on position 5,4 Hz).

Because the BZKS20 is intended, first of all, for new devices, it **has not, compared to EK-1, the fifth output frequency of 0,9 Hz mod. (when every fourth impulse of 0,9 Hz frequency is omitted for four-aspect UAB system).**

#### 05.04 Switch parameters:

##### a) AC switch:

- max. voltage **255 V<sub>ef</sub> AC**
- max. current **3,0 A<sub>ef</sub>**
- maximum voltage drop in on-state **3 V<sub>ef</sub>**
- nominal frequency **50 Hz to 275 Hz**

##### b) DC switch:

- max. voltage **40 V DC**
- max. current **3,0 A**
- max. voltage drop in on-state **1,8 V**

#### 05.05 Parameters of supervisory circuit of oscillating buses:

- Input: - AC: **max. 255 V<sub>ef</sub> AC**
- nominal frequency **50 Hz to 275 Hz**
  - DC: **max. 35 V DC**
  - nominal frequency of supervised oscillating buses **0,651 Hz to 1,8 Hz**

- Output: - voltage with load of 4 kΩ resistor and with frequency of supervised bus
- in tolerance **22 V ±2 V DC**
  - out of tolerance **less than 2 V DC**

- output component - NMS 2-4000 relay with inductors in series is recommended, or electronic voltage evaluation device with input resistance of 4 kΩ and input voltage at least in range of 20 V - 24 V.

#### 05.06 Isolation resistance between active parts and chassis ground min. **10 MΩ**

#### 05.07 Breakdown voltage

- mutually between switch outputs **2,75 kV AC / 50 Hz**
- every output to chassis ground **4 kV AC / 50 Hz**

- every output to power supply **4 kV AC / 50 Hz**
- between interconnected all terminals of SVK terminal board and chassis ground **500 V AC / 50 Hz**
- power supply input to chassis ground (when protection wire disconnected from chassis ground) **2,5 kV AC / 50 Hz**
- battery supply input to chassis ground **500 V AC / 50 Hz**

05.08 Reserved

05.09 Protection against indirect contact is assured in IT electrical network by operation in closed el. workroom with usage of čl. 413.1.5.8. Note N of CSN 33 2000–4–41 and čl. 5.4 of CSN 34 2600. Alternative method of protection is chosen in accordance with the supply network type, in which the device is operated.

Method of protection has not influence on function of BZKS20.

05.10 The ground clamp is marked with ground symbol and is placed on right side of device cabinet of BZKS20 from inside. The clamp is freely accessible through assembly opening in the rear panel. Before measurement of the device isolating state by voltage higher than 100V it is necessary disconnect the clamp (because of the inner over-voltage protections).

05.11 IP code is 00 considering open space of backward cover, which is necessary for easy access to terminal boards.

05.12 Electromagnetic compatibility (EMC): BZKS20 is fully compliant with the requirements on immunity to EMC influences according to ČSN EN 50121 - 4 - Railway applications - Electromagnetic compatibility. Part 4: Emission and immunity of the signalling and telecommunications apparatus

## 06. RELIABILITY PARAMETERS

06.01 Mean Time Between Failures: **4 years**

06.02 Mean technical lifetime of BZKS20:  $T_z = 20$  years

06.03 Every new device or repaired part is burned-in in production process in accordance with test and setting instructions Z 72845a.

## 07. FUNCTION DESCRIPTION

07.01 The BZKS20 has modular structure and consists of five boards with different function in maximum configuration.

07.02 **Board of power supply N** is intended to power supply boards of impulse source ZI (ZIP, ZIZ) and safe supervisory circuit of oscillative buses (DKS). It is produced as two types:

- **board N 230V** is powered by AC voltage of 230V (Ds100). The DC stabilized voltages of „+5V“, „+12V“ and „-12V“ related to internal ground are available on the board outputs. Input supply voltage has galvanic separation from board output voltages.

- **board N 24V** is powered by DC nominal voltage of 24V (Ds150). The DC stabilized voltages of „+5V“, „+12V“ and „-12V“ related to internal ground are available on the board outputs. Input supply voltage has galvanic separation from board output voltages.

07.03 **Board of impulse source ZI** (Ds200) is powered by DC voltage of „+5V“ and „+12V“ drawn from the board N. The four contactless non-power DC switches with galvanic separation from the board

electronic circuits are connected on the board output. These contactless switches are controlled by pulsed signals with frequencies of **0,9 Hz**, **1,8 Hz**, **3,6 Hz** and **5,4 Hz**, which are generated by control circuits. Principle of safe generation ensures that the pulsed signals of **0,9 Hz**, **1,8 Hz**, **3,6 Hz** on non-power switches outputs will not speed up in considered faulty states, but the safe deadlock of pulsed signals generation on board outputs will take place at failures of the board control electronics. Output, generating pulsed signal **5,4 Hz** (code of green), is not fail-safe supervised.

**Board of impulse source ZIP** (Ds201) – variant for PZS – generates 40 cycles/min and 59 cycles/min (pulse ratio 1:1). The safe frequency generation principle is also respected here – see previous section **ZI**.

**Board of impulse source ZIZ** (Ds202) – variant **ZI** for oscillative power supply of signalling circuits - is identical by circuit solution with **ZI** (Ds200) however with control frequencies of 0,9 Hz, 1,8 Hz, 3,6 Hz and **ZI**, 8 Hz.

07.04 Power switches of both variants (DC and AC) are placed in switch boards **S1** and **S2** (their number can be extended by **S3** and **S4** in design with extension ) and are controlled direct power signals, brought from power switch sources impulses via so-called terminal board of code selection **SVK** (the terminal board, called "extension switch inputs **VSN**" has this function in extension).

07.05 Every board of power switches is equipped by two direct and two inverse power switches:

- direct switch is open (off-state) without excitation, the dc control signal has to be brought on switch input to close it (on-state).
- inverse switch is closed (on-state) without excitation, the dc control signal has to be brought on switch input to open it (off-state).

07.06 **Boards of power switches** are produced as two types:

- AC (**Ds300**) is able to switch AC currents (čl. **05.01**)
- DC (**Ds400**) is able to switch DC currents (see čl. **05.02**).

07.07 The way of non-power control of the boards **Ds300** and **Ds400** is identical, the differences in construction of power switches are given by different character of switched currents (voltage, frequency).

07.08 Individual switches have control inputs with galvanic separation from power output circuits and switches have mutual galvanic separation.

07.09 Control inputs of switches are in principle connected so that the one input of power switch on first board and one input of power switch on second board are always connected in series, and it is always direct and inverse switch in the following combination:

- **S1-1/S2-3** (first - direct - board S1 and third - inverse - board S2)
- **S1-2/S2-4** (second - direct - board S1 and fourth - inverse - board S2)
- **S1-3/S2-1** (third - inverse - board S1 and first - direct - board S2)
- **S1-4/S2-2** (fourth - inverse - board S1 and second - direct - board S2)

Interconnection of switches is hard-wired on the rear connecting board with connectors and is evident from annexes **P 01.01 ÷ P 01.05**. Use of connecting board **PD** (D 600) is apparently necessary from interconnection of boards switch inputs in case that the only one board of switches (always **S1**) is enough for appropriate application of BZKS20.

07.10 The function of BZKS20 results from scheme depicted in annexes (**P 01.01 ÷ P 01.09**), where the contactless switches are replaced by symbols of contacts of classic electromechanical relay for clearness purposes.

The function of BZKS20 can be simply described like this:

The voltage „**24V ovl.**” is taken from DC source of cooperative interlocking device (recommended variant). If the local situation does not allow this solution, the voltage „**+12V**”, „**-12V**” (related to

internal ground) from board power supply **N**, brought on terminal board **S12**, is used (this solution is recommended in case of using BZKS20 for PZS – the external interference influences are eliminated).

Control voltage „+24V ovl.” is brought on clamp of the terminal board **SVK (X7-02)**. This voltage is then keyed by non-power switches **NSI ÷ NSIV** in the impulse source **ZI** (annex P 01) with frequencies of 0,9 Hz ÷ 5,4 Hz (0,9 Hz, 1,8 Hz, 3,6 Hz, 7,2 Hz, 1,8 Hz, or 0,651 Hz and 0,976 Hz). This way keyed voltages are brought on clamps **X7-03 ÷ X7-06**, from where they are then interconnected through external jumpers on clamps **X7-07 ÷ X7-10** (in accordance with required function of BZKS20) thereby also on the control inputs of power switches of the board **S1 (VS1-1 ÷ VS1-4)**, further then on inputs (connected in series) of power switches of the board **S2 (VS2-1 ÷ VS2-4)**, eventually to the connecting board **PD**. The control circuit of the appropriate couple of contacts is closed on the bus „-24V ovl.”. This way keyed voltages control the power switches (with galvanic separation), which then oscillate with frequency of the appropriate control voltage.

- 07.11 All parallel-connected inputs of boards **S1 ÷ S4** of contactless power switches can be supplied in case of need from one selected output of source **ZI (ZIZ, ZIP)** at code selection. Outputs of impulse source and inputs of contactless power switch boards **S1 ÷ S4** are immune to the destruction by mistaken code choice (e.g. by mistaken parallel connection of impulse source outputs).
- 07.12 **Board of safe supervisory circuit of oscillative buses D** is powered by DC voltage of „+12V” and „-12V”. The board is produced as four types:
- **Dst,st (Ds500)** contains two independent supervisory circuits of AC oscillative bus
  - **Dss,ss (Ds550)** contains two independent supervisory circuits of DC oscillative bus
  - **Dst,ss (Ds570)** contains one independent supervisory circuit of AC and one independent supervisory circuit of DC oscillative bus
  - **Dstn (Ds590)** – this type enables supervise both direct and inverse buses by one supervisory relay, e.g. for signalling circuits of light signals.
- 07.13 Supervisory circuits, in a safe way in terms of requirements for signalling devices, evaluate that the input voltage, brought on input **1** or **2**, oscillates. Presence of oscillative input signal has effect of the „safe” DC voltage generation on appropriate outputs **1** or **2** of supervisory circuit board. This voltage on outputs serves to excitation of inductors of control relays (I. safety class) of NMS type (relay NMS 2- 4000 – with serial inductors is recommended), eventually to excitation of input of other electronic evaluation device.
- Input and output circuits of each independent channel of supervisory circuit have galvanic separation mutually with each other and also between inner electronic circuits of the board of safe supervision of oscillative buses.
- 07.14 If the dc oscillative power supply is supervised, it is necessary to preserve marked polarity on input of supervisory circuit.

## 08. DEVICE OPERATION

- 08.01 Generator BZKS20 is ready to work right after its connection to power supply.
- 08.02 The uninterrupted operation of BZKS20 is possible considering the reliability of used components. It is not therefore necessary to turn it off at the time, when switches are not in operation.

## 09. INSTRUCTIONS FOR INSTALLATION

- 09.01 Activity of BZKS20 function boards is indicated by control LEDs on particular boards.
- 09.02 BZKS20 has not separate outputs for other indication of activity.
- 09.03 In case of need of other indications, some of the switch output is used or the indication can be derived from activity of circuits controlled by particular switches, eventually by relays attached to supervision outputs.
- 09.04 If the variant of BZKS20 with the board of safe supervision of oscillative buses is used, the indication is performed via outputs – see čl.07.13.
- 09.05 The BZKS20 can stand freely on the shelf of universal stand, eventually in other free space, or can be mounted to the standard construction units for electronic devices, depending on its design.
- 09.06 In case of standing on the shelf of universal stand, the BZKS20 occupies one floor of this stand.
- 09.07 It is not necessary to provide any special conditions for cooling of BZKS20 at its operation.
- 09.08 The BZKS20 has not its own internal protection of supply voltage and therefore its protection by external protection elements is recommended.  
In case of use of plug fuses for signalling devices, the fuses of the value **0,5A** are used for the BZKS20 powered by AC voltage of **230V**. The fuses of the value **1,0A** are used for the BZKS20 powered by DC voltage of **24V**.
- 09.09 The polarity of supply voltage must be kept for the BZKS20 powered by DC voltage.
- 09.10 The impulse source outputs may be connected only with input circuits of power switches and that is why its independent protection is not necessary.  
In case of using external DC source for control, this circuit should be protected by independent fuses with the maximum value of **0,5A**.
- 09.11 One impulse source output can control the inputs of all switches, if necessary (i.e. up to 16 switches for variants with fully used extension).
- 09.12 The switches switch the external voltage, which is connected on their outputs with frequency given by connection of appropriate switch input on appropriate bus of impulse source. The circuits of these external voltages must be designed that way the maximum allowed value of current of these switch is not exceeded (čl. **05.04**).
- 09.13 The power switches **must not be connected in parallel** in order to increase the current load of switch above 3,0A.
- 09.14 It does not matter the polarity of output clamps toward switched voltage for power switches st, sti.
- 09.15 The polarity of output clamps of power switches (**X5-01 ÷ X5.08, X6-01 ÷ X6-08**) toward switched voltage is necessary to keep for power switches ss, ssi. The voltage polarity is apparent from annex **P 01**.
- 09.16 Power switches can not be connected to circuits, where there is a change of power supply system during its function (i.e. DC - AC, AC - DC) – e.g. indicating circuits powered by AC voltage, which change over on DC supply from battery after outage of supply net. If such case necessarily occurred, the switch of appropriate type has to be used in every supply system and the switch-over of these buses must be done behind the switches.
- 09.17 The working principle of power switches does not eliminate their use in circuits, where the changes of switched voltage levels can happen, if their values are conformable with parameters, mentioned in chapter 05.

- 09.18 The frequency selection, of what the individual switches will be switched, is done by means of external jumpers on terminal board **X7** (annexes No. **P 01.01** ÷ **P 01.09**), which are designed for specific application of BZKS20.
- 09.19 The BZKS20 is equipped with switch boards in accordance with required variant (the switch placement on position **S1** and **S2**, eventually in extension variant on position **S3** and **S4**). If only one functional board is used (always on first position – **S1**), the connecting board PD must be always used on second position (see čl. **07.09**).
- 09.20 It is necessary to specify the design in accordance with table **T 01 – Summary of variants** in the order of the device.
- 09.21 Dimensions of incoming and protective wires are chosen in accordance with the way of protection and protection types.
- 09.22 Maximum cross-section of wires brought on connectors of terminal boards is 1,5 mm<sup>2</sup>.
- 09.23 Protective wire is finished with faston connector of 6,3, slipped over the protective clamp with flat-pin plug.
- 09.24 In text, the term „input of power switches" means the clamp of terminal board **X7**, on which the control signal of selected frequency, taken from the appropriate bus ZI (ZIP, ZIZ), is connected. The term „output of power switches" means the clamp of terminal boards **X5** and **X6**, the controlled voltage is connected on.
- 09.25 It is recommended that the inputs of power switches at all variants of BZKS20 were powered from external power source of 24V DC (**+24 V ovl.**, **-24 V ovl.**). If this voltage is not available at variant with power supply of **230V AC**, then the voltage of **24V DC** is obtained from the power supply board and is brought-out on terminal board clamps **X12** (**+12 V**, **-12 V** related to internal ground) (see annex **P 01.04**). This internal voltage is recommended to be used at variants of BZKS20 for PZS.
- 09.26 While using the BZKS20 for power supply of signals or PZS (230V AC) is necessary to load the switch outputs (inputs of supervision board **Dstn**) with resistors of 10k/10W (see annex P 01.06 and P01.07) in order to create the load for the correct function of supervision board solid-state switches in time, when no electrical loading is connected at the moment of switching-over.
- These resistors are, for variants with **Dstn**, directly part of product delivery as a configuration 72845 Ds755 – the board with resistors, which is designed with fixing angle piece for mounting from behind the relay on the panel of free coupling.
- 09.27 BZKS20 is supplied as complete, certified and burned-in product in harmony with the order. The enclosed vehicles must be used for transport of product.
- 09.28 Certification of product quality and completeness, Technical description, instructions for installation and maintenance T 72 845 and installation drawing is supplied with every product.
- 09.29 The labelling (title) of product, drawing number and number of pcs. has to be specified in the order – see čl. **02.18** ÷ **02.21**.
- 09.30 Summary of equipment and outlets of terminal boards of generator BZKS20.

**X5, X6 – Switch S1, S2****(X15, X16 – Switch S3, S4 - only variants with extension)**

	Switch st	Switch ss
<b>Sv9</b>	empty	empty
<b>Sv8</b>	1 ← (In)	1 In +
<b>Sv7</b>	1 → (Out)	1 Out +
<b>Sv6</b>	2 ← (In)	2 In +
<b>Sv5</b>	2 → (Out)	2 Out +
<b>Sv4</b>	3 ← (In)	3 In +
<b>Sv3</b>	3 → (Out)	3 Out +
<b>Sv2</b>	4 ← (In)	4 In +
<b>Sv1</b>	4 → (Out)	4 Out +

**X8 – Power supply of 230 V AC**

<b>Sv3</b>	<b>N</b>
<b>Sv2</b>	<b>PE</b>
<b>Sv1</b>	<b>L</b>

**X12 – Internal voltage of 24 V DC (related to internal ground)**

<b>Sv2</b>	<b>+12 V</b>
<b>Sv1</b>	<b>-12 V</b>

**X13 – Power supply of 24 V DC**

<b>Sv2</b>	<b>-</b>
<b>Sv1</b>	<b>+</b>

**X7 – Code selection terminal board SVK**

Impulse source type		ZI	ZIZ	ZIP
<b>Sv10</b>	<b>N4</b>	In S1-4 + In S2-2		
<b>Sv9</b>	<b>N3</b>	In S1-3 + In S2-1		
<b>Sv8</b>	<b>N2</b>	In S1-2 + In S2-4		
<b>Sv7</b>	<b>N1</b>	In S1-1 + In S2-3		
<b>Sv6</b>	<b>B1</b>	Out 0,9 Hz	Out 0,9 Hz	no signal
<b>Sv5</b>	<b>B2</b>	Out 1,8 Hz	Out 1,8 Hz	no signal
<b>Sv4</b>	<b>B3</b>	Out 3,6 Hz	Out 3,6 Hz	Out 0,651 Hz
<b>Sv3</b>	<b>B4</b>	Out 5,4 Hz	Out Z1,8 Hz	Out 0,976 Hz
<b>Sv2</b>	<b>+24 V ovl</b>	External or internal power supply of code selection		
<b>Sv1</b>	<b>-24 V ovl</b>	External or internal power supply of code selection		

**X11 – Supervision of oscillative buses DKS**

	<b>Dst,st</b> (Ds500)	<b>Dss,ss</b> (Ds550)	<b>Dst,ss</b> (Ds570)	<b>Dstn,ss</b> (Ds580)	<b>Dstn,stn</b> (Ds590)
<b>Sv9</b>		Out 1 +		Out 1 +	Out 1 +
<b>Sv8</b>		Out 1 –		In 1 c	In 1 c
<b>Sv7</b>		Out 2 +		Out 2 +	Out 2 +
<b>Sv6</b>		Out 2 –		Out 2 –	In 2 c
<b>Sv5</b>	empty				
<b>Sv4</b>	In 2 b	In 2 –	In 2 –	In 2 –	In 2 b
<b>Sv3</b>	In 2 a	In 2 +	In 2 +	In 2 +	In 2 a
<b>Sv2</b>	In 1 b	In 1 –	In 1 b	In 1 b	In 1 b
<b>Sv1</b>	In 1 a	In 1 +	In 1 a	In 1 a	In 1 a

**X14 – Inputs of switches in extension VSN (only variants with extension)**

<b>Sv5</b>	<b>N4</b>	In S3-4 + In S4-2
<b>Sv4</b>	<b>N3</b>	In S3-3 + In S4-1
<b>Sv3</b>	<b>N2</b>	In S3-2 + In S4-4
<b>Sv2</b>	<b>N1</b>	In S3-1 + In S4-3
<b>Sv1</b>	<b>-24 V ovl</b>	External or internal power supply of code selection in extension

**X20 – Supervision power supply D2 (only variants with extension for supervision board)  
(interconnect with X12)**

<b>Sv2</b>	+12 V
<b>Sv1</b>	-12 V

**X21 – Supervision of oscillative buses DKS D2**

	<b>Dss,ss (Ds550)</b>
<b>Sv9</b>	Out 3 +
<b>Sv8</b>	Out 3 –
<b>Sv7</b>	Out 4 +
<b>Sv6</b>	Out 4 –
<b>Sv5</b>	
<b>Sv4</b>	In 4 –
<b>Sv3</b>	In 4 +
<b>Sv2</b>	In 3 –
<b>Sv1</b>	In 3 +

These terminal connectors (CUF type) serve for all functional, supply and working wires and for creation of suitable interconnections.

**10. BZKS20 DOCUMENTATION**

## 10.01 Technical documentation of BZKS20:

- a) Technical conditions TP 72 845

b) Instructions for designing	P 72 845
c) Technical description, instructions for installation and maintenance	T 72 845
d) Test and setting instructions	Z 72 845

10.02 The producer will supply documentation (on request) according to point 11.01.a ÷ c.

10.03 The documentation in accordance with point 11.01.d is intended only for producer and its service.

10.04 The part of delivery of each BZKS20 is also "Technical description, instructions for installation and maintenance T72845"

We ask users for kind sending of their suggestions to the function of product and instructions. Suggestions will used for production of next BZKS20 series or eventually for incorporation to the next publication of instructions or revisory sheets.

**These „Instructions for designing" are an intellectual property of the producer and any copying and distribution of it for commercial use is prohibited by law. The producer takes no responsibility for any harms, due to copy of instructions propagation.**

## 11. ANNEX

- **T1 Summary of BZKS20 generator variants and their usage - 18.12.2004**  
**T2 List of the BZKS20 spare parts**
- **Figure annexes P 01.01 ÷ 01.11, P 02 a ÷ j, P 03**
- **Table – replacements of EK1 encoder (No.72835) by BZKS20 generator of oscillative signals**  
**- replacements of electronic oscillator EKM1 (No. 71945) by BZKS20 generator of oscillative signals**