



Signal Mont s.r.o.
Kydlinovská 1300
HRADEC KRÁLOVÉ

Technical description, instructions for installation and maintenance

SAFE GENERATOR OF OSCILATING SIGNALS - BZKS20

T 72 845

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1. Introduction

Safe generator of oscillating signals - BZKS20 (No. 72 845) is fundamental schematic, constructional and technological innovation of electronic encoder EK-1, which was made since 1984 as a substitute for original electromechanical encoders and also as innovation of electronic oscillator EKM (No. 71 945) (slow and fast oscillation of 0,9 Hz and 1,8 Hz with safe supervision of direct and backward bus is possible). The safe generator of oscillating signals BZKS20 is then primarily intended (likewise as above - mentioned encoders) for safe generation of oscillating signals of 0,9 Hz, 1,8 Hz, 3,6 Hz and 5,4 Hz (frequency 5,4 Hz isn't safely supervised), used for additional encoding of track circuits with LVZ code.

Improved and extensive functional characteristics of BZKS20 make it possible to use also in other applications of railway signalling devices, where the electronic encoder EK-1 or EKM wasn't possible to use till now. By means of BZKS20 with variant source of impulses, called ZIP, it is possible e.g. to switch contactlessly light bulbs of the positive PZS signal with frequency of 40 cycles/min and the road warning PZS signal with frequency 59 of cycles/min. Both functions are realized with the safe oscillation supervision. If it is necessary to switch more road warning signal lights than is maximum capacity of contacts on two boards of them, the number of contacts can be extended variably with extension (72 845 Ds1 . .) to double it (see annex T1 – summary of variants).

When use more (3 to 4) boards of contacts (basic cabinet is only for 2 boards of contacts) the basic cabinet can be extended by extension on the left side.

In case of source of impulses failure the generator BZKS20 will cease generation of impulses and contacts will stay in normal position that is the direct contact stay open and inverse contact stay closed.

The BZKS20 with board of safe supervision makes it possible to also realize power oscillating buses of 0,9 Hz and 1,8 Hz for signalling and indicating circuits of interlocking devices (the supervision board **D_{stn, stn}**, which makes possible the supervision of holding bus as well, is part of the solution in this case) and also directly encode track circuit from supply end without using contacts, called TYS (it is however necessary always to use TYS - safe switch for encoding from relay end).

Construction of BZKS20 makes it possible its placement either separately on shelf (design with rubber nibs) or its mounting to the 19" frame (panel) for electronics.

If there is a need to build in the BZKS20 to the relay element panel of the free coupling at reconstructions, the generator will be placed to the panel of free coupling by the help of separately ordered shelf, which for basic version takes place of two NMS relay – the shelf Ds750, for variants with extension takes place of three NMS relay – the shelf Ds751.

Other possible variants, solving occurred operational needs can be arranged with manufacturer.

2. Technical description of generator BZKS20

The new mechanical design of BZKS20 generator is formed by cabinet from Al profile (formed by special profile with inner guidance of PCBs) and closed by conductively interconnected front and rear panel.

The front panel is equipped with slides for good visibility of the monitoring LED diodes in place of the inserted PCBs. The rear panel, on which the connecting board with connectors is fixed from inside, is equipped with rectangular opening for easy access to terminals. This opening is sufficient for removal of the connector for its repair. The front and rear panel are, in case of using extension cabinet, prolonged on total width of it.

BZKS20 generator is, by default, equipped with one impulse source board **ZI (ZIP, ZIZ)** and one board of power supply **N (N_{230V} or N_{24V})**.

The following variants of impulse sources are produced:

ZI - with standard frequencies of 0,9 Hz; 1,8 Hz; 3,6 Hz; 5,4 Hz for encoding of ATP

ZIP - 0,651 Hz and 0,976 Hz for oscillating power supply of road warning lights of PZS

ZIZ 0,9 Hz; 1,8 Hz; 3,6 Hz; Z1,8 Hz for oscillating power supply of signals.

The Z1,8 Hz output is delayed by 10 m towards output 1,8 Hz for elimination of undesirable glimmer in signal lights circuit.

The generator is equipped with maximum two boards (position **S1** and **S2**) output switches **S** (variants with extension have the number of switches extended as far as on double, i.e. on positions **S1** - **S4**), which can be occupied alternatively in accordance with concrete requirements. Every switch board includes four switches.

The following variants of output switch boards are produced:

The switch board Sst (D 300) - contains **two direct - st** (closing) and **two inverse - sti** (opening) switches of alternating current

The switch board Sss (D 400) - contains **two direct - ss** (closing) and **two inverse - ssi** (opening) switches of direct current

In case that the only one board of switches is sufficient - it will occupy always the position **S1** and the position **S2** always will be used for connecting board **PD (Ds600)** containing jumpers, replacing input circuits of missing switch board **S2**.

The generator can be also equipped with the safe supervisory circuit board **D** for supervision of max. two oscillating buses and these variants are possible: **D_{st,st}** (the board equipped with circuit **D_{st}, D_{st}**), **D_{ss,ss}** (the board equipped with circuit **D_{ss}, D_{ss}**) or **D_{st,ss}** (the board equipped with circuit **D_{st}, D_{ss}**). For monitoring of oscillating power supply of signal circuits there is the supervision **D_{stn,stn}** (the board equipped with circuit **D_{stn}, D_{stn}**) with three-terminal input for full supervision (i.e. also of holding bus) of slow and fast oscillation and **D_{stn,ss}** (the board equipped with circuit **D_{stn}, D_{ss}**). Power supply of the generator is performed by mains 230V AC or from the battery 24V DC, via independent connectors, whose mutual position and interface eliminate wrong use towards the power supply board.

3. Technical parameters of generator BZKS20

Power supply: AC	– nominal voltage	... 230 V AC
	– voltage tolerance	... 180 V ÷ 255 V
	– nominal frequency	... 50 Hz ÷ 75 Hz
	– maximum power consumption	... 10 VA
DC	– nominal voltage	... 24 V DC
	– voltage tolerance	... 20 V ÷ 36 V
	– maximum power consumption	... 10 W

Output: Output frequency for:

Encoding of VZ	... 0,9 Hz; 1,8 Hz; 3,6 Hz; 5,4 Hz
PZS	... 0,651 Hz a 0,976 Hz (40 oscillations/min and 59 oscillations/min)
oscillating driving of signals	... 0,9 Hz; 1,8 Hz; 3,6 Hz; Z1,8 Hz
Operational tolerance	... ±1 %
Secured tolerance	... ±15 % - outputs 0,651 ÷ 3,6 Hz (5,4 Hz is not fail-safe supervised)
Nominal 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).

Switch parameters:

AC switch	– max. voltage	... $U_{ef} = 255 \text{ V AC}$
	– max. current	... $I_{ef} = 3 \text{ A}$
	– max. voltage drop when closed (on-state)	... 3 V AC
	– nominal frequency	... 50 Hz - 275 Hz
DC switch	– max. voltage	... 40 V DC
	– max. current	... 3 A
	– max. voltage drop when closed (on-state)	... 1,8 V DC

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

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 / 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

Supervisory circuit of oscillating buses (**D**)

Input – AC:	max. 255 V_{ef} AC , nominal frequency of 50 Hz - 275 Hz
	– DC: max. 35 V DC
	– nominal frequency of supervised oscillating buses 0,651 Hz - 1,8 Hz
Output – output voltage (with load resistor of 4 kΩ) and with frequency of supervised bus	- in tolerance 22 V ±2 V DC
	- out of tolerance less than 2 V DC

- NMŠ 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.

Operational parameters:

Operational temperature range	–	-25 °C ÷ +70 °C
Maximum relative air humidity (at 20 °C)	–	95 %
Mean Time Between Failures	–	4 years
Mean technical lifetime	–	20 years
Device fulfils EMC requirements in compliance with ČSN EN 50121 – 4.		
Dimensions	basic variant (w x h x d)	... 165 mm x 115 mm x 226 mm
	variant with extension	... 247 mm x 115 mm x 226 mm
Weight	– basic variant (fully occupied) –	2,87 kg, with extension – 4,1 kg
IP code	00 (open space of backward cover – access to terminal boards)	

4. Description of function and technical features of generator BZKS20

The safe generator of oscillative signals **BZKS20** No.72 845 - further only "generator" - has modular construction and in maximum configuration is equipped by five (up to seven in variants for PZS with extension) PCB boards with different functions –

- **Board of impulse sources**

(ZI) Ds200 – is powered by dc voltage +5 V and +12 V. The four contactless non-power dc switches with galvanic separation from board electronic circuits are placed on board output. These contactless switches are controlled by pulsed signals, which are safely generated control circuit with frequencies of **0,9 Hz; 1,8 Hz; 3,6 Hz and 5,4 Hz**. Principle of safe generation ensures that the pulsed signals on switch outputs of **0,9 Hz; 1,8 Hz; 3,6 Hz** no will not speed up in all considered faulty states, but the safe lock-out of generation of pulsed signals on the board outputs will take place at failures of the board control electronics. The output, generating pulsed signal **5,4 Hz** (code of green), is not fail-safe supervised.

(ZIP) Ds201 – the application is intended for PZS. There is generation of frequency for positive signal - 40 cycles/min and for the red lights of the road warning signals, or also for the electromechanical bells - 59 cycles/min. The principle of safe generation is also respected – see above.

(ZIZ) Ds202 – the application is intended for SZZ, where the slow and fast oscillation of signal lights is used, when the pulsed signals of frequency 1,8 Hz on output from SVK - B4 are delayed compared with output from SVK - B2 - **Z 1,8 Hz** (the parasitic micro-glimmers of signal light bulbs are prevented).

- **Board of switches (direct and inverse switches SP/SI)** – is designed as two types:

DC variant **ss** - DC (dc switch **S_{ss}** – **Ds400**) – includes two power contactless switches of direct current and their outputs are open in normal state; they can be brought to the closed state by fetch of dc control signal on switch input (pair of direct switches **SP**). Second pair of direct power switch on board (pair of inverse switches **SI**) has outputs closed in normal state. They can be brought to the opened state by fetch of dc control signal on switch input. Individual switches have galvanic separation of control inputs from power output circuit and switches have galvanic separation mutually between each other. The direct switches stay open and inverse switches closed in normal state (e.g. failure of impulse source).

AC variant **st** - AC (ac switch **S_{st}** – **Ds300**) board of switches is schematically solved similarly with pair of power direct and inverse switches, but enables to switch the alternating current in range of nominal frequencies of sinusoidal or rectangular shape. The way of ac switch control by direct input signal is identical as with board of direct switches. The direct switches stay open and inverse switches closed in normal state (e.g. failure of impulse source).

Board of direct and inverse switches how in his dc, so in ac variant does not require for his function auxiliary dc supply voltage, hence also without power supply will direct switch opened and inverse closed.

The two boards of contactless switches (position **S1** and **S2**) can be equipped on the whole by four direct and four inverse switches in the BZKS20 (the number of switches is extended to double for PZS variants). Boards of dc and ac switches can be mutually combined (see table of BZKS20 variants). Control inputs of board pair of direct and inverse switches are mutually interconnected into series (see block diagram – point 7).

Direct and inverse switches on switch boards **S1**, **S2** are then in accordance with the above described algorithm controlled, by common control signal, always in pair of direct/inverse switch. In case that the only one switch board **S** is sufficient in particular application, then it will occupy the position **S1** and the connecting board **PD**, for connection of control signals of unequipped input circuits of switches **S**, will always occupy the position of the board **S2** (see annex **T01 Summary of variants**).

Selection of controlling pulsed signals for required code of pair of one direct and one inverse switch is drawn on terminal board of code selection **SVK block diagram**. The voltage of 24V DC is connected on clamps **-24 V ovl** and **+24 V ovl** on terminal board **SVK** from either external source of consecutive technology (this solution is preferred!) or internal voltage, which is available on terminal board **X12** (this solution is recommended in case of using BZKS20 for PZS – the external interference influences are eliminated). The outputs of switches, which switch and open in rhythm of selected code, are activated by interconnection of selected outputs of impulse source **ZI** - outputs B1 - 0,9 Hz, B2 - 1,8 Hz, B3 - 3,6 Hz and B4 - 5,4 Hz (**ZIP** – output B3 – 0,65 Hz, B4 – 0,98 Hz, **ZIZ** output B1 - 0,9 Hz, B2 - 1,8 Hz, B3 - 3,6 Hz and B4 – Z1,8 Hz) with input of switch pair (direct and inverse) **N1÷N4**. The direct switch **1** on board **S1** is closed and inverse switch **3** on switch board **S2** is opened, when the signal is connected on clamp **N1** of terminal board **SVK**. The direct switch **2** on board **S1** is closed and inverse switch **4** on switch board **S2** is opened, when the signal is connected on clamp **N2** of terminal board **SVK**. The direct switch **1** on board **S2** is closed and inverse switch **3** on switch board **S1** is opened, when the signal is connected on clamp **N3** of terminal board **SVK**. The direct switch **2** on board **S2** is closed and inverse switch **4** on switch board **S1** is opened, when the signal is connected on clamp **N4** of terminal board **SVK**.

As an example of selection can be given the connection of output 0,9 Hz (**B1**) on terminal board **SVK** with input **1/3** (**N1**), output 1,8 Hz (**B2**) with input **2/4** (**N2**) and output 3,6 Hz (**B3**) with inputs **3/1** and **4/2** (i.e. **N3** and **N4**). The switch output **1** on board **S1** and switch **3** on board **S2** in rhythm of code 0,9 Hz, switch output **2** on board **S1** and switch **4** on board **S2** in rhythm of code 1,8 Hz and switch outputs **3, 4** on board **S1** and **1, 2** on board **S2** in rhythm code 3,6 Hz are activated at this selection. The switches **1** and **2** are direct and switches **3** and **4** are inverse.

The one selected impulse source output can supply, at code selection, all parallel-connected inputs of contactless switch boards **S1** and **S2** – i.e. 4 direct and 4 inverse switches and all parallel-connected inputs of contactless switch boards **S1 - S4** (i.e. 8 direct and 8 inverse switches) in case of the BZKS20 with extension. Outputs sources impulses and inputs boards **S** contactless switch are immune against destruction at mistaken selection code (e.g. at mistaken parallel connection output sources impulses). Outputs of impulse source and inputs of contactless power switch board **S** are immune to the destruction by mistaken code choice (e.g. by mistaken parallel connection of impulse source outputs).

The entire previous description is explained in detail on block diagram – point 7.

- **board of supervisory circuit of oscillative buses D** ($D_{st,st} - Ds500$, $D_{ss,ss} - Ds550$, $D_{st,ss} - Ds570$, $D_{stn,ss} - Ds580$, $D_{stn,stn} - Ds590$) is powered by dc voltage of +12 V and -12 V (related to internal ground). The five variants of the board exist:
 - $D_{st,st}$ in variant st,st contains two independent supervisory circuits of AC oscillative bus
 - $D_{ss,ss}$ in variant ss,ss contains two independent supervisory circuits of DC oscillative bus
 - $D_{st,ss}$ in variant st,ss with one supervisory circuit of AC oscillative bus and second supervisory circuit of DC oscillative bus
 - $D_{stn,ss}$ in variant stn,ss with one three-input supervisory circuit of AC oscillative bus and one independent supervisory circuit of DC oscillative bus
 - $D_{stn,stn}$ in variant stn,stn with two three-input supervisory circuits for slow and fast bus including backward bus, every supervision has one output relay.

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 **1** or **2** serves to excitation of inductors (connected in series) of control relay (I. safety class) (relay NMS 2- 4000 – with serial inductors is recommended).

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 supervisory circuits.

- **board of power supply N** ($N_{230V} - Ds100$, $N_{24V} - Ds150$) – is intended for power supply of boards of electronics of the BZKS20. Two variants of board are produced:
 - $N_{230V} - Ds100$ - the board is powered by AC voltage of 230V AC. The DC stabilized voltages of +5V, +12V and -12V (related to internal ground) are to disposal on the board outputs. The input supply voltage has the galvanic separation from the board output voltages.
 - $N_{24V} - Ds150$ - the board is powered by nominal voltage of 24 V DC. The same stabilized voltages, as for the previous board, are to disposal on the board outputs. The input supply voltage has again the galvanic separation from the board output voltages.

5. Installation scheme of generator BZKS20 – rear view of connection block

The equipment of given variant is content of particular "General assembly drawing", which is attached at the device expedition. It was processed for these groups of variants:

M72845a – Ds1÷Ds20 (Ds31÷Ds50)	BZKS20 - Variants of basic design
M72845b – Ds24 (Ds54)	BZKS20 - Variants for PZS ac
M72845c – Ds25 (Ds55), Ds30 (Ds60)	BZKS20 - Variants for PZS dc
M72845d – Ds21÷Ds23 (Ds51÷Ds53), Ds26÷Ds28 (Ds56÷Ds58)	BZKS20 - Variants for power supply of light signals
M72845e – Ds124 (Ds154), Ds129 (Ds159)	BZKS20 - Variants for PZS with extension
M72845f – Ds66 (Ds76), Ds86 (Ds96)	BZKS20 - Variants for power supply of light signals and dc oscillation (power supply of indicating circuits)
M72845g – Ds126÷Ds128 (Ds156÷Ds158), Ds131÷Ds133 (Ds161÷Ds163)	BZKS20 - Variants for PZS (dc power supply of road warning signals, ac power supply of level crossing signals) with extension

M72845h – Ds61 (Ds71), Ds62 (Ds72) BZKS20 - Variants for PZS (dc power supply of road warning signals, ac power supply of level crossing signals)

M72845i – Ds148 (Ds198), Ds149 (Ds199) BZKS20 - Variants for substitution of EKM1 No. 71945 Ds11 (Ds1)

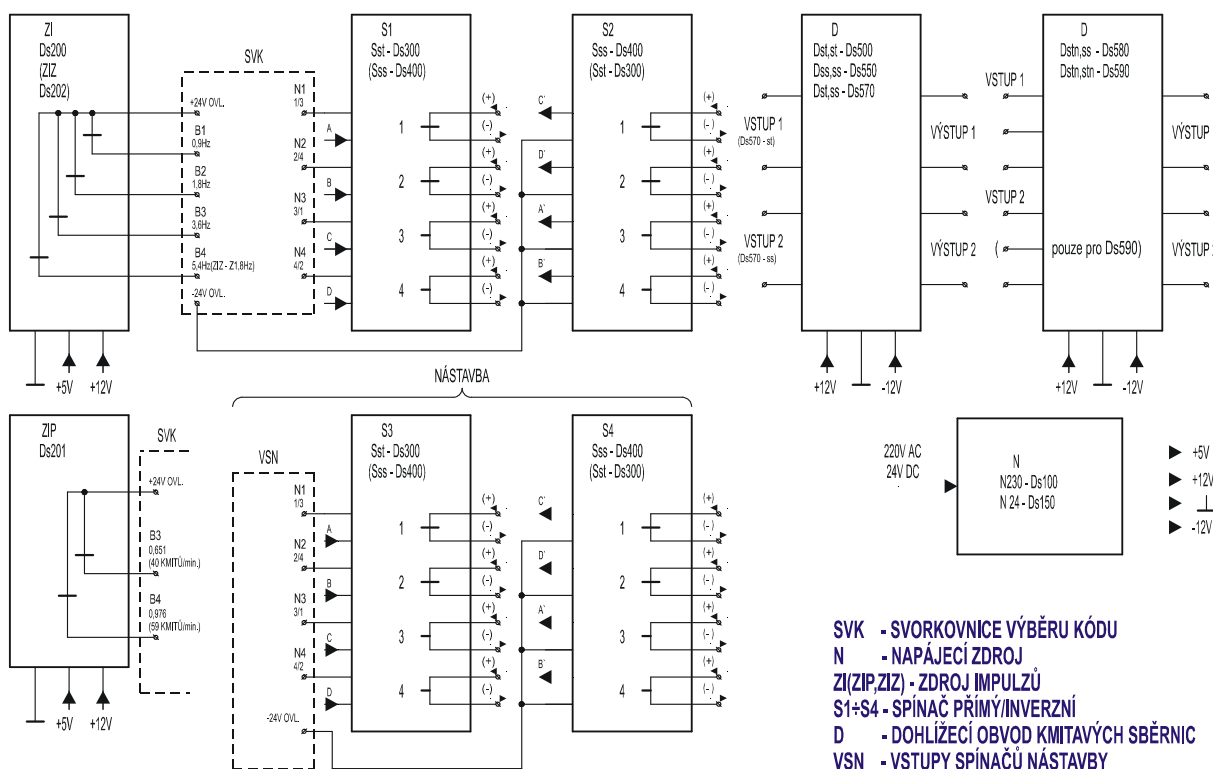
M72845j – Ds125 (Ds155), Ds130 (Ds160) BZKS20 - Variants for PZS with extension

6. Setting of operating conditions of STD (specified technical device)

All working states are indicated on front panel, the schematic solution prevents in advance dangerous states by internal checking circuits (e.g. change of frequency etc.). That is why, the periodic verification of functional parameters need not to be carried out. The measurement of insulating condition is advised in order to verify and evaluate the operational qualification at technical inspection and examination - it is measured among live parts and frame of the device cabinet by DC voltage of 500V. **It is however necessary disconnect the guard wire from ground terminal at measurement.**

If the measured value of insulating resistance, read 1 min after application of voltage, is **minimally 10 MΩ** (see chapter 3. Technical characteristics of BZKS20 of this technical description) the **product is qualified for operation.**

7. Universal functional block scheme of generator BZKS20



Legend: Switch S1, S2

Switch S3, S4 – variants for PZS with extension

Code selection terminal board SVK

terminal board X5, X6

X15, X16

X7

Power supply of 230 V _{ac} N	X8
Power supply of 24 V _{dc} N	X13
Oscillative buses supervision D	X11
Internal voltage 24 V _{dc} (+12 V, -12 V towards internal ground)	X12
Inputs of extension switches VSN	X14

8. Instructions for installation of generator BZKS20

The BZKS20 in variants **Ds1 ÷ Ds30** (Ds66, Ds86, Ds124 ÷ Ds130) with nibs freely stands on non-flammable pad and without fixing. The BZKS20 variants, mounted to the standard relay element panel of free coupling at reconstructions of signalling devices, are placed on the shelf Ds750 (No.72 845) (width of 2 NMS type relays is occupied in basic version) or shelf Ds751 (No.72 845) (width of 3 relays is occupied in 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.

The BZKS20, in variants **Ds31 ÷ Ds60** (Ds76, Ds96, Ds154 ÷ Ds160) without nibs, is fixed by means of extended front panel to the frame for electronics. The basic version is intended to the cabinet for electronics of Schroff system with fastening holes for M3 screws. The fastening holes have to be redrilled for M4 screws for use in the system ALMES. "Support for BZKS to the container" D736 (No. 72 845) is used for position fixation in both cases.

While using the BZKS20 for power supply of signals or PZS (230V AC) is necessary to load the switch outputs (inputs of three-input supervision boards **D_{stn,stn}** and **D_{stn,ss}**) with resistors of 10k/10W 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 **D_{stn,stn}** and **D_{stn,ss}**, directly part of the board with resistors Ds755 (72845) or it can be ordered as spare part. This board is designed with fixing angle piece for mounting from behind the relay on the panel of free coupling.

Certification of product quality and completeness, Technical description, instructions for installation and maintenance T 72 845, certificate of warranty and installation drawing of board connections is supplied with every product of BZKS20.

Summary of equipment and outlets of terminal boards of generator BZKS20

(It is graphically well-arranged to every particular device delivery on enclosed assembly drawing M 72 845a÷f)

X5, X6 – Switch S1, S2

(X15, X16 – Switch S3, S4 - only variants with extension)

	Switch st	Switch ss
Sv9	empty	empty
Sv8	1 ← (In)	1 In +
Sv7	1 → (Out)	1 Out +
Sv6	2 ← (In)	2 In +
Sv5	2 → (Out)	2 Out +
Sv4	3 ← (In)	3 In +
Sv3	3 → (Out)	3 Out +

Sv2	4 ← (In)	4 In +
Sv1	4 → (Out)	4 Out+

X7 – Code selection terminal board SVK

Impulse source type		ZI	ZIZ	ZIP (pro PZS)
Sv10	N4	In S1-4 + In S2-2		
Sv9	N3	In S1-3 + In S2-1		
Sv8	N2	In S1-2 + In S2-4		
Sv7	N1	In S1-1 + In S2-3		
Sv6	B1	Out 0,9 Hz	Out 0,9 Hz	no signal
Sv5	B2	Out 1,8 Hz	Out 1,8 Hz	no signal
Sv4	B3	Out 3,6 Hz	Out 3,6 Hz	Out 0,651 Hz (40 cycles/min)
Sv3	B4	Out 5,4 Hz	Out Z (zpoždění) 1,8 Hz	Out 0,976 Hz (59 cycles/min)
Sv2	+24 V ovl	External or internal power supply of code selection		
Sv1	-24 V ovl	External or internal power supply of code selection		

X8 – Power supply of 230 V AC

Sv3	N
Sv2	PE
Sv1	L

X11 – Supervision of oscillative buses DKS

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

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

Sv2	+12 V
Sv1	-12 V

X13 – Power supply of 24 V DC

Sv2	-
Sv1	+

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

Sv5	N4	In S3-4 + In S4-2
Sv4	N3	In S3-3 + In S4-1
Sv3	N2	In S3-2 + In S4-4
Sv2	N1	In S3-1 + In S4-3
Sv1	-24 V ovl	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)**

Sv2	+12 V
Sv1	-12 V

X21 – Supervision of oscillative buses DKS D2 (only variants with extension for supervision board)

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

These seven (or twelve in variants with extension) terminal connectors (**CUF** type) serve for all functional, supply and working wires and for the creation of suitable interconnections:

- **X5** belongs to the first board of power switches (**S1**), has eight occupied functional clamps and one vacant. The outputs of power switch board **S1** are connected on connector
- **X6** belongs to the first board of power switches (**S2**), has eight occupied functional clamps and one vacant. The outputs of power switch board **S2** are connected on connector
- **X7** has function of so-called terminal board of code selection (**SVK**). The ten clamps is occupied:

The inputs of power switches of boards **S1** (N1 ÷ N4) are brought on clamps **07 ÷ 10**

The inputs of non-power switches of impulse source (B1 ÷ B4) are brought on clamps **03 ÷ 06**

Clamp **02** is intended for connection of control voltage of **+24 V DC ovl.**

The second pole of control voltage of **-24 V DC ovl.** is connected on clamp **01** and is internally interconnected with inputs of power switch board **S2**

- **X8** belongs to supply of **N230Vstř** (Ds100) – it has three fully occupied clamps (**L, N, PE**). This connector is not functional in BZKS20 variant powered by dc voltage of 24V.
- **X10** is soldering point, interconnected with so-called internal ground. It is connected with protective clamp on the device cabinet by faston connector. This connection has to be interrupted in case of measurement of insulating state of the stand (fault location) at measurement with voltage higher than 100V.
- **X11** belongs to board of safe supervisory circuit of oscillative buses (DKS), it has nine clamps:
 - Clamp 01 ÷ 04** – checked voltage from oscillative bus of powered device is connected on clips (if the oscillation of dc buses is checked, the polarity „ plus" must be kept on clamps 01, 03, and the polarity „ minus" on clamps 02, 04. The polarity does not matter for ac supply buses.)
 - Clamp 06 ÷ 09** – for Ds500 ÷ Ds570: the output voltage for external evaluation circuit is taken from these clamps. If oscillation is OK, the voltage is present.
 - for Ds580: **cl.6+7** output for check relay of supervision of **ss**, **cl.8** as third input supervision of **stn**, **cl.9** output for check relay of **stn**.
 - for Ds590 (three-wired input): **cl.6+8** as third input, **cl.7+9** outputs for check relay.
 - Clamp 05** – empty.
- **X12** has two occupied clamps, on which the internal voltage **+12 V DC, -12 V DC** (toward internal ground) is connected from supply **N**. This voltage can be used as control voltage in inevitable cases, connected on **SVK** (see čl. 07.10, 10.21).
- **X13** belongs to supply **N24Vss** (Ds150), has two occupied clamps. This connector is not functional in BZKS20 variant powered by AC voltage of 230V.
- **X14** has function of input terminal board of switch driving - in extension.

The pole of control voltage of **-24V DC ovl** is connected on clamp 01 and it is internally interconnected with inputs of power switches of boards **S3** and **S4**

The inputs of power switches of boards **S3** and **S4** (**N1 ÷ N4**) are connected on clips **02 ÷ 05**
- **X15** belongs to power switch board **S3** (in extension) and has eight used functional clamps and one empty. The outputs of power switch board **S3** are connected on the connector.
- **X16** belongs to power switch board **S4** (in extension) and has eight used functional clamps and one empty. The outputs of power switch board **S4** are connected on the connector.
- **X20** Power supply of supervision **D2** (only variants with extension for board of supervision) - to interconnect with **X12**
- **X21** belongs to board of safe supervisory circuit of oscillative buses (DKS) in extension variant for the second supervision board **D2**

At installation, all the external connections must be made by Cu stranded wires including protective and supply wires.

To making inner connections on terminal board **X7 – SVK** (connection of impulse source outputs and inputs of power switches) is advised to use wire with cross-section of 0,5 mm².

Maximum two wires with cross-section of 0,5 mm² can be connected to the connector clamps in case of multiplexes created on switch inputs.

The colours of incoming wires are selected according to the appropriate standards and regulations.

All incoming wires are mounted to the connectors of **CUF** type (they are part of the BZKS20 delivery), which are fitted on the counterparts (connectors of **CUM** type), soldered in the

connecting board of the rear panel. The demountable but reliable connection of all incoming wires and interconnections is assured by this implementation. All connectors have marked numbering of clamps and are clearly marked according to enclosed assembly drawing with the purpose of no substitution by mistake.

The connectors can be switched over at disassembly (when sending to the customer service) of the BZKS20 with extension (connector from VSN can be pulled through).

!!! The BZKS20 must be by means of protective clamp connected on protective system of installation, whose is the part of, before connection of all incoming wires of supply and controlled voltage!!!

!!! The ground terminal X10 have to disconnected at measurement of insulating state of other connected devices by voltage higher than 100V!!!

The voltage regulation on light bulbs of road warning signal has to be carried out when using the BZKS20 for power supply of road warning signals of PZS. It is convenient to stop function of switches during measurement to measure out full (uninterrupted) voltage on light bulb. The measurement has to be carried out on outputs of both direct and inverse switches:

- that can be achieved by fetch of oscillative driving voltage on direct switch inputs. It can be ensured in practice e.g. by means of the connector SVK for measurement Ds771(No. 72 845), by which the terminal boards **X12** and **X7** (SVK) are interconnected after removal of existing connectors. For generator with extension, it is ensured by means of the connector VSN for measurement Ds772 (No. 72 845), by which the terminal boards **X12**, **X7** (SVK) and **X14** (VSN) are interconnected after removal of existing connectors. Connectors for measurement can be obtained from producer on special order. The voltage of 24V DC from terminal board **X12** i.e. +12V, -12V related to internal ground is connected to all on inputs N1 ÷ N4 by means of measuring connectors. (The name connector Ds771 and Ds772 (No. 72 845, 72 845) means the system of two or three connectors, which are interconnected by two-wire connection and the functional jumpers are created on every appropriate counterpart of SVK and VSN.)
- the situation is simpler for inverse switches, because they are closed without input driving signal. It means in practise that they will be permanently closed, if the connectors **X7** (SVK) and **X14** (VSN) are pulled out.

9. Instructions for maintenance of generator BZKS20

The BZKS20 does not require any preventive maintenance in operation. The maintenance consists only in ordinary dust and dirt removal with preservation of common basics for surface cleaning of electric devices.

!!! The ground terminal X10 have to disconnected at measurement of insulating state of other connected devices by voltage higher than 100V!!!

At setting to the operation, at least one piece of BZKS20 has to be taken into account as a backup for every 10 pcs. of operated devices. The backup units have to be stored in normal environment conditions.

The entire device should be replaced by spare unit at failure and the defective one sent to repair to the production service.

The BZKS20 is equipped against incompetent intervention with sealing self-adhesive label with denotation of production date or repair date. The blue seal label marks the product activated in production, the red seal label marks the product after repair in production service of Signal Mont, s. r. o. Hradec Králové.

The user has not permission to break sealing self-adhesive labels delivered by producer or service. The above-mentioned sealing self-adhesive labels disallow any manipulation with the boards placed in device. The producer or service takes no responsibility for any possible damages, caused during the operation of product with damaged or removed sealing self-adhesive labels.

Producer provides to customer the guarantee of error free operation of products for a period of 24 months from the day of the product delivery to final customer. The longer duration of guarantee can be provided individually on the basis of special agreement.

If the failure of product happens due to violation of operational parameters of technical conditions (see čl. 16. and 26. ÷ 28. TP SM HK 03/00) or incompetent intervention, the claim on guarantee wears off (čl. 16. Power supply: AC – nominal voltage 230 V AC, voltage tolerance 180 V ÷ 255 V AC, nominal frequency 50 Hz - 75 Hz, maximum power consumption 10 VA, DC – nominal voltage 24 V, voltage tolerance 20 V - 36 V, maximum power consumption 10 W, čl. 26. The BZKS20 is intended for placement to the spaces, which are more closely specified in ČSN 34 2600, tab.1 and defined as „Inside outdoor cabinets without protection against solar radiation“, čl. 27. Operational temperature range -25 °C ÷ +70 °C, čl. 28. Maximum relative air humidity (at 20 C) 95 %).

Guarantee and after-guarantee repairs are carried out by the maintenance workplace - Signal Mont, s. r. o. Hradec Králové.

Necessary condition for demand of guarantee repair is documented copy of „Certificate of quality and completeness of product“, which is supplied with every product.

When sending BZKS20 to the customer service, it is necessary to state:

- place of the device operation
- when demanding the guarantee repair, the copy of „Certificate of quality and completeness of product“ have to be enclosed
- real time of the device operation
- brief description of the problem
- precise postal address including phone number of the sender.

To the product disposal, all used materials, on the basis of the waste classes from product and waste from the product covers, are intended to the category **O** – other (see notice No. 381/2001 Sb.), which means that they are not dangerous.

The producer guarantees the withdrawal of the product after termination of his service life backward to its disposal.

Maintenance staff checks the correct activity of BZKS20 by lightening of indicators on particular boards of the product.

The meaning of lightening of particular indicators is as follows:

a) Power supply board N:

Green – indicates presence of specified output voltage, i.e. +5 V, -12 V, +12 V (applies to power supply board N230V and also N24V)

Yellow – is alight permanently only in case of presence of the board N24V (indication of battery-powered power supply)

b) Board of impulse source ZI, ZIP, ZIZ:

Yellow (for ZI and ZIZ – 4 pcs.) – permanent oscillation of designated frequency indicates output of specified signal (0,9 Hz, 1,8 Hz, 3,6 Hz, 5,4 Hz – Z1,8 Hz for ZIZ)

Yellow (for ZIP – 2 pcs.) – permanent oscillation of designated frequency indicates output of specified signal (0,651 Hz, 0,976 Hz)

Green – DO – is alight permanently, if the all generated frequencies are correct

– **N** – permanent lightening indicates presence of supply voltage +5V

c) Board of power switches **S1, S2**:

Green – indicators oscillate in rhythm and in phase of connected driving code, indicating the presence of driving signal

Yellow – indicates output signal (if the given switch is used). It oscillates in phase opposition for direct switch and it oscillates in phase for inverse switch.

d) Connecting board **PD**: has no indicators.

e) Board of safe supervisory circuit of oscillative buses **DKS**:

Yellow In1, In2 (bottom) – oscillates only in case of usage of designated supervision input (regardless of the connection of supervisory relay) and it oscillates in rhythm of supervised bus frequency (at failure of the supervised bus oscillation, when input supervised voltage is zero – indicator is lightless, or constant – indicator is permanently alight)

Yellow In1 (upper) – indicates connection of second oscillative bus; is used only at usage of the board **Dstn,stn** and **Dstn,ss** - function is the same as for **In1** (bottom), but it oscillates in phase opposition to **In1** (bottom)

Yellow In2 (upper) – indicates connection of second oscillative bus; is used only at usage of the board **Dstn,stn** - function is the same as for **In2** (bottom), but it oscillates in phase opposition to **In2** (bottom).

Green Out1 (Out 2) – is permanently alight in case of usage of designated supervision (indicates input supervised oscillative voltage regardless of the connection of supervisory relay, at failure of the supervised bus oscillation, when input supervised voltage is zero or constant – indicator is lightless).

10. Annex

T1 - Summary of BZKS20 generator variants and their usage - 03.01.2005

T2 - List of the BZKS20 spare parts

Table of the replacements of EK1 encoder (No.72835) by BZKS20 generator of oscillative signals

Table of the replacements of electronic oscillator EKM1 (No. 71945) by BZKS20 generator of oscillative signals