

APPARATUS OF MINE HOIST COMMUNICATION AND SIGNALING OF ACШП TYPE



GENERAL INFORMATION

Apparatus of mine hoist communication and signaling of ACШП type is designed to coordinate the operating staff actions during lowering and lifting operations in the mine shafts.

The apparatus can be used for operative (or reserve) signaling according to the existing regulations.

The apparatus is designed to operate in coal mines including those hazardous of gas (methane) and/or coal dust.

The equipment can be used in cold, temperate and tropical climate.

In the 2012 apparatus of ACШП type was declared the winner of the All-Ukrainian competition «100 best goods of Ukraine» regional stage, nomination «industrial purpose goods».

IDENTIFICATION CODE STRUCTURE

ACШП	X	XX	Y	5	
					apparatus of mine hoist communication and signaling of ACШП type;
					hoisting installation type: «K» — cage, «C» — skip;
					number of serviced levels;
					climatic version according to ГОСТ 15150-69
					location category according to ГОСТ 15150-69

OPERATION CONDITIONS

- ambient temperature:
 - for the components located in the machine room, from + 1 to 40° C;
 - for the components located on the zero level, from — 20 to + 35° C;
 - for the components located on the 1...X level landings, from — 5 to + 35° C;
- relative humidity is up to $(98 \pm 2) \%$ at the temperature of $(25 \pm 2)^\circ \text{C}$;
- rated values of the external ambient factors correspond to mechanical category M1 according to IEC 721-3-3-87.

FUNCTIONS

The apparatus of ACШП type support the following:

- Setting the hoisting plant operation modes from the signaling panel;
- Setting the cage address, i.e. level, which the cage is addressed to and which is granted the right of running signals injection;
- Operating modes and working levels signaling;

- Running signals injection by means of buttons as well as signals “Stop” and “Breakdown”, additional signals injection using the buttons marked “People”, “Drilling and Blasting Operations”, “Patient”;
- Direct injection of the «Stop» signal to the engine room from any signaling panel;
- Injection of the «Ready» signal from assistants signaling panels to signaling panel of the corresponding banksman or lander;
- On the single-ending skip hoisting installations injection of the «Start» signal from the skip loading/unloading areas; while on multilevel hoisting installations signaling should be allowed from the working level;
- Injection of the «Breakdown» signal from the banksman, landers and their assistants signaling panels with a direct transmission to the driver signaling panel and indication of the signal on all the signaling panels;
- Giving the operating mode signals, level numbers and «Breakdown» signal (in the «dry contact» form) to be used in the hoisting installation control and protection circuits;
- Duplication of the running signals and “Stop” signal presentation on the driver signaling panel;
- Signaling of mine hoist machinery and equipment position (or state): mine shaft doors; landing chairs (rests, end-hinged rails), filling of the hopper feeder, filling of the receiving hopper, swinging gate, invalid lifting of the balancing rope loop, unplugging of the brake cables;
- Signaling circuits operating check;
- Control and display of communications between the apparatus components on the driver signaling panel;
- Apparatus connectivity with mine process control system, as well as the apparatus components diagnostic data transfer to the mine technical support service or manufacturer;
- Staff two-side loudspeaking communication.

Structural diagram of the apparatus of mine hoist communication and signaling of АСШП type is given in Figure 1.

TECHNICAL DATA

Parameter name	units	value
Hoisting height	m	1500*
Number of levels	—	5*
Supply voltage	V	380
Intrinsically safe circuits voltage	V	24
Supply voltage tolerance	%	+ 10 – 15
Single level apparatus current consumption, not more than	A	0,5
Sound pressure level of the running signals and “Stop” signal, not less than	dB	90
Sound pressure level of the “Stop” signal, not less than	dB	95
Visibility range of the light signals on the signaling columns, not less than	m	1,0
Continuous voice communications time after the power supply shutdown, not less than	hours	3
Speech intelligibility in accordance with ГОСТ 16600-72, not worse than		III
Overall dimension, not more than		
Power supply and control cabinet		1300×800×300
Power supply unit of ИПВИ–12–1,5 type		240×370×200
Driver signaling panel		150×750×200
Banksman signaling panel		500×320×200
Lander signaling panel		500×320×200
Assistant panel		200×250×150

* — can be increased on demand.

DELIVERY SET

Component part name	Location	Explosion protection marking in accordance with IEC 60079
Power supply and control cabinet	Machine room	General industrial performance with intrinsically safe output circuits (ia)
Power supply unit of ИПВИ–12–1,5 type	Zero level (Banking level), levels 1...X	Exdial
Driver signaling panel	Machine room	General industrial performance
Banksman signaling panel	Zero level	Exial
Lander signaling panel	Levels 1...X	Exial
Assistant panel	Zero level, levels 1...X	Exial
Junction box	Zero level, levels 1...X	Exial
Additional voice communication panel*	Zero level, levels 1...X	Exial
Unloading control panel**	Skip unloading area	Exial
Loading control panel**	Skip loading area	Exial

* — necessity depends on hoisting conditions;

** — for skip hoist.

Delivery set is formed individually for each client, taking into account the specifics of the use, on the basis of a questionnaire.

ADVANTAGES OF USING THE APPARATUS OF ACШП TYPE

Apparatus of mine hoist signaling used on the vast majority of existing mines in CIS is based on the principle of multiple direct connections between staff (banksman, landers, their assistants and hoist driver) panels and ladder logic. This approach does not meet modern requirements for ergonomics and reliability of the apparatus of ACШП type and makes it not possible to implement a number of necessary and useful functions.

The apparatus of ACШП type is manufactured using modern electronic components and taking into account modern safety and ergonomics requirements.

The main advantages of ACШП apparatus are:

1. The ACШП apparatus design is based on the principle of remote systems using fieldbus (RS485 interface). This makes it possible to extend the range of features and functions significantly, as well as to increase apparatus reliability over the existing equipment used in mining conditions;
2. Apparatus design modularity. Through the implementation of this technical solution makes it possible to simplify the process of maintenance and repair, as well as to increase reliability significantly;
3. The use of high-speed programmable controller (PLC) makes it possible to expand the number of realizable functions significantly, as well as to realize the record of events and mine hoist operators commands.
4. PLC performance capabilities allow operatively change the system algorithm for the purpose of a various additional functions implementation and a flexible adjustment to meet the specific operating conditions;
5. Explosion protection type of the shaft signal system staff control and display panels is «intrinsically safe electrical circuit». This makes it possible to improve the ergonomics of equipment significantly, to use modern control and display devices, as well as to carry out maintenance and repair without powering down the entire system.

In 2010, the first piece of ACШП apparatus was delivered to the mine «Krasnolimanskaya» (Ukraine), where it is successfully operated up to date. Besides this, the ACШП apparatus is mass-used at such coal mining enterprises as:

PJSC «Krasnodonugol» (Ukraine),

DTEK Dobropolyeugol LLC (Ukraine), etc.

Also ACШП apparatus is successfully operated abroad (Georgia).

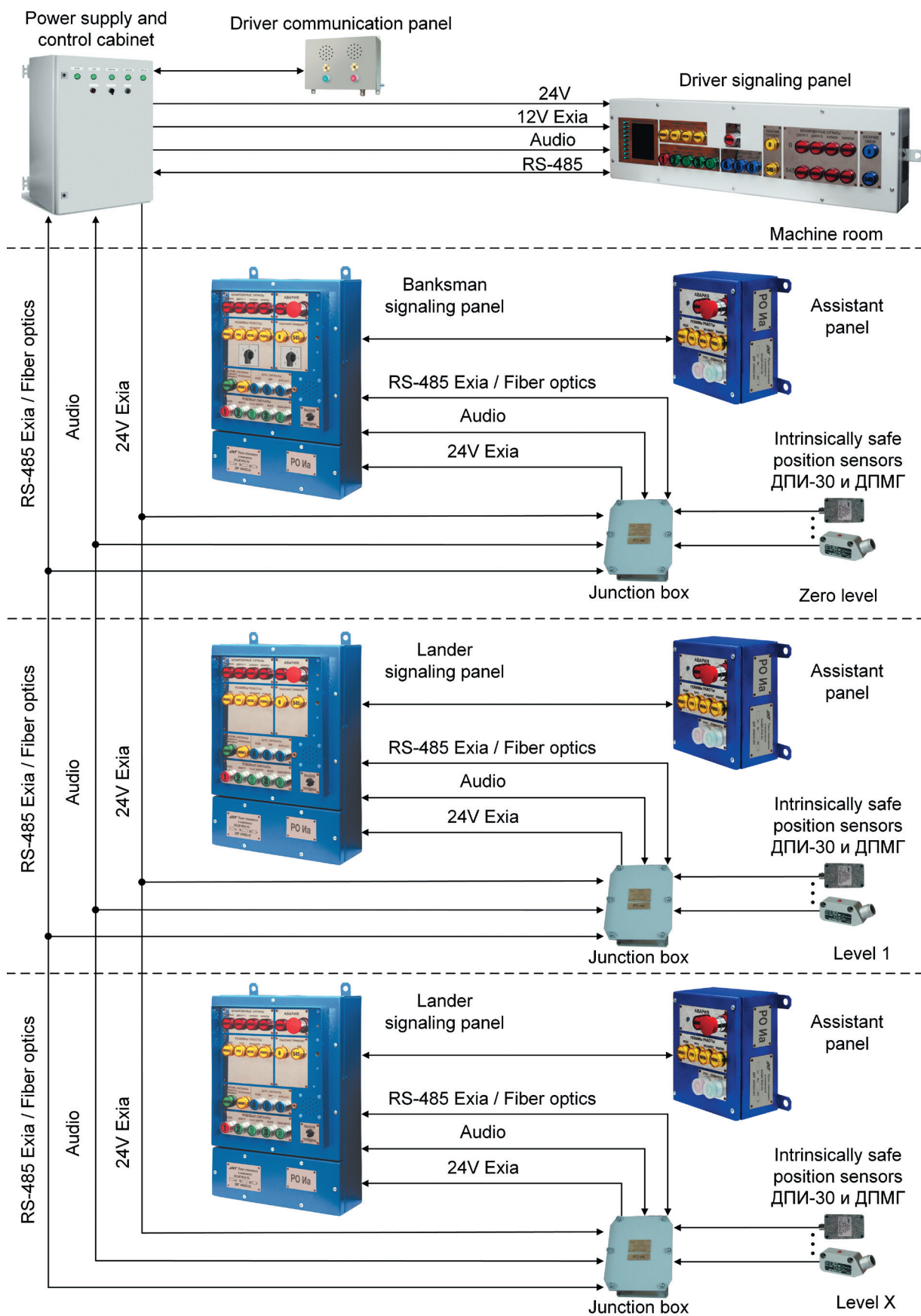


Figure 1. Structural diagram of the apparatus of mine hoist communication and signaling of ACLШП type.