



Figure 1. Control panel of the rope road train driver of ПМКД type

GENERAL INFORMATION

The apparatus of mining transport control is designed for signaling and communication between the road conductor and train driver, for control of the road train running as well as for setting the train running speed in both local and distance operation modes. The apparatus can be used for control, signaling and communication according to the demands of «Safety rules in the coal mines» of Ukraine. The equipment conforms to the technical demands of TY Y 31.2–23189879–040:2012.

The main applications of the equipment are as follows: staff lifting installations in the slope mine courses with a rope haulage, rope mono-rail and ground layer rope roads. The apparatus is designed to operate in coal mines including those hazardous of gas (methane) and/or coal dust.

IDENTIFICATION CODE STRUCTURE

AYPT–X.XX

- A** — apparatus;
- Y** — control;
- P** — mine;
- T** — transport;
- X** — type of the installation served:
 - «Ч» — frequency-controlled electrical drive (VSD) of the road;
 - «H» — nonadjustable electrical drive of the road;
 - «П» — lifting unit;
- XX** — climatic version according to GOST 15150–69.

OPERATION CONDITIONS

The apparatus is manufactured in climatic versions of Y, T type, location categories of 3, 5 ac-

cording to GOST 15150–69 for operation under the following rated conditions:

- ambient temperature from 0 °C to + 40 °C;
- relative humidity of the environment 98 ± 2 % at temperature of 25 ± 2 °C.

APPARATUS CONTAINS

The apparatus is manufactured in three types:

AYPT-Ч is designed for signaling and communication between the conductor and train driver of the road as well as for control and speed setting of the road train running in local and distance operation modes.

AYPT-H is designed for signaling and communication between the conductor and train driver of the road as well as for the road train running control in local and distance operation modes.

AYPT-П is designed for signaling and communication between the conductor and train driver of the lifting unit.



Figure 2. Power supply and data processing device of УПОИ type

APPARATUS COMPONENT PARTS AND THEIR VERSIONS

Table 1

Name	Quantity		Protection level and type acc. to GOST R 51330.10-99, ATEX
	АУРТ-Ч, АУРТ-Н	АУРТ-П	
Control panel of the rope road train driver ПМКД	1	—	Exial Ma
Indication panel of the train driver ПИМ	—	1	Exial Ma
Power supply and data processing device of УПОИ type	1	1	Exdial Mb
Controlled light signaling unit (indicator) of CCY-24 type	2*	—	Exial Ma
Sound signaling device of Y3C type	20*	4*	Exial Ma
Voice communication post of ПГС type	4*	4*	Exial Ma
Identification block (built into the cable-rope switch with Exial explosion protection marking)	40*	—	ia
Speed and direction sensor of ДЧН type	1	—	Exial Ma
Linear receiver of ЛП type	4	4	Exial Ma
End load of КН type	1	—	Exial Ma
Portable conductor's control panel (radio station of НШ-3М type)	4**	4**	Exial Ma
Mobile conductor's control panel	2	2	Exial Ma
Accumulator power supply unit (for mobile conductor's control panel)	2	2	ExialC Ma
Monitoring device (installed in the mine control room. Input/output circuits are of ia explosion protection marking)	1**	1**	ia
Power supply adaptor	1	1	—
Mobile antenna	1	1	Exial Ma
Terminal box	—	1	Exial Ma

* — The quantity is defined by the road length. The quantity listed in the table corresponds to the road length of 2000 m.

** — The necessity of delivery is defined by the Customer.

CONSTRUCTION AND OPERATION

The apparatus of АУРТ-Ч type provides the following operation functions:

- Automatic warning pre-starting signal of not less than 5 sec. duration that can be heard along the whole road;
- Warning signal sounding control;
- Automatic stoppage of the train by any person from any point of the road with the help of the cable-rope switches line;
- Monitoring of the cable-rope switches line operation state as well as identification of the number of the cable-rope switch been triggered;
- Automatic stoppage of the electrical drive while the train coming to the end points of haulage;
- Slippage control of the haulage cable at the friction pulley;
- Monitoring of braking and wear degree of the brake shoes;
- Position monitoring of the tension station loads;
- Temperature monitoring of the drive electrical motor (if the temperature sensor is available in the electrical motor);
- Warning light signaling of the road operation at the end points of haulage;
- Voice communication between the road serving staff in the places of loading and unloading operations;
- Radio communication between the train driver and conductor's control panels as well as monitoring of the radio channel operable state;
- Continuous monitoring of technical state and identification of basic failures of the units;
- Interaction with the device of the electrical drive control of ЭМДВ type (except АУРТ-Н type);

- Possibility of the apparatus connection to the mining control and monitoring system to transfer the road operation data;
- Possibility of remote transmission of the diagnostic data of the apparatus units state to the mine technical support service or to the original manufacturer (if the monitoring and control device is available, see table 1).

From the rope road train driver's control panel:

- blocking of the not-authorized switch-on of the mechanisms of the drive station;
- emergency stoppage of the mechanisms of the drive station;
- displaying of the train speed, movement direction and current location;
- displaying of the sensors state and technological blockings of the drive station and linear part of the road;
- displaying of the basic failures of the apparatus units and offering recommendations on failure removal;
- displaying of the main parameters, operation modes and failures of the ЭМДВ device (except AYPT-H type);
- channel of the voice radio communication with the conductor's control panel;
- selection of the road operation mode: «local», «transmitting», «distance»;
- stoppage of the road electrical drive in all the operation modes;
- run-up of the road electrical drive in the «local» and «transmitting» operation modes;
- setting of the road train running direction in the «local» and «transmitting» operation modes;
- setting of the road train running speed in the «local» and «transmitting» operation modes (except AYPT-H type);
- light and sound indication of the conductor's inquiry to change the train running speed in the «transmitting» and «distance» operation modes;
- manual sound signaling that can be heard along the whole road;
- indication of the accumulator battery charge state of the conductor's control panel.

From the conductor's control panel:

- channel of the voice radio communication with the rope road train driver's control panel;
- emergency stoppage of the road train;
- control of the road electrical drive from the train cabin: run-up, stoppage, train running direction setting in the «distance» operation mode;
- setting of the train running speed in the «distance» operation mode (except AYPT-H type);
- inquiry for the road electrical drive control from the train cabin in the «transmitting» operation mode;
- diagnostics of the conductor's control panel operation state at the start-up;

- sound indication of the control buttons pushing.

The apparatus of AYPT-П type provides the following operation functions:

- Voice communication between the road serving staff in the places of loading and unloading operations;
- Radio communication between the train driver and conductor's control panels as well as monitoring of the radio channel operable state;
- Automatic sound signaling of the operational commands that can be heard at the receiving landings;
- Monitoring of the operational commands sound signals;
- Giving a command (in the «dry contact» form) while «Stop» and «Breakdown» signaling to be used in the lifting installation circuits;
- Continuous monitoring of the technological state and identification of the basic failures of the apparatus units;
- Possibility of the apparatus connection to the mining control and monitoring system to transfer the road operation data;
- Possibility of remote transmission of the diagnostic data of the apparatus units state to the mine technical support service or to the original manufacturer (if the monitoring and control device is available, see table 1).

From the train driver's indication panel:

- voice radio communication channel with the conductor's control panel;
- displaying operational signals and «Stop» signal in the light and sound forms; while light component of the signal is presented by the corresponding inscription lightening and the sound one is presented by the automatic reproduction of the traditional code sound signals;
- duplicating of the operational signals and «Stop» signal displaying at the indication board of the train driver's control panel;
- operational viewing of the last operational signals given;
- fixation (saving) of the light component of the operational signal up to the «Stop» signal coming from the conductor's control panel;
- «Breakdown» signal displaying with the help of light and sound;
- possibility of switching off the sound component of the «Breakdown» signal;
- displaying of the basic failures of the apparatus units and offering recommendations on failure removal;
- indication of the accumulator battery charge state of the conductor's control panel.

From the conductor's control panel:

- channel of the voice radio communication with the train driver's indication panel;
- providing of «Breakdown» signal;

- providing of «Upwards», «Downwards», «Slowly upwards», «Slowly downwards» operational signals and «Stop» signal;
- blocking of the next immediate operational signal giving omitting «Stop» signal;
- diagnostics of the radio station operation state at the start-up;
- sound indication of the control buttons pushing.

THE APPARATUS PURPOSE AND TECHNICAL LEVEL VALUES

Table 2

Road length, m	До 2000
Rated supply voltage, V	127/36
Intrinsically safe circuits voltage, V	24, 18, 12
Network power supply deviations allowed, %	+ 10...–15
Power consumption of the apparatus, not more than, W	200
Speech legibility according to GOST 16600, not worse than	III
Sound pressure level of signaling device, not less than, dB	95
Light signals visibility range at the train driver's indication panel, not less than, m	1,0
Range of the train running speed measuring (except АУРТ-П type), m/s	0,1–5
Range of the train location displaying (except АУРТ-П type), m	9999
Precision of the train running speed measuring (except АУРТ-П type), not more than, %	1
Operational life time of the conductor's control panel from the accumulator, not less than, hours	12

CONSTRUCTION

Power supply and data processing device of УПОИ type is manufactured in a metallic enclosure, with Exdial Mb explosion protection marking, two cable glands of M40×1,5 type and mechanic lever for on/off switching.

The УПОИ device enclosure has two sections. In the upper section there is the terminal board installed used to connect the apparatus power supply unit as well as terminal boards required to connect the intrinsically safe circuits to the rope road train driver's control panel (ПМКД) or train driver's indication panel (ПИМ). In the second section there are intrinsically safe power supply units and control blocks.

The rope road train driver's control panel (ПМКД) is manufactured in a metallic enclosure, with Exial Ma explosion protection marking.

On the right side of the ПМКД there are cable glands of M16×1,5; M32×1,5 and M40×1,5 types. The rope road train driver's control panel has four opening sections: two ones at the front side of the enclosure and two ones — at the back side. Three sections of the ПМКД are closed, plumbed and have the control blocks installed in them. In the forth section there are the terminals required to connect the external circuits.

The train driver's indication panel (ПИМ) is manufactured in a metallic enclosure, has Exial Ma explosion protection marking and ca-

ble glands of M16×1,5; M20×1,5 and M32×1,5 types.

The controlled light signaling unit of ССУ-24 type is manufactured in a plastic enclosure, has Exial Ma explosion protection marking and two cable glands of M16×1,5 type. At the front side there are installed two LED indicators: red and green ones.

The sound signaling device of УЗС type is manufactured in a plastic enclosure, has Exial Ma explosion protection marking and two cable glands of M16×1,5 type. At both sides of the УЗС enclosure there are piezoelectric radiating devices installed.

The voice communication post of ПГС type is manufactured in the enclosure with Exial Ma explosion protection marking and has two cable glands of M16×1,5 types. At the front side of the ПГС enclosure there are following elements installed: the dynamic head of the loudspeaker of 0,5ГДШ-2 type, microphone block and «Call» button.

The identification block is built into the cable-rope switch (ВДШ). This block is a board with wires used to connect to normally-opened contacts of the ВДШ.

The speed and direction sensor of ДСН type is manufactured in a metallic enclosure of Exial Ma explosion protection marking, with a cable gland of M20×1,5 type. Inside the

enclosure there is a terminal used to connect to the ПМКД and two inductive sensors.

The linear receiver of ЛП type is manufactured in the enclosure of Exial Ma explosion protection marking, with two cable glands of M16×1,5 type. Inside the enclosure there is a terminal used for connections.

The end load of KH type is manufactured in the enclosure of Exial Ma explosion protection marking, with two cable glands of M16×1,5 type. Inside the enclosure there is a terminal used for connections.

The monitoring device is manufactured in the electro-technical cabinet with cable glands of M16×1,5 type. Inside the cabinet there are terminals used to connect both data transmitting line and power supply network.

Mobile conductor's control panel is manufactured in a still enclosure of Exial Ma explosion protection marking. On the bottom side of the enclosure there are cable glands of M16×1,5 type. At the front panel of the enclosure there are control and communication elements installed. Inside the enclosure there are a radio-communication unit and terminal blocks used for connecting mobile antenna and battery pack.

Accumulator power supply unit is manufactured in a plastic enclosure of ExialC Ma explosion protection marking. The enclosure is equipped with a handhold for easy carrying. Under the handhold there are installed the indicators of the accumulator battery charge state and the unit operation state. On the sides of the unit there are connectors with locks to connect the power network adapter and the mobile conductor's control panel. Inside the enclosure there is a potted board with accumulator batteries.

The power supply adaptor is manufactured in a metallic enclosure with the network supply cord and two cords with plugs used to connect the accumulator power supply blocks of the radio station.

The mobile antenna is a frame that is installed into a plastic enclosure and filled with assembly foam to be hard.

Functional diagram of the apparatus of АУРТ-Ч type for control of the ground layer rope road of ДКНУ type with the variable speed drive of ЭМДВ type is given in Figure 1.

MANUFACTURER WARRANTY

Warranty period is 12 months from the date of the equipment commissioning but not more than 18 months since the delivery date.

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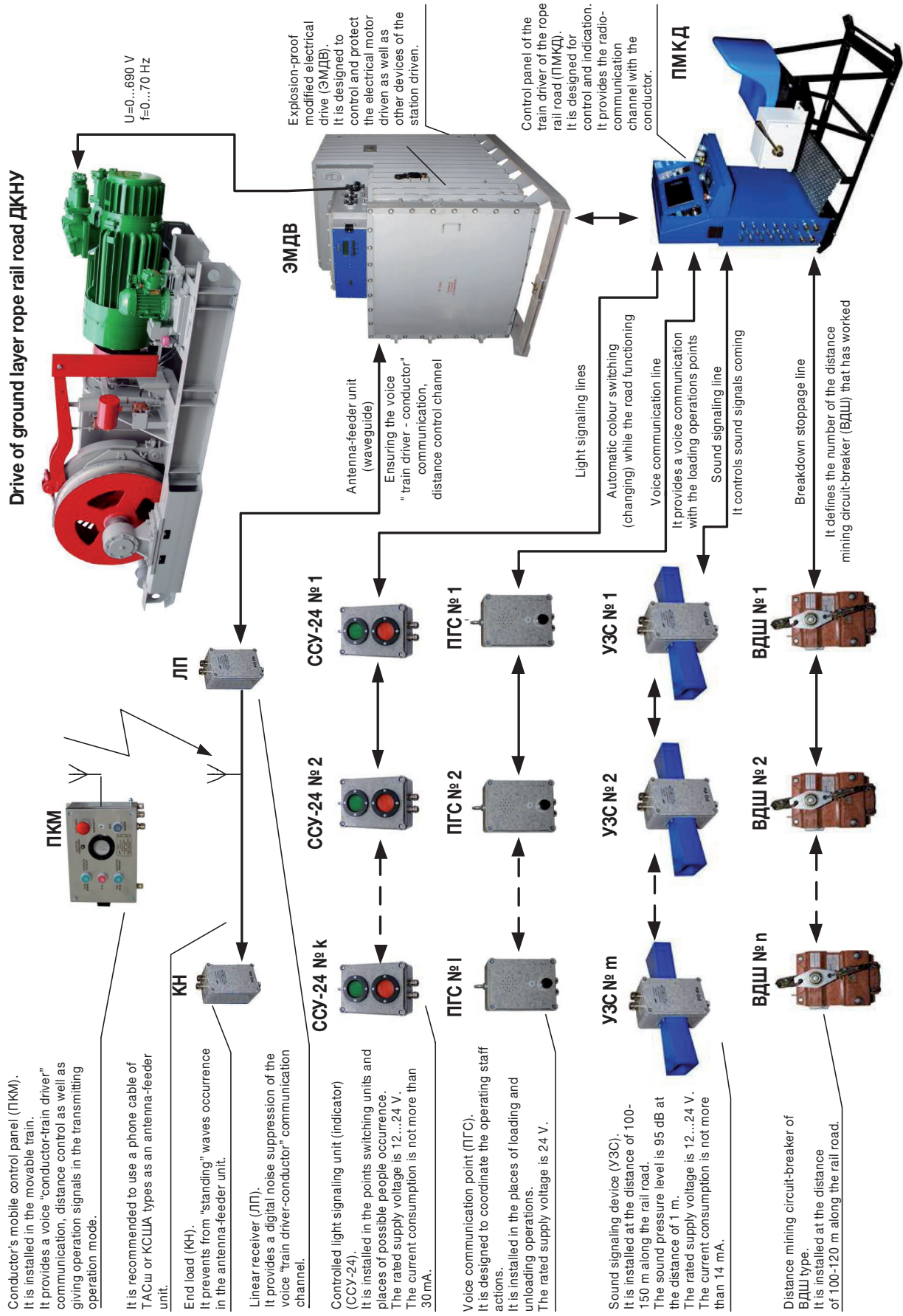


Figure 3. Functional diagram of the apparatus of АУРТ-Ч type for control of the ground layer rope road of ДКНУ type with the variablespeed drive of ЭКДВ type.