

Fault indicators on the Russian market

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Abstract. The article indicates the relevance of using fault indicators. Various models and manufacturers of fault indicators are presented on the Russian market. The analysis of the characteristics of various fault indicators was produced. At present, the most suitable domestic device for electric grid companies in Russia, which allows determining the open and short circuit on power lines, as well as indicating the location of the fault, is a fault indicator CI34B of the ANTRAKS R&D&M Co, Ltd. The market analysis of fault indicators in Russia will allow specialists of design organizations, personnel of electric grid companies and other specialists to reduce the time spent on searching for information on fault indicators.

1 Introduction

The authors' works [1-11] indicate that rapid location of faults on power lines can significantly accelerate the restoration of power supply to consumers and reduce the number of attending personnel, eliminating the faults. In case of a fault on a power line, it is necessary to determine the place of wire breakage or the location of failed power equipment more accurately; in turn, it will allow the personnel to reduce the time on locating and eliminating the fault on a power line quicker.

The authors [12-20] indicate that falling of trees on power lines, breakdowns of insulators and other causes of faults greatly complicate the work of attending personnel of electric grid companies. Most often, there are no devices for monitoring power lines; so the place of insulator breakdowns and other faults must be determined visually. It takes a lot of time and leads to a long disconnection of consumers. In this regard, there is a need for the use of special equipment to detect an open and a short on power lines, as well as to indicate the location of the faults.

One of the devices that can do the above mentioned things is a fault indicator (FI). Depending on the purpose and design, the FIs are installed in the switchgear unit, on the overhead power line support, or directly on the phase line wire. The use of FIs can significantly reduce the time and cost of locating and eliminating faults in branched distribution networks.

2 Research methodology

In Russia, on the market of fault indicators, FI models of various manufacturers are widely presented. At the same time, the characteristics of FIs of various manufacturers

differ from each other; it, in turn, affects their effectiveness.

The personnel, dealing with the selection of FIs, spend considerable time on it, since FIs, presented on the Russian market, have different characteristics and prices. To increase the efficiency of the selection of FIs, it is necessary to analyze their characteristics.

Analysis of the FIs, presented on the Russian market, will be made according to the following parameters:









- minimum detection current for single phase-to-ground faults;
- determination of current direction;
- presence of internal memory;
- radio communication range;
- channel used for alarm annunciation;
- fault indication;
- FI power supply;
- FI battery life;
- data transfer unit power supply;
- the largest range for line-to-line faults;
- system of fault location;
- etc.

3 Results and their discussion

Fault indicators of eight companies were presented on the Russian market. Appearance, models and manufacturers of fault indicators are presented in table 1.

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Table 1. Models and manufactures of fault indicators.

Model, (manufacturer)	Appearance of the device
FI-C13B, (Antraks)	
JYZ-HW V2.0, (Four-Faith)	
AMKA-single phase-to-ground fault-18, (AIZ Lytkarino)	
FLA3.1VL, (INION)	
Overhead line fault indicator (OLFI), (Relematika)	
Sicam FSI, (Siemens)	
Smart Navigator (HORSTMANN)	
ASTRON-8080, (ASTRON)	

All of the above mentioned FIs are placed on the phase wire of the power line. Externally, product designs are almost identical. They are a sealed flask, inside which, depending on the manufacturer, there may be a battery, an electronic circuit, a set of LED indicators.

The installation of a FI can be carried out both on a disconnected power line using a truck crane, and on a power line under voltage using appropriate insulating rods. FIs usually operate as a group of three to six devices with information exchange with a data collection and transmission unit (DCTU).

DCTU provides communication in the appropriate protocol with the remote server. All FI models, presented in the table, are used as an alarm annunciation channel – the GSM / GPRS channel. The FI power supply is provided by built-in batteries; individual manufacturers have implemented the function of recharging the FI from power lines.

The characteristics of FIs of various manufacturers, presented on the Russian market, are shown in table 2.

The FIs, presented in Table 2, have different characteristics. So, the minimum detection current is provided by Anthrax FI-C13B, it is 0.5 A; determination of current direction is available in Four-Faith FI- JYZ-HW V1.0, in Relematika FI-OLFI and Anthrax FI-C13B; presence of internal memory is available in Anthrax FI-C13B; the HORSTMANN FI Smart Navigator has the longest battery life which is equal to 20 years; the smallest wire diameter for installation has the HORSTMANN FI; the largest range for line-to-line fault is available in Anthrax FI-C13B and ranges from 20 to 2000A; the system of fault location is available in Siemens FI- Sicam FSI, INION FI- FLA3.1VL, Relematika FI-OLFI and Anthrax FI-C13B.

4 Conclusions

Based on the presented analysis, we can conclude that at the moment, the most suitable domestic device for the Russian grid companies to determine the open and short circuit on power lines, as well as to indicate the location of the fault, is a fault indicator C134B of the ANTRAKS R&D&M Co, Ltd.

The market analysis of fault indicators in Russia will allow specialists of design organizations, personnel of electric grid companies and other specialists to reduce the time spent on searching for information on fault indicators.

Table 2. Characteristics of FIs, presented on the Russian market.

N o.	Parameter	Siemens	AIZ Lytkarino	IIOIRSTMANN		INION	ASTRON	Relematika	Antraks	Four-Faith
1	2	3	4	5	6	7	8	9	10	11
1	Model of FI	Sicam FS	AMKA-single phase-to-ground fault-18 UHL1	Smart Navigator	Smart Navigator 2.0	FLA3.1VL	ASTRON -8080 UHL1	OLFI	B 34	JYZ-FF V2.0
2	Minimum detection current for single phase-to-ground faults, A	5...1500	120	100	100	4...1500	120...630	120...600	20...2000	3...800
3	Range for line-to-line fault, A	5	3	50	5	5	20	20	0,5	3
4	Determination of current direction for single phase-to-ground fault	No	No	No	No	No	No	Yes	Yes	No
5	Presence of internal memory	No	No	No	No	No	No	No	Yes	No
6	Radio communication range, m	No data	No	30	30	50	No data	50	200	No data
7	Alarm annunciation channel	GSM/GPRS	GSM/GPRS	GSM/GPRS	GSM/GPRS	GSM/GPRS	GSM	GSM/GPRS	GSM/GPRS/SMS	GSM/GPRS
8	Temperature range, °C	-40...+70	-40...+70	-40...+85	-40...+85	-40...+70	-40...+60	-40...+80	-55...+85	-40...+70
9	Wire Diameter for installation, mm	5-42	5-42	8-29	8-29	5-42	5-35	10-42	5-42	5-42
10	Fault indication	LEDs on the FI	Blinker and LEDs on the FI	LEDs on the FI	LEDs on the FI	Blinker and LEDs on the FI	LEDs on the FI	LEDs on the FI	LEDs on the FI, blinker on the data transfer unit	LEDs on the FI
11	FI power supply	From battery	From battery	From battery	From battery	With current in the line of more than 20 A works from power lines	From battery	From battery	From battery	From battery
12	Declared battery life, years	10	>10	20	Recharged from power lines	Recharged from power lines	7	8	10	10
13	Data transfer unit power supply	Battery powered, solar recharged	Battery powered, solar recharged	Battery powered, recharged from power lines	Battery powered, recharged from power lines	Battery powered, recharged from power lines	Battery powered, recharged from power lines	No data	Battery powered, recharged from power lines	Battery powered, solar recharged
14	System of fault location	Yes	No	No	No	Yes	No	Yes	Yes	No

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