OPEN JOINT-STOCK COMPANY
RESEARCH & DEVELOPMENT CENTRE
UNIFIED POWER SYSTEM
FEDERAL GRID COMPANY
(«RDC UPS FGC» OJSC)

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APPROVED
Director for Tests and Certification,
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<*Signature*> V.V. Boykov

22.07.2015

PROTOCOL OF INVESTIGATIVE TESTS No.50 - 2015

Test object	Mounting system of MC mark with cable type ПвПу2г1 х400гж/150-64/110
Specifications	TU 5285-006-98970470-2014
Test customer and manufacturer of test object:	RKS Plast LLC
Test objective	Mechanical bracing check (test for electrodynamic stability) with short-circuit current
Regulatory document subject to which the test was conducted	Test program
Place of test	(«RDC UPS FGC» OJSC)
Date of sample acquisition	30.06.2015
Test date	01.07.2015
Test contract	57-БТ-15

THE PROTOCOL CONTAINS: Total sheets: 11

CONCLUSION: A sample of MC mounting system with cable type ПвПу2г1 х400гж/150-64/11 manufactured by RKS Plast LLC to TU 5285-006-98970470-2014 has withstood mechanical bracing test:

- when laying with cable clamp ВКК-65/90 - $i_Д$=120 кА, $t_{КЗ}$=0,8 s;
- when laying in delta with cable clamp ВККЗ-65/90 - $i_Д$=140 кА, $t_{КЗ}$

and meets the Test Program.

Head, <*Signature*> A.V. Noskov
Heavy Current Laboratory

Moscow 2015

Contents:

1. KEY TECHNICAL CHARACTERISTICS OF TEST OBJECT

Table 1

1.1.Name and designation, sample type	MC mounting system with cable type ПвПу2г1 х400гж/150-64/110
1.2.National product classification code (OKP)	528500
1.4.Serial number	w/n
1.5.Overall dimensions, mm	6500x1500x1700
1.6.Weight, kg	50

The external appearance of the mounting system of MC mark with different clamps assembly is shown in Figure 9.1.-9.2

2. DESCRIPTION OF CONSTRUCTION

This mounting system is used for laying cables in communication tunnels. During the testing process the system included:

NN	Name	UoM	Q-ty
1	Mounting profile МСП-41-Н 6м	м	42
2	Bracket МСК-41/450-Н	pcs	12
3	Support МСО-21-62-Н	pcs	6
4	Support МСО-45-Н	pcs	12
5	Connecting brace МСС-41-Н	pcs	12
6	Mounting washer МСШ-13-С	pcs	36
7	Mounting nut МСГ-М12-С	pcs	120
8	Stud bolt M12x1000 galv.	pcs	4
9	Hexs bolt M 12x25 galv.	pcs	60
10	Hexs bolt M12x35 galv.	pcs	24
11	Flat washer A13 galv.	pcs	156
12	Hexs nut M12 galv.	pcs	144
13	High voltage cable clamp ВКК-65/90	pcs	18
14	High voltage cable clamp ВККЗ-65/90	pcs	7
15	Cable ПвПу2г1х400гж/150-64/110	м	18

3. TEST CUSTOMER AND MANUFACTURER OF TEST OBJECT:

RKS Plast LLC
Customer address:
111024, Moscow, 2-nd Kabelnaya st., bldg. 2, block 9
Tel: (495) 777-75-06
Production site address:
142155, Moscow region, Podolsk district,
Lyvovskiy settlement, Metallurgov proezd 3

4. TECHNICAL DOCUMENTATION PACKAGE

4.1. Mounting metal elements. Specification TU 5285-006-98970470-2014.

4.2. High voltage cable clamps for group laying. Specification TU 4834-004-98970470-2009.

4.3. High voltage cable clamps Specification TU 4834-002-98970470-2009.

5. TEST PROGRAM AND METHODOLOGY

5.1.Characteristics tested in accordance with the Test Program are given in Table 2

Table 2

Characteristic	UoM	Designation	Rated value
1.Maximum mechanical bracing current peak - cable clamp ВКК-65/90 - cable clamp ВККЗ-65/90	кА	$i_д$	 120 140
2.Flow period of mechanical bracing current	s	$t_{КЗ}$	0.8

5.2. Test methodology, test conditions, duration of short circuit current flow in mechanical bracing test, number of experiments and result evaluation criteria meet the Test Program.

6. TEST CONDITIONS

6.1. The test was conducted on heavy current test bench УБТ-800.1000.00.00.00.

6.2. Test mode – 50 Hz three-phase alternating current. The current was measured by measuring system NIK -16k. Distance between props 0,8 м.

6.3. Climatic conditions of the test – normal to GOST 15150-69, para. 3.15:

- ambient temperature + 22°C;
- relative humidity 61%.
- atmospheric pressure 748 mm Hg

7. MEANS OF TEST AND MEASUREMENTS

The list of used test equipment (TE) and measuring system (MS) are presented in Table 3.

Table 3.

Name of TE and MS	Serial number	TE and MS error	Number of test certificate, accreditation certificate, validity period
1.Heavy current installation UBT-800.1000.00.00.00	-	2.5	Certificate No.3/2010, valid until 06.12.2015
2. Transfer shunts 70 кА AC «Metra Blansko»	5.007.890 5.007.891 5.007.899	0.5 0.5 0.5	№.206.1-62-14 №.206.1-63-14 №.206.1-61-14 valid until 03.12.2016
3.Lower-frequency measuring system (NIK-16K)	02	1,0	№. 206.1-3603-15 valid until 27.05.2016
4. Aneroid barometer БАММ-1	1019	1st class	№ 555602 valid until 01.07.2015
5. Liquid thermometer СП-2К	68	-	№ 0454625 valid until 05.06.2016
6. Psychrometric hygrometer ВИТ-1	41	-	№ 0647644 valid until 19.08.2016

8. TEST RESULTS

8.1. Test oscillogram processing data are given in Table 4.

Table 4

Oscillogram number	Short-circuit current, кА		$t_{КЗ}$, s	Observation results, Notes
	$i_д$	$I_т$		
Cable clamp ВКК-65/90				
49054 phase A phase B phase C	 120,5 74,3 100,6	-	0,8	Qualification mechanical bracing experiment, no comment, figure 9.1
Cable clamp ВККЗ-65/90				
49059 phase A phase B phase C	 140,0 84,5 110,1	-	0,8	Qualification mechanical bracing experiment, no comment, figure 9.2

9.PHOTO

MC mounting system with ВКК-65/90 cable clamp

Figure 9.1

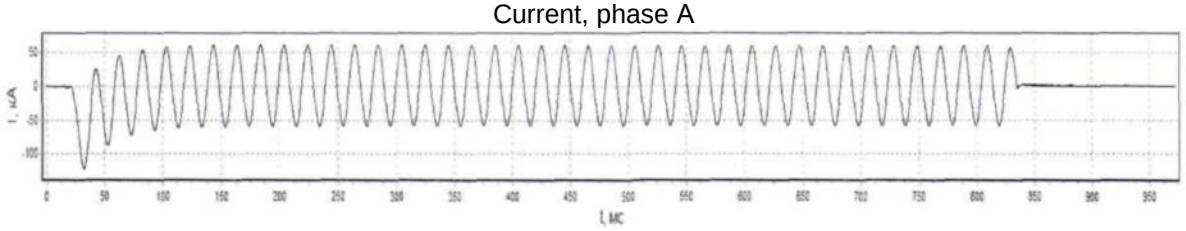
MC mounting system with BKK3-65/90 cable clamp

Figure 9.2

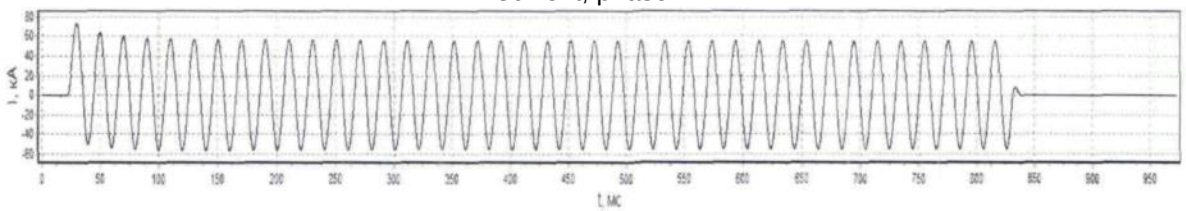
10. OSCILLOGRAMS

Oscillogram No.49054

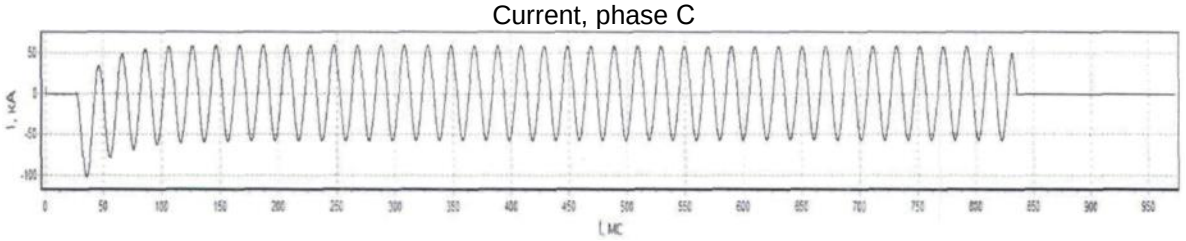
Current, phase A



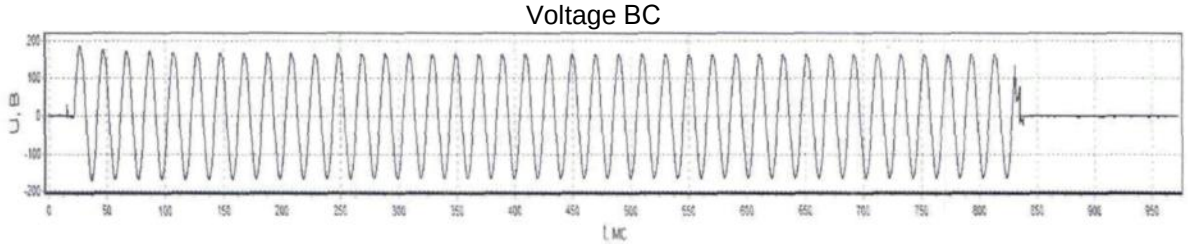
Current, phase B



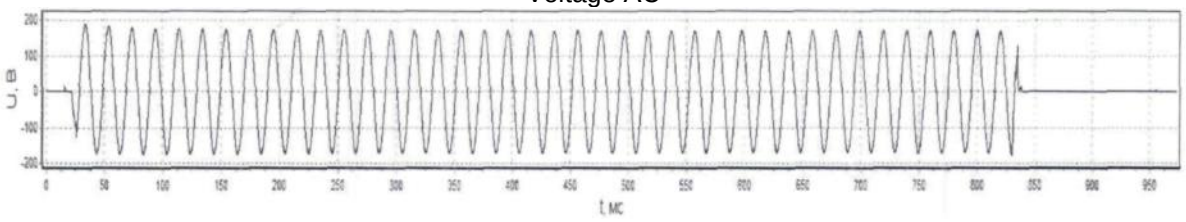
Current, phase C



Voltage BC



Voltage AC



Voltage AB

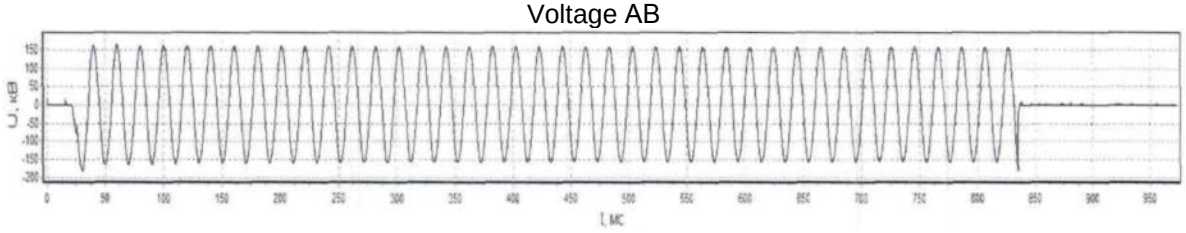


Figure 10.1

Oscillogram No.49059

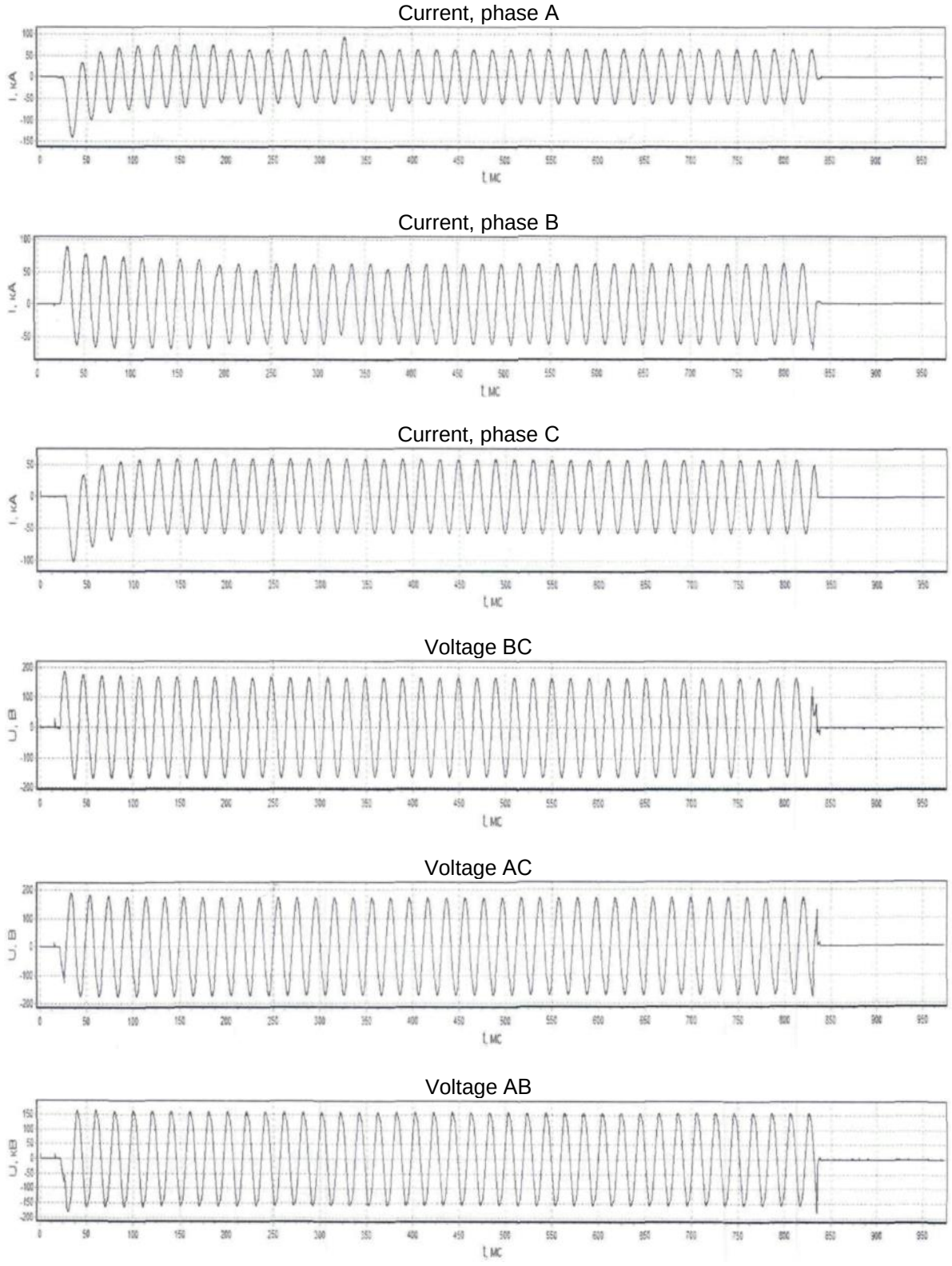


Figure 10.2

11. CONCLUSION

A sample of MC mounting system with cable type ПвПу2г1 х400гж/150-64/11 manufactured by RKS Plast LLC to TU 5285-006-98970470-2014 has withstood mechanical bracing test:
- when laying with cable clamp ВКК-65/90 - $i_д$=120 кА, $t_{кз}$=0,8 s;
- when laying in delta with cable clamp ВККЗ-65/90 - $i_д$=140 кА, $t_{кз}$

and meets the Test Program.

12. REGULATIONS

TU 5285-006-98970470-2014	Mounting metal elements. Specification.

Originators:

Head of Heavy Current Laboratory	*<Signature>*	A.V. Noskov

Agreed:

Person in charge of Regulatory Document Fund	*<Signature>*	E.G. Grigorieva
Person in charge of test metrological support	*<Signature>*	V.I. Rogozhin

Supplement

APPROVED
Deputy Chief Engineer
Testing and Certification Centre of
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<*Signature*> *V*.A. Mayorov

«08» June 2015

CONFIRMED
General Director
RKS-Plast LLC

_____ A.A. Grigoriev

«___» _____ 2015

TEST PROGRAM
for
MC mounting system
with high voltage ВКК (ВККЗ) cable clamps

1. Test object

The object of testing is MC mounting system with high voltage ВКК (ВККЗ) cable clamps. To perform testing the Customer shall submit the following:

- MC mounting system;
- high voltage ВКК cable clamps:
- high voltage ВККЗ cable clamps:
- cable ПвПу2г1 х400гж/150-64/110кV (6 m at most);
- short-circuiter.

2. Test objective

Check for electrodynamic stability to let-through current.

3. Test procedure.

3.1. In the hall of Heavy Currents Laboratory, the Customer shall install the MC mounting system with high voltage ВКК clamps (on cables ПвПу2г1х400гж/150-64/110кV). The cables shall be lugged. The clear distance between cables shall be of cable size. The test shall be performed using short-circuit current with electrodynamic stability of 70 кА то 120 кА at a 20-30 кА pitch. Duration 0,8 s.

3.2. In the hall of Heavy Currents Laboratory, the Customer shall mount the MC mounting system with high voltage ВККЗ clamps (on cables ПвПу2г1х400гж/150-64/110кV) when laying cables in delta, without clear distance. The test shall be performed using short-circuit current with electrodynamic stability of 70 кА то 40 кА at a 20-30 кА pitch. Duration 0,8 s.

3.3. 4. Test results criteria:

- Integrity of construction
- Integrity of clamps.

Head of HCL
Testing and Certification Centre of
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«___» _____ 2015.

Leading specialist
RKS-Plast LLC

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«___» _____ 2015.