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Ordinance Factory
Project
Hyderabad.

PH 10.000 TY 1

NUMBER T-612

SHEET 2 OF 4

PH 10 VOLTAGE REGULATOR

TECHNICAL SPECIFICATIONS

PH 10.000 TY 1

These technical specifications pertain to Voltage regulator PH-10, hereinafter referred as regulator, meant for maintaining in the given limits of voltage of generator BF-7500, operating together with storage batteries, type 6GT9H-140M (or 12UT-70) and relay AMP-400T.

Designation of regulator when placing order voltage regulator PH-10, PH10.000 TY 1.

1. TECHNICAL REQUIREMENTS.

Regulator should correspond to requirements of these technical specifications, set documents as per specification documents as per specification PH 10.000 C1 and OST B3.1164.72.

All the completing materials and articles used at the time of manufacture of regulator should correspond to the valid standards and technical specifications for them.

1.1 Basic parameters and dimensions.

1.1.1 The regulator has the following basic parameters:-

- | | |
|--|----------------------|
| a) Maintained voltage | - 26.5-28.5V; |
| b) Maximum regulated current of excitation winding | - 10A, |
| c) Mode of operation | - long time |
| d) Connecting circuit | - two wire |
| e) Version | - water proof |
| f) Operating position | - any |
| g) Weight | - not more than 5Kg. |

1.1.2 Overall dimensions of regulator as per the drawing PH 10.000 T4

1.2. Characteristics.

1.2.1 Regulator as per overall mounting dimensions and outer appearance should correspond to drawing PH 10.000 T4 and set of documents in conformity with specification PH.10.000 C1

1.2.2 Regulator should withstand the effect of vibration on one of the frequencies in range 20-25Hz at acceleration of 25ms⁻².

1.2.3 Electrical wiring of regulator should conform to the electric circuit diagram PH 10.000 93, electric wiring drawing PH 10.000 M9 and should ensure the following.

1.2.3.1 Maintaining of voltage of the generator in the limits 29.5-28.5V irrespective of:-

a) Change in load from 10 upto 300A and speed of rotation of armature of generator in operating range of turns during load upto 10A from ~~1000~~³⁰⁵⁰ upto 8000 rpm;

b) heat of regulate during operation;

c) change of temperature of ambient medium from minus 50°C to +50°C, in this case regulator should maintain voltage of the generator (during the change of its load and speed of rotation) in the limits: $28 \pm 0.5V$ at minus 50°C; $27 \pm 0.5V$ at +50°C. During this, the difference of the regulated voltage with change of temperature from +50°C minus 50°C during the operation with the storage batteries should not be less than 0.5V. When the operation is without storage batteries increase in the regulated voltage at minus temperatures upto 29V and lowering of regulated voltage at plus temperatures upto 26V is allowed.

1.2.3.2 Frequency of oscillations of voltage of generator, maintained by regulator at which in all range of revolutions of armature of generator (during regulation of voltage of generator) the flickering of incandescent lamp is not noticeable for eye.

1.2.3.3 Operation of protection circuit as per the voltage of regulator at the settled voltage of generator 29.5-28.5V.

1.2.3.4 Resistance of the insulation between electric circuits and body, as well as between the electrically non-connected circuits should be:-

a) in normal climatic conditions practically in the cold condition - not less than 20 Mega Ohms.

b) in conditions of increased temperature - not less than 5 Mega Ohms.

c) under the conditions of increased humidity - not less than 1 Mega Ohm.

1.2.5 Insulation between the electric circuits and as well as between the electrically unconnected circuits under normal climatic conditions should withstand the testing voltage of 500V (effective value) of alternating current of 50Hz frequency without break down or surface flash over.

1.2.6 Parts and assembly units of the articles of the same series should be interchangeable.

1.2.7 The regulator should withstand without damage and loss of working capacity of the effect of:-

a) Pulses of increased voltage upto 70V with duration upto 3 micro seconds;

b) short-duration switchings of voltage of reverse polarity with value of 30V and duration upto 1 minute;

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1.2.8 Regulator should not have design elements and assembly units with resonance frequencies upto 40Hz.

1.2.9 Regulator should be in good working condition during operation, and retain its parameters under the conditions specified in OST B3-1164-72.

1.2.10 For ensuring the guaranteed operation, the regulator during the stand tests should withstand 500 hours of operation.

1.2.11 The service life of regulator should be 1000 hours of operation with conducting of scheduled maintenance, envisaged by instructions for use.

1.2.12 Regulator should not create interference to radioreception in the operation of TTY (interphone equipment) exceeding the norms set by PNB-150-71.

1.3 Complete set

1.3.1 Following is included in the set of delivery:-

- a) Regulator PH-10;
- b) Certificate;
- c) SPJA as per list PH.10.000 SW;

Note: Other completeness of set is by contract for delivery.

1.4 Marking.

1.4.1 Marking of regulator should be carried out in compliance with the documents set as per the specification PH10.000 CH.

1.5 Packing and preservation.

Packing of the regulator is carried out in compliance with requirements of OST B3-1164-72 and valid drawing of packing.

Preservation is carried out taking in account the requirements of OST B3-2381-74.

2. ACCEPTANCE RULES

2.1 Major documents for the manufacture, test and acceptance of the regulator are these technical specifications, OST B3-1164-72 and set of documents as per specification PH 10.000CM.

2.2 All the purchased articles before installing in the regulator should be checked by incoming TID. Scope and sequence of incoming inspection are set in upon agreement with the representative of customer.

2.3 Tests of the regulator are subdivided into acceptance periodical and type tests.

2.4 Each regulator in the scope and sequence in compliance with table 1 is subjected to acceptance tests.

2.5 During the acceptance tests the regulators are submitted for acceptance in batches of 12-32 pieces. SPTA No.2 of regulators are submitted for acceptance in batches of upto 30 pieces.

Note: Number of all the articles in the batch can be reduced upon agreement ~~in the~~ with the representative of the customer.

2.6 Periodic tests are conducted two times a year on two samples in the scope and sequence as per table 1.

2.7 Type tests are carried out with the purpose of checking the correspondence of regulator to requirements of these technical specifications, in case of major changes in circuit, design or manufacturing technology of regulator which can affect the operation & features; in the need of checking of service life of regulator and measures, taken for elimination of defect of regulator; as well as on the initial production batch of series manufacture.

The necessity of conducting the type tests, including for service life, and representative customer in various environments

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The necessity of conducting the type tests, including for service life, is determined and agreed upon by manufacturer and representative of customer in volume sufficient for checking the effectiveness of the conducted measures or service life as per the coordinated test programme, guided by the types of testings of Table 1.

TABLE 1

Types of testings and checkings.	No. of items		Category of tests		
	Requirements	Methods	Acceptance.	Periodic	Type
1. Checking of completeness and correspondence with drawings	1.2.1	3.2	+	+	+
2. Test for vibration strength at fixed frequency	1.2.2	3.3	+	+	+
3. Checking of the correctness of electric wiring and functional parameters.	1.2.3.1 1.2.3.3	3.4.1- 3.4.4	+	+	+
4. Testing of the resistance of insulation					
a) under normal climatic conditions	1.2.4a	3.5	+	+	+
b) under increased temperature conditions	1.2.4b	3.1.3	-	+	+
c) under the conditions of increased humidity	1.2.4c	3.11	-	+	+
5. Test for the electric insulation strength	1.2.5	3.6	+	+	+
6. Test of water-tightness	1.2.9	3.7	+	+	+
7. Interchangeability checking	1.2.6	3.8	+	+	+
8. Test for the effect of.					
a) pulses of increased voltage	1.2.7a	3.9a	-	-	+
b) voltage of reverse polarity	1.2.7b	3.9b	-	-	+
9. Test for the absence in regulator of design elements and assembly units with resource frequencies upto 40Hz	1.2.8	3.10	-	-	+
10. Test for moisture resistance	1.2.9	3.11	-	+	+
11. Test for cold resistance	1.2.9	3.12	-	+	+
12. Test for heat resistance	1.2.9	3.13	-	+	+
13. Test for resistance against dew and hour frost effects	1.2.9	3.14	-	+	+
14. Test for the effect of sea (salty) fog	1.2.9	3.15	-	+	+

Continuation of Table 10

Types of testings and checkings.	No. of items		Category of test		
	Require-ments	Methods	Accep-tance	Perio-dic	Inter-
15. Test for the effect of cyclic change of ambient temperatures at	1.2.9	3.16	-	+	+
16. Vibration resistance test	1.2.9	3.17	-	+	+
17. Impact resistance test	1.2.9	3.18	-	+	+
18. Vibration strength test	1.2.9	3.19	-	+	+
19. Impact strength test	1.2.9	3.20	-	+	+
20. Reduced pressure effect test of ambient air:					
a) upto 460mm Hg.	1.2.9	3.21a	-	-	+
b) upto 170mm Hg.	1.2.9	3.21b	-	-	+
21. Guarantee operation test	1.2.10	3.22	-	+	+
22. Service life test	1.2.11	3.23	-	-	+
23. Test for effect of single impacts with big accelerations.	1.2.9	3.24	-	-	+
24. Test for effect of fumes of oil, petrol, kerosene, diesel fuel and low freezing liquids	1.2.9	3.25	-	-	+
25. "Y" and "N" - phon effect test	1.2.9	3.25	-	-	+
26. Radio interference level test	1.2.12	3.27	-	-	+
27. Disconnecting and reserving circuit operation check	1.2.33	3.45	-	+	+

Designations:

"+" - tests are carried out.

"-" - tests are not carried out.

Note: 1. The sequence of conducting the tests can be altered upon agreement of the representative of customer.

2. All the checkings for the correspondence to electrical parameters are conducted in the set with storage batteries unless in cases particularly specified in these technical specifications.

3. Testing methods determine the sequence of conducting vibration strength and impact strength tests.

3. CHECKING METHODS.

3.1 All the tests are conducted under normal climatic conditions except for those where the climatic conditions are specified separately.

Characteristics of normal climatic conditions:-

- a) Ambient air temperature - $+25 \pm 10^{\circ}\text{C}$;
- b) Relative humidity of the air - $45 \pm 80\%$;
- c) Atmospheric pressure - 630-800mm Hg.

Note: At a temperature higher than 30°C relative humidity should not be higher than 70%. Check and measuring devices should not have an accuracy class not below 0.5 for voltmeters and 1.0 - for ammeters.

3.2 Completeness, conformity to requirements of drawings, quality of the assembly, of outer finish, quality of the soldering, absence of loose fastenings is checked by visual inspection, visually-conformity of the wiring, ~~to~~ to electrical wiring drawing, and with the help of checking and measuring instruments, mounting and overall dimensions are checked.

3.3 Vibrations strength test at one frequency is carried out with the aim of detecting crude technological defects, made in the manufacturing process of the regulator. Prior to test technological checking of correctness of electrical wiring of regulator is carried out. Regulator in off condition without the shock absorbers is rigidly fastened to the platform of the stand in horizontal position with base downwards.

The test is carried out at one of the frequencies, within the range of 20-25Hz at an acceleration of 2g. Duration of the test is 30 minutes.

After the tests visual inspection of regulator and checking of the parameters as per methods of items 3.4.2 - 3.4.4 of these technical conditions is carried out without the operation of regulator for 3.5 hours.

Regulator is considered to have passed the test, if mechanical damages, loose, fastenings are not detected its parameters conform to the requirements of item 1.2.3.1a, 1.2.3.2, 1.2.3.3. of present technical specifications.

3.4 Checking of the correctness of electric wiring and functional parameters of the regulator are carried out in the following way:-

3.4.1 Checking of the correctness of the electric wiring is carried out by any method which ensures the checking of the regulator for correspondence with the diagram PH 10.000.33 or by device (tester) U 437 as per following method:

a) Readings of the Ohm meter of tester should correspond to the values of resistances, specified in Table-2.

TABLE 2

Nos. of contacts of plug connectors	Resistance value	Tester's scale.
1. Takeout Π p2, Π p3, Π p5, Π p6 fuses		
2. Π 2/6 - Π 2/17	1-4 Ohm	X1
3. Π 2/17 - Π 2/6	Not more than 15 Ohms	X1
4. Take out Π p4, insert Π p5.		
5. Π 2/6 - Π 2/17	1-4 Ohm	X1
6. Take out Π p5, insert Π p6.		
7. Π 2/6 - Π 2/17	1-4 Ohm	X1
8. Take out Π p6		
9. Π 2/4 - Π 2/7	24-33 Ohm	X1
10. Π 2/4 - Π 2/6	22-35 Ohm	X1
11. Insert Π p3		
12. Π 2/4 - Π 2/2	2.0-6.0 Ohm	X1
13. Take out Π p3 insert Π p2		
14. Π 2/4 - Π 2/2	2.0-6.0 Ohm	X1
15. Take out Π p2		
16. Π 1/2 - Π 1/1	210 $\pm$ 50	X10
17. Π 1/1 - Π 1/2	230 $\pm$ 100 Ohm	X10
18. Π 2/6 - Π 1/4	230 - 250 Ohm	X10
19. Π 2/9 - Π 2/2	2-5 Ohm	X1

Continuation of Table 2

Nos. of contacts of plug connectors	Resistance value	Tester's scale
20. W 3/1A-W 1/4	230-280 Ohm	X10
21. W 3/1B-W 1/4	230-280 Ohm	X10
22. W 1/4 - W 3/4A	230-250 Ohm	X10
23. W 1/4 - W 3/4B	230-250 Ohm	X10
24. W 2/2 - W 3/1B	Short circuit	X1
25. W 1/1 - W 3/5A	80-90 Ohm	X10
26. W 1/1 - W 3/5B	80-90 Ohm	X10
27. W 1/5 - W 3/3A	Short circuit	X1
28. W 1/5 - W 3/3B	Short circuit	X1
29. W 1/1 - W 1/5	Not more than 0.50hm	X1
30. W 3/2A - W 1/5	30-40 Ohm	X1
31. W 2/10 - W 3/2B	Short circuit	X1
32. W 2/10 - W 3/2A	Short circuit	X1
33. W 1/2 - W 2/8	1000 $\pm$ 500 Ohm	X100
34. W 2/8 - W 1/2	90-220 Ohm	X1
35. W 1/4 - W 2/8	210-280 Ohm	X10
36. W 2/7 - W 2/27	5-6 Kilo Ohm	X1000

Continuation of table 2

Nos. of contacts of plug connectors	Resistance value	Tester's scale
37. W1/3 - W1/1	5-6 Kilo Ohm	X1000
38. W2/7 - W1/6	Circuit break	X1000
39. W2/8 - W2/7	1200 $\pm$ 600 Ohm	X100
40. W2/9 - W2/4	1-4 Ohm	X1
41. W1/1 - W1/3	5-10 Ohm	X1
42. W2/17 - W2/7	5-10 Ohm	X1

b) supply "plus" of voltage to the W1/4 contact and "minus" - to contact W2/8.

The tester readings (scale X1) should correspond to the value of resistance maximum 1 Ohm between contacts W2-9, W2/2 W2/7- W1/46 and maximum 20 Ohms between contacts W2/9 - W2/4.

Disconnect the voltage.

c) Switch the tester to DC voltmeter (scale X50) connect "plus" of voltage to W1/1, and "minus" - to contact W1/2. Tester readings should correspond to the value of voltage 10-25 Volts between the contacts W2/7 and W1/5.

Disconnect the voltage.

d) Connect "plus" of voltage to contact W2/8, and "minus" - to contact W1/2. Tester readings should correspond to the value of resistance maximum 2 Ohm (scale X1) between the contacts W2/8 and W2/7.

h) checking of PW-10 unit.

Ohmmeter tester readings should correspond to the resistance values, specified in table 3.

TABLE 3

Nos. of the contacts of plug connectors.	Resistance value	Tester scale
1. W3/5A - W3/4A	0-100 Ohm	X1
2. W3/5A - W3/5B	short circuit	X1
3. W3/4A - W3/4B	short circuit	X1
4. W3/4A - W3/2A	Maximum 15 ohm	x1
5. W3/2B - W3/2A	short circuit	x1
6. W3/3A - W3/2A	2.0-6.0 Ohm	x1
7. W3/3B - W3/3A	short circuit	x1
8. W3/1A - W3/2A	2.0-6.0 Ohm	x1
9. W3/1A - W3/1B	short circuit	x1

1) Check the resistance of the circuits, specified in table 4.

TABLE 4

Circuits to be checked	Resistance value	Tester scale
1. Terminal B relay P2(wire No.6) - W1/2	Short circuit	x1
2. Terminal A relay P2(wire No.3) R ₂ (terminal 7 board 8)	Short circuit	x1
3. W2-10 - R5 (terminal 3 of board - 10)	27000±1500 Ohm	X1000
4. W3-2A - C1(wire No.8)	Short circuit	x1
5. W1/1 - C1(wire No.3)	Short circuit	x1

Install the fuses Wp2- Wp6, casing PH10.027 and unit W4-10, regulator to be closed with covers.

Note 1: When checking on a special stand the diagram of stand and method of checking should be agreed upon with representative of the customer at the manufacturing enterprise of regulator.

2. During all the tests "plus" of voltage is supplied to the plus connector contacts through Fuse 10A.

Note 3. Checking is carried out under voltage 27 ± 1 volts with removed 5M-10 unit, covers and PH10027 casing.

4. During the checking by tester terminal of the tester "068" is connected to the contact of connector which is specified in table first.

5. Resistance values specified in table 2-4 for the electric circuits with semiconductor devices are allowed to be specified respectively to the type of device used instead of U 437 tester.

3.4.2 Checking of the voltage(generator's) regulator value, maintained by the regulator during change of speed of rotation of armature of generator and load is carried out twice on a special stand. (connecting circuit diagram of the regulator is drawn on sheet 37a of the Russian text), in cold condition (from the beginning of the operation of regulator, not later than 5 minutes) and in heated condition (after the operation of regulator closed by covers for 4 hours together with the generator in no load condition at excitation current of 4.5-5A or in equivalent as per the heat mode on the stand of non-machine operation).

Checking is carried out in the following order:-

a) Connect the load upto 10A and smoothly raise the speed of rotation of armature of the generator upto 8000 rpm, thereafter smoothly lower it upto its halt. During this check the voltage of the generator which is maintained by the regulator in the speed range of 3650-8000 rpm;

b) Connect the load to 300±5A and smoothly raise the rotation speed of the generator's armature upto 8000 rpm, after which smoothly lower upto its halt. During the check the generator's voltage which is maintained by the regulator, in the speed range of 4150-8000 rpm.

Disconnect the charge.

Regulator is considered to have passed the test, if the

data of checking correspond to the requirements of items 1.2.3.1, a, & of these technical specifications.

3.4.3 Checking of frequency of the oscillations of generator's voltage, maintained by the regulator is carried out twice on special stand during the operation of the generator in parallel with the storage batteries in cold condition (not later than five minutes from the start of regulator's operation) and in heated condition (after the operation regulator closed with covers for 4 hours together with the generator at no load under 4.5-5A excitation current or in equivalent as per the heat condition, on the stand of non-machined operation).

Checking is carried out at smooth lowering of rotation speed of generator's armature from 8000 rpm to a speed corresponding to the end of flow of charging current of storage batteries. In this case, there should not be noticeable to the eye flickering of incandescent lamp with 10-15 Watt power and voltage 24-28Volts switched on to full voltage of generator.

Regulator is considered to have passed the test if the data of checking correspond to the requirements of item 1.2.3.2 of these technical specifications.

3.4.4 The checking for the voltage of disconnecting circuit operation, of faulty stand-by transistor-during the acceptance tests is carried out twice; in cold condition (within 5 minutes from the starting of operation) and in heated condition (after the operation of regulator closed with covered for 4 hours together with generator at no load condition under 4.5-5A excitation current or in equivalent as per the heat condition on stand of non-machine operation). Before the checking between contact W1/6 and "Minus" the incandescent lamp connected with a power of 3-4Watts voltage 24-28Volts and with the help of wire having resistance not more than 0.10hm, the contacts W1/1 and W2/7 are connected smoothly rotation speed of generator's armature is increased till the incandescent lamp starts glowing. At the moment when the glowing of lamp starts voltage of the generator is registered, thereafter the generator's armature rotation speed is lowered till it halts.

Regulator is considered to have passed the test provided the data of checking meet the requirements of item 1.2.3.3 of these technical specifications.

Note: 1. During the acceptance tests the checking of the operation voltage of disconnecting circuit is conducted with disconnected storage batteries.

2. Duration of the generator's operation under voltage of $\geq$ more than 30V should not exceed 30 seconds.

3.4.5 Checking of the operation voltage of disconnecting and stand-by circuit during the periodical tests is conducted after all electrical tests by means of short-circuiting the base-collector junction, of any of the transistors T2-T6 when the regulator cover is open. Speed of the generator's armature is smoothly raised till the fuse blows in the circuit of short-circuited transistor, after which (without repairing the blown fuse) regulator is checked as per the method of items 3.4.2, 3.4.3 of these technical specifications (without the operation of the regulator ~~as~~ for 4 hours).

After the checking of the regulator as per the specified method, short-circuiting is carried out of emitter-collector junction of this transistor with subsequent checking of regulator as per method of items 3.4.2, 3.4.3 of these technical specifications (without the operation of regulator for 4 hours).

Note: 1. If during the periodic tests, fuse blows in one of the groups $\Pi p-2$, $\Pi p-3$, $\Pi p-4$ $\Pi p-6$, $\Pi p-8$ - $\Pi p-9$, $\Pi p-10$ - $\Pi p-12$ then "shortening" bat in the junction circuit of faulty transistors is not installed.

2. In event of blowing of one fuse in each group $\Pi p-2$ - $\Pi p-3$, $\Pi p-4$ - $\Pi p-6$, $\Pi p-8$ - $\Pi p-9$, $\Pi p-10$ - $\Pi p-12$ at the time of periodic tests, then the checking of the operation of disconnecting circuit as per the method of the given item is not carried out.

3.5 Insulation resistance test is conducted by Megohmmeter (DC) with voltage 500Volts. Before the checking jumper between the contacts 1-12, 17 of plug connected U2 is installed.

Insulation resistance is measured between the body and successively each of the subsequent contacts: 1,6 of connector U1.

Insulation resistance is measured between body and each of the following contacts alternatively: 1,6 of plug connected U1.

Insulation resistance between electrically non-connected circuits is measured between contacts 1,6 of plug connector U1.

Regulator is considered to have passed the test provided the measured values of the insulation resistance meet item 1.2.4a of these technical specifications.

3.6 Checking of electrical strength of insulation is carried out on a special high voltage. Installation with a minimum capacity 0.5KVA by means of feeding total testing voltage for 1 minute.

Before the checking ~~k~~ jumper between the contacts 1-12, 17 of plug connector U2 is mounted.

Testing voltage is applied between the body and to each of the following contacts: alternatively: 1,6 of plug connector U1.

Test ~~of~~ electrical strength of insulation between the electrically non-connected circuits is carried out between the contacts 1 and 6 of plug connector U1.

The regulator is considered to have passed the test provided there was no breakdown or surface sparkover of insulation.

Note: 1. In event of subsequent tests of regulator before the installation on the vehicle, norm of the testing voltage is fixed as 80% of norm envisaged by requirements of these technical specifications.

2. Reduction of period of keeping time of insulation under voltage upto 1 second with simultaneous increase voltage ~~norm~~ for 25% is allowed. During this, the rise and drop

of testing voltage can be carried out practically instantaneously.

3.7 Water proof test:-

a) During the acceptance tests regulator in switches off condition with closed covers is placed into special chamfer. Internal cavity of the regulator with the help of special union and rubber tube is connected with external medium.

Inside the chamfer dry air with an excessive pressure of 0.2 ± 0.05 atmosphere ^{is supplied for 5 minutes.} ~~for 5 minutes is supplied.~~ In this case immediately after the air supply, terminal of the tube coming out from the chamfer is lowered 2-3cm into the container filled with water. Container filled with water is placed 20-30cm below the regulator.

Regulator is considered to have passed the test provided continuous or periodic release of air bubbles from the outlet end of the tube are not observed;

b) during the periodic tests regulator in switched off condition with closed covers is submerged into bath with covers water for 1 hour.

Temperature of the regulator should exceed the water temperature by $10-15^{\circ}\text{C}$ at the moment of its submerging.

Depth of submerging from the surface of the water to the point(upper) of regulator should not be less than 50-55cm.

Regulator is considered to have passed the test provided after the test the water does not appear inside it.

3.8 For checking the regulator for the correspondence to the drawings and the interchangeability at customer representative's demand disassembly of one of the samples from batch to be accepted is conducted. In this case checking of the correspondence of the components and assembly units to the requirements of design documents is made.

Interchangeability is checked by means of replacing in the disassembled regulator the components and assembly units.

from those available at the assembly line, with subsequent adopted adjustment.

In absence of components and assembly units at the assembly line two regulators are disassembled.

Regulator is considered to have passed the checking for interchangeability provided the components and assembly units correspond to drawings and after ~~the~~ ^{their} replacement correspond to items of tests of these technical specifications.

Note: Covers and other removable components are removed and replaced in the regulator.

3.9 Test of regulator for effects of:

a) Pulses of increased voltage is carried out on the stand with generator BIL-7500, by four parallelly connected batteries and load of 300A.

Pulses of increased voltage are obtained by means of disconnecting the load 300A at a maximum speed of generator 6500 ± 200 rpm.

Pulses are fed in cycles of 3 pulses in a row in each cycle. Number of the cycles is 7. Interval between the cycles is not less than 3 and not more than 10 minutes.

Value and duration of pulses are measured by oscillograph.

After the end of the test checking of the regulator as per method of item 3.4.2 ~~is~~ ^{is} carried out (without the operation of the regulator for 4 hours) of these technical specifications.

b) Checking for the effect of reverse polarity voltage of 30V is carried out by supplying into regulator circuit the "+" to contacts, 2, 4, 6 and "-" to contact I of plug connector 101 of regulator.

Regulator is considered to have passed the test for effect of increased voltage pulses and reverse polarity voltage, provided the parameters of regulator correspond to the requirements of item 1.2.5.16 of these technical specifications.

Note: Before obtaining the equipment ensuring stable frequency in the range of 5-10Hz, test in this range of frequencies is not to be carried out.

3.11 During the test for moisture resistance regulator in the switched off condition with the removed covers is placed in hygrostat with relative air humidity of 93-97% and temperature 20-25°C and is kept in it for 5 days.

Increase of the humidity upto 98% and temperature upto plus 35°C depending upon the temperature of ambient air is allowed, ~~from the hygrostat~~. After withdrawing the regulator ^{from the hygrostat} ~~not later than 2-3 minutes~~ ^{minutes} the checking of the following is conducted, ~~not later than 2-3 minutes~~.

a) insulation resistance as per method given in item 3.5 of these technical specifications,

b) parameters as per method of items 3.4.2-3.4.4 of these technical specifications (without the operation of regulator for 3.5 hours),

c) working capability of the regulator by switching on for 5 minutes as per the mode of testing for the guaranteed operation life at the speed of generator 6500 ± 200 rpm and load 200 ± 10 A,

d) absence of corrosion, except for the locating surfaces, anticorrosion protection of which is not envisaged by the drawings from the design point of view;

e) intactness of varnish and paint coatings.

After ~~the~~ keeping the regulator in normal climatic conditions with removed covers for 24 hours, insulation resistance is checked as well as electric strength of insulation as per method given in items 3.5, 3.6 of these technical specifications.

Regulator is considered to have passed the test provided it remains, operative, parameters and insulation resistance correspond to the requirements of items 1.2.3.1a, 1.2.3.2, 1.2.3.3, 1.2.4 of these technical specifications, there is ~~not~~ peeling off of varnish and point coatings and the corrosion traces are absent; after keeping in the normal climatic conditions electrical strength and insulation resistance correspond

3.10 Test for the absence of resonance of design components is carried out during type tests after the visual inspection and checking the electrical wiring;

Regulator in non-working condition with removed covers is rigidly fastened without shockabsorbers to the platform of the vibration stand.

Test is carried out in three mutually perpendicular position of regulator, specified in item 3.17 of the present technical specifications, as per the norms of table 5 at a smooth change of frequency of vibration in each sub-range.

Table - 5

Sub-ranges of frequencies, Hz	Amplitude value	
	Acceleration, g	Displacement, mm
From 5 to 10	0,05 - 0,30	0,5 - 0,8
Above 10 to 20	0,30 - 1,00	0,15 - 0,8
Above 20 to 25	1,00 - 2,00	0,5 - 0,8
Above 25 to 40	2,00	0,3

Note: Checking is made by one of the methods:-
by acceleration or displacement.

Time of passing each subrange should be sufficient for detecting the resonance, but not less than 2 minutes. During the process of testing, visually or using devices, absence of resonance of design components and assembly units of regulator is checked.

The regulator is considered to have passed the test, if in the range of specified frequencies, resonance of design elements and assembly units is absent, or the amplitude of oscillations of any element, assembly unit does not exceed twice the amplitude of its fastening point and if mechanical damages are not detected as a result of visual inspection.

to the requirements of items 1.2.4a, 1.2.5 of these technical specifications.

3.12 During the test for cold resistance regulator in switched off condition is placed in cold chamber the temperature in which is lowered down to minus 50°C and maintained with an accuracy of $\pm 30^{\circ}\text{C}$. On achieving this temperature regulator is kept in the chamber for 4 hours, after which checking is carried out for its working capability by switching on for 3 minutes as per the test mode for the guaranteed operation at the generator's speed is of 6500 ± 200 rpm and load of $200 \pm 10\text{A}$ and checking of parameters as per the method of items 3.4.2 - 3.4.4. (without the operation of the regulator for 4 hours) of these technical specifications outside the chamber, but not later than 2-3 minutes after withdrawing from the chamber under normal climatic conditions.

Regulator is considered to have passed the test provided it remains operative and parameters correspond to requirements of items 1.2.3.1b (~~use Russian letter indices~~), 1.2.3.2, 1.2.3.3 of present technical specifications.

Note: Regulator is allowed to be placed in a cold chamber, temperature in which earlier was brought down to minus 50°C . In this case, the regulator should be kept in the chamber for 4 hours.

3.13 During the heat resistance test temperature in the heat chamber is set at plus 50°C and maintained with an accuracy of $\pm 30^{\circ}\text{C}$.

Regulator is placed in the chamber, connected to the generator and storage batteries and is tested under a load of $200 \pm 5\text{A}$ at 6150 ± 100 rpm of generator's speed for a period of 4 hours.

After accomplishing the test checking of the parameters of the regulator as per method given in items 3.4.2-3.4.4 (without the operation of the regulator for 4 hours) and insulation resistance as per method of item 3.5 of these technical specifications is carried out.

Regulator is considered to have passed the test provided,

it remains in good working condition and parameters and insulation ^{resistance correspond to the requirements of} of items 1.2.3.1a, 1.2.3.2, 1.2.3.3, 1.2.4.5 of the given technical specifications.

3.14 During the test for the resistance against dew and hear frost effects, regulator in switched off condition is placed in cold chamber and is kept in it at temperature minus $20 \pm 5^{\circ}\text{C}$ for a period of 2 hours.

After this regulator is taken out of chamber, placed in the normal climatic conditions, connected to the generator, rotation speed of the armature of generator ^{is fixed at 4150 ± 100 r.p.m.} and load at $200 \pm 5\text{A}$.

Regulator in the specified mode works for 3 hours, in this case immediately after switching on and after every 30-60 minutes checking of working capability is carried out in the conditions of formation of hoar frost and dew as per method given in items 3.4.2-3.4.4 (without the operation of the regulator for 4 hours) of these technical specifications.

Regulator is considered to have passed the test provided at the time of staying in the normal climatic conditions after taking it out from the cold chamber parameters correspond to the requirements of items 1.2.3.1a, 1.2.3.2, 1.2.3.3 of these technical specifications.

3.15 During the sea (saline) fog effect test, regulator with the closed covers and ~~connected~~ connected cable set is placed in the chamber, in which temperature is set at $27-30^{\circ}\text{C}$ and is subjected to the effect of saline fog. Prior to the installation in the chamber, visual inspection is carried out for the absence of damaged varnish and paint coatings.

The regulator is placed in the chamber in such a way that in the process of test, splashes of solution as well as drops from the ceiling, walls and suspension system do not fall on it.

The fog is formed by the centrifugal aerosol apparatus or sprayer of salty solution, which is made by dissolving in distilled water of sodium chloride as per GOST 4233-66 in the

quantity of 35 ± 3 gm/litre. The fog should have dispersion of 1-10 μ m (95% drops) and water content of $2-3$ gm/m³.

Spraying of the solution is carried out for a period of 15 minutes after every 45 minutes. Total duration of the test is 2 days. Duration of the test is calculated from the moment of first spraying of solution.

After the end the test regulator is washed in distilled water after which it is dried for 1 hour at temperature $+55 \pm 2^\circ\text{C}$ with subsequent cooling and is subjected to visual inspection.

Regulator is considered to have passed the test provided no rust marks and damage of varnish and paint coatings are detected.

3.16 During the test for the resistance against cyclic changes on temperatures, regulator in switched off conditions is subjected to the effect of three cycles of changes of temperatures, which follow continuously one after another.

Each cycle is carried out in following sequence : Regulator is placed in cold chamber where the ~~chamber~~ temperature is brought down in advance minus 50°C and is kept for 4 hours at this temperature.

~~Immediately~~ ^{immediately} From cold chamber regulator is carried to heat chamber which has temperature plus 65°C and is kept in it for 4 hours, at this temperature.

During of keeping in the heat and cold chamber is calculated from the movement of achieving specified temperature of air in the chamber after loading the regulator.

On accomplishing the final cycle of test regulator is taken out of heat chamber and is kept in normal climatic conditions for 4 hours.

Thereafter visual inspection of regulator, checking of the parameters as per method given in items 3.4.2 - 3.4.4 (without the operation of the regulator for a period of 4 hours) of these technical specifications are carried out.

Regulator is considered to have passed the test if it remains operative and its parameters correspond to the requirements of items 1.2.3.1a, 1.2.3.2, 1.2.3.3 of these technical specifications.

Note: 1. ~~Resistance test~~
Resistance test against cyclic changes of temperatures is allowed to be carried out in one chamber with temperature changing speed of not less than 0.5°C per minute.

2. 3.17 Vibration resistance test is carried out on the stand

with a single component vertical or horizontal vibration alternatively in three-mutually perpendicular, positions

1. Horizontally - with base downwards;
2. Vertical connectors W1 and W2 to the right.
3. Vertical connectors W1 and W2 upwards in the frequency range specified in table 6.

Regulator with operating set of connecting cables is fastened on the stand on sockabsorbers.

Test is carried out with the operating regulator (speed of rotation of generator's armature is 4500-5000 rpm maximum load 25A).

Prior to test visual inspection is carried out.

TABLE 6

Frequency sub ranges, - Hz	Amplitude value	
	Acceleration, g	Displacement, mm
From 10 to 20	1.0 - 2.0	2.0
Above 20 to 30	2.0 - 4.0	1.2
Above 30 to 40	4.0	
Above 40 to 50	4.0 - 6.0	0.6
Above 50 to 60		Corresponds
Above 60 to 80	5.0	to
Above 80 to 100		acceleration
Above 100 to 120		

Note: Checking is done by one of the methods:
by acceleration or displacement.

Testing is carried out at a smooth change of frequency in each sub range in one direction from the lower frequency to the upper one or vice versa, in this case checking is carried out over the operation of the regulator as per method given in items 3.4.2, 3.4.3 of these technical specifications and by absence of blowing of fuse $\Pi p1$.

Duration of passing each subrange should be sufficient for the checking of the parameters, but not less than 2 minutes.

After the time of testing is over, checking of the parameters of regulator as per method given in items 3.4.2-3.4.4 (without the operation of the regulator for 4 hours) of these technical specifications is carried out.

Regulator is considered to have passed the test provided the mechanical damages are absent, fuse $\Pi p1$ does not blow and the parameters correspond to the requirements given in item 1.2.3.1a, 1.2.3.2, 1.2.3.3 of these technical specifications.

Note: If instability of any of the parameters of the regulator on each of these frequencies as well as on resonance frequency of shock absorption is detected, additional keeping for 15 minutes is carried out and this period is counted during the vibration resistance test.

As per the agreement with the customer's representative in the presence of resonance vibrations on the regulator on the shock absorbers, acceleration (amplitude) of vibration on the stands platform in the range from 0.7 to 1.4 of resonance frequency is allowed to be decreased by two times by comparing with Table 6.

3.18 Impact resistance is carried out on the impact stand.

Regulator is fastened on the stand on shock absorbers and is connected to the generator and storage batteries.

The test is carried out in a switched on condition of regulator (speed of rotation of the armature of generator is 4500-5000 rpm) in these mutually perpendicular positions of regulator, specified in the item 3.17 of these technical specifications, under the effect of impacts ~~for~~ ^{three} as per the norms of table 7 for the period of time necessary for checking the parameters as per method of items 3.4.2.

3.4.3 (Without the operation of the regulator for a period of 4 hours) of these technical specifications:

After the tests regulator is checked as per method given in items 3.4.2-3.4.4 (without the operation of the regulator for 4 hours) of these technical specifications.

TABLE 7

Accele- ration, g	Duration of the pulse, M sec.	Minimum number of impacts in each plane, V	Maximum number of impacts per minute
15	from 10 to 15	20	80

Regulator is considered to have passed the test provided mechanical damages are absent, fuse [p1] does not blow and parameters correspond to the specifications of items 1.2.3.1a, 1.2.3.2, 1.2.3.3 of these technical specifications.

3.19 Vibration strength test is carried out in a switched of condition of the regulator. Its visual inspection is carried out prior to the test.

Regulator is installed ^{on} the shock absorbers on the stand with single component horizontal ~~mutually perpendicular~~ or vertical vibration alternatively in three mutually perpendicular positions specified in the item 3.17 of these technical specifications and is subjected to the test in each position by the method fixed frequency as per the norms given in table 3.

TABLE 3

Fixed frequency, Hz.	Amplitude value		Total duration of the test, hours
	Accelera- tion, g	Displace- ment, mm.	
10	1.0	2.0	3.0
20	2.0	1.0	9.0
30	3.0	0.8	6.0
40	4.0	0.6	4.5
50		0.4	
60		0.3	
80	4.0	Corresponds to acceleration.	1.5
100			
120			

Note: The checking is performed by one of the methods:
by acceleration or displacement.

Test for the vibration strength is carried out simultane-
ously with the guarantee operation test as per the following
mode:- 1/3 of total duration of vibration in the first
position of regulator before guarantee operation tests, 1/3
of total duration of vibration in second position of the regu-
lator in the middle of guarantee operation tests and 1/3 of
total duration of vibration in the third position of regulator
after the guarantee operation test.

When the natural frequency of the shock absorber coincides
with the fixed frequency should be changed with the aim of removing
from resonance region of shock absorber.

After the test visual inspection and checking of the
parameters is carried out as per the method given in items
3.4.2-3.4.4 (without the operation of the regulator for
4 hours) of these technical specifications.

The regulator is considered to have passed the test
provided during the visual inspection no mechanical damages
are detected and the parameters correspond to the requirements.

norms given in items 1.2.3.1a, 1.2.3.2, 1.2.3.3. of these technical specifications.

3.20 Impact strength test is carried out in switched off condition of the regulator in the middle of guarantee operation tests. Prior to the test its visual inspection is made.

Regulator on the shockabsorbers is mounted on the stand alternate in three mutually perpendicular positions, specified in item 3.1.7 of these technical specifications is subjected to the effect of impacts in each position as per the norms given in table 9.

TABLE 9

Acceleration, g	Duration of the pulse, Micro Seconds	Total number of impacts	Number of impacts per minute
15	from 10 upto 15	2000	upto 100

Total number of impacts is distributed equally for the various positions of the regulator.

After the test visual inspection and checking of the parameters is carried out as per the method given in items 3.4.2 - 3.4.4 (without the operation of the regulator for a period of 4 hours) of these technical specifications.

Regulator is considered to have passed the test, provided during visual inspection nometanical damages are detected and its parameters correspond to the requirements of items 1.2.3.1a, 1.2.3.2, 1.2.3.3 of these technical specifications.

3.21 Test under the conditions of reduced pressure of ambient air is carried out in the pressure chamber at $\pm 25 \pm 10^{\circ}\text{C}$ temperature.

Prior to the test visual inspection and checking of the parameters of the regulator is carried out as per method given in items 3.4.2-3.4.4 of these present technical specifications

(without the operation of the regulator for a period of 4 hours).

a) the regulator is placed in a pressure chamber, then connected to the generator and storage batteries. Thereafter the pressure in the chamber is reduced down to 460mm Hg and the regulator is kept in the chamber for a period of 1 hour at a speed of rotation of generator's armature 4500-5000 rpm and load upto 25A.

After one hour is passed, pressure in the chamber is smoothly increased upto the normal pressure, regulators is taken out of the chamber and is visual inspection is made as well as the checking of the working capability as per method of items 3.4.2-3.4.4 of the present technical specifications (without the operation of the regulator for a period of 4 hours).

The regulator is considered to have passed the test, provided the regulator remains ~~is~~ ~~not~~ operative in the pressure chamber and in normal climatic conditions after taking it out of pressure chamber and its parameters correspond to the technical specifications of items 1.2.3.1a, 1.2.3.2, 1.2.3.3 of the present technical specifications.

5) The regulator in the switched off condition is placed in the pressure chamber after which a pressure of 170mm Hg is set in it and regulator is kept in such conditions for a period of 2 hours.

Then the pressure in the chamber is smoothly raised upto the normal pressure, regulator is taken out of the chamber, its visual inspection and checking of the efficiency is made as per the method of items 3.4.2-3.4.4. of the present technical specifications (without the operation of the regulator for 4 hours).

The regulator is considered to have passed the test, provided it remains operative and its parameters correspond to the requirements of items 1.2.3.1.a, 1.2.3.2, 1.2.3.3 of present technical specifications.

3.27 Generator operation test of regulator is carried out complete with the generator and storage batteries by 10 repeated cycles in accordance with table 10.

TABLE 10

Operation time	Load (A)	Speed of rotation of generator's armature (rpm)
6 hours	upto 10	3650 $\pm$ 300
25 hours	upto 10	6500 $\pm$ 200
10 minutes	upto 10	8000 $\pm$ 200
15 hours	200 $\pm$ 10	4150 $\pm$ 300
3.5 hours	200 $\pm$ 10	6500 $\pm$ 200
10 minutes	300 $\pm$ 10	4150 $\pm$ 300
10 minutes	300 $\pm$ 10	8000 $\pm$ 200

In the process of test ~~store~~ voltage is checked, which is maintained by regulator and which should be in the limits of 26.5-28.5V. After 1, 3, 5, 7, 9 cycles, checking of the regulator as per method of items 3.4.2-3.4.4 is made without the operation of the regulator for 4 hours) and after 2, 4, 6, 8, 10 cycles checking of the parameters as per method of items 3.4.2-3.4.4 is made (without the operation of the regulator for 4 hours) of present technical specifications.

After accomplishing the guarantee tests additional tests are carried out for 5 hours as per the mode of present item (speed of rotation of generator's armature 6500 ± 200 rpm and load 200 ± 10 A) as well as visual inspection and checking of the parameters as per method of items 3.4.2-3.4.4. is carried out (without the operation of regulator for a period of 4 hours) of present technical specifications.

Regulator is considered to have passed the test provided the data of check-ups meet the requirements of items 1.2.3.1a, 1.2.3.2-1.2.3.3 of present technical specifications.

10. The cost of service here is carried out

as per method of item 3.22 of present technical specifications with carrying out the scheduled maintenance after the tests in the scope of guarantee operation envisaged in the operating instructions.

Regulator is considered to have passed the service life test, provided at the time of tests no additional works are required to be carried out, except for the ones envisaged in the operating instructions, and the regulator remains operative during the additional test for 2.5 hours as per the mode of item 3.2.2 of the present technical specifications (speed of rotation of generator's armature 6500 ± 200 rpm and load 200 ± 10 A).

Note: Number of hours and switchings on, made during the guarantee operation is included during the testing for service life.

3.24 Conformity of the regulator and its installation with requirements for stability to the destroying effect of single impacts with big accelerations is confirmed by full-scale tests on the vehicle with the ^{entries} ~~entries~~ in the report of joint tests.

3.25 Before the elaboration of stand test methods for the stability against the effect of oil, petrol, kerosene, diesel fuel and low freezing coolant liquids ^{fuels}, conformity of the regulator to this requirements ~~is~~ is confirmed during the full-scale tests with the entries in the report of joint tests.

3.26 Effect test and γ -phon is carried out as per the special programme and method agreed upon with the customer's representative and the enterprise conducting the given tests.

3.27 Test for determining the levels of interferences to radio reception and operation of TTY interphone equipment is carried out as per method P-150-71 in the scope agreed upon with the customer's representative.

4. TRANSPORTATION AND STORAGE

- 4.1 Packed regulators can be transported by any means of transport ensuring the protection from the effects of precipitation and mechanical damages.
- 4.2 The storage of the regulator should be carried out in accordance with the requirements of OST B3-1164-72 and OST B3-2381-74.

5. INSTRUCTIONS FOR USE:

- 5.1 The regulator should be used in the conditions and modes corresponding to the requirements of present specifications.
- 5.2 Use of the regulator should be agreed upon as per GOST 2.117-71 and OST -3-10-71.

6. SUPPLIER'S GUARANTEE

- 6.1 The regulator should be accepted by the technical inspection department supplying enterprise.
- The supplier guarantees the conformity of the regulator to the requirements of present technical specifications and trouble-free operation, provided the following instructions, for use, transportation and storage set by technical specification are observed by the consumer.

The guarantee period is fixed as 500 running hours of operation of main engine (2000 km of vehicle running).

Guarantee period of storage regulators preserved taking into the consideration OST B3-2381-74 in the storage facilities of consumer should not exceed 5 years or if packed in the tight covers as per OST B3-2381-74 should not exceed 3 years.

REGISTRATION LIST OF CHANGES

Chan-ge.	Number of sheets (Pages) Chan-ge-d Repla-aced. New Cance-llled	Total sheets (pages) in the docu-ment.	No. of docu-ments.	Ref.No. of cov-ering docum-ent & date.	Sign-ature	Date
3	All	32	42	Ba1678-77		5.8.77
4.	3, 4, 8, 10, 12, 14, 15, 16, 23, 35, 39	18, 19, 20, 21		AW1703-78		13.12.78
5.	26		42	AW11212-78		17.1.79
6	1		42	AW12059-79		17.12.79
7	1, 3, 4, 8, 10, 13, 16a, 14, 19, 23, 26, 27, 35, 15.		42	AW11478-78		2.1.80
8	17 17a		43	AW11892-79		3.1.80
9	16a, 17, 18, 23, 26, 27, 28, 30, 31, 32, 33, 34, 35					
10	11 16a - 137a		44	AW11401-80		20.03.80
11	113		44	AW11417-80		24.3.80
12	112		44	AW11798-80		29.7.80
13	1115		44	AW11445-80		11.9.80
14	113, 38, 39		44	AW11882-79		11.9.80
15	1116, 29, 30, 31		44	AW1181-81		17.4.81
16	114, 10, 18		44	AW11841-81		31.10.81

~~AV - parameter checking devices (voltmeter-magneto-electric system) shielded class of accuracy 0.5)~~

L I S T

of documents to which references are given in present technical specifications

Designation of the document	No. of the pages of technical specification to which the references for the documents are given
PH10.000-10 X 3	3, 12
PH10.000 C 1	2, 3, 6, 7
PH10.000 I 4	3
GOST 2-117-71	37
PTM3-150-71	6, 36
OCT B3-2381-74	6, 37
GOST 4233-66	27
OCT B3-1164-72	2, 6, 7, 37
OCT 3-10-71	37
PH10.000 3 M	6
PH10.000 C x M	3

LIST OF ENCLOSURES

1. Voltage Regulator PH-10 Electric circuit diagram
PH10.000 33.
2. Voltage regulator PH10 outline drawing PH10.000 14

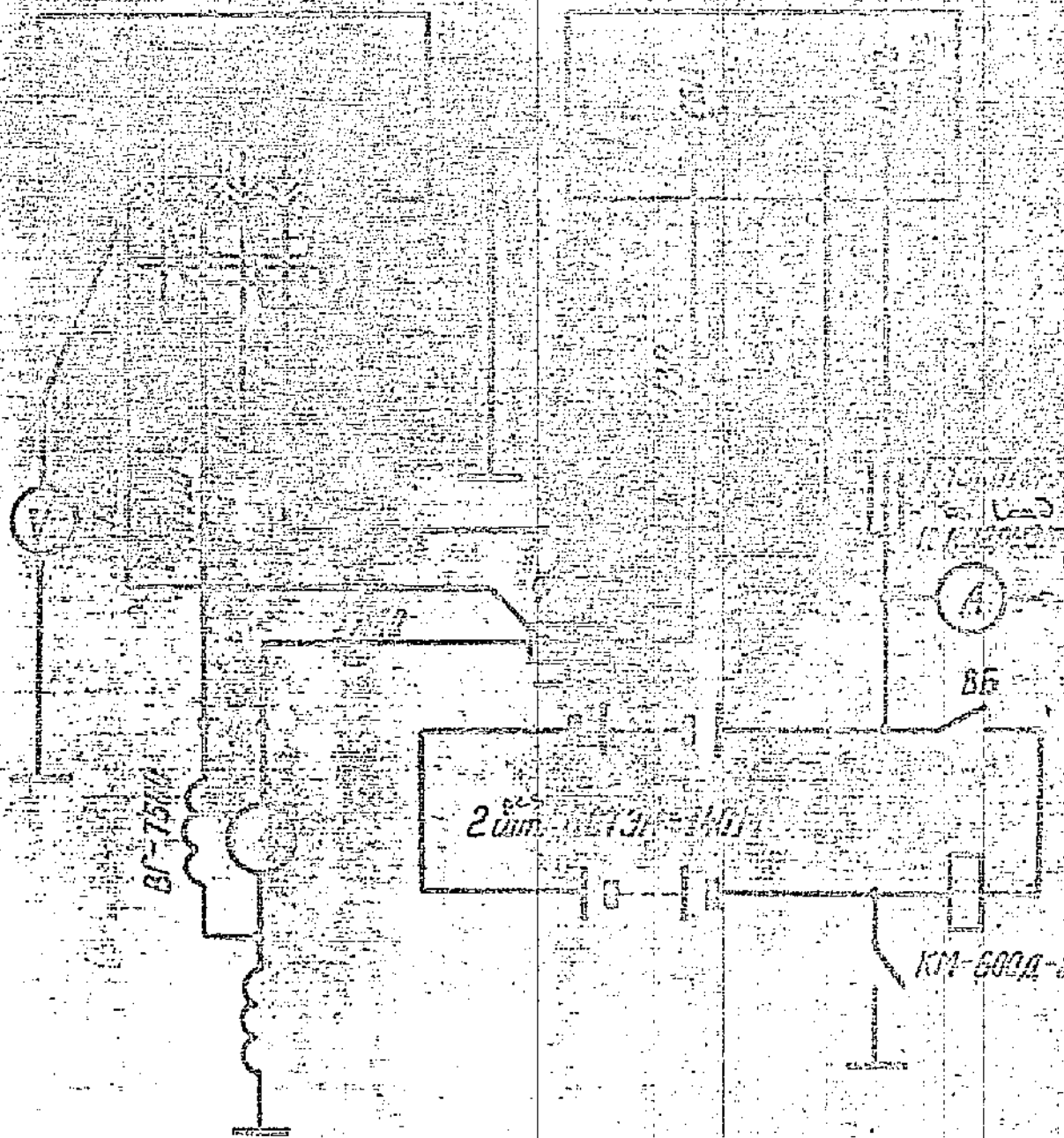


Fig. Voltage regulator PM-10 Electric diagram of connections.

Designation of Wires.

N 40 - Wire 50 mm^2 $L = 6800 \text{ mm}$	N 172 - wire 1.5 mm^2 $L = 1100 \text{ mm}$
N 110 - " 2.5 mm^2 $L = 6800 \text{ mm}$	N 173 - " 0.75 mm^2 $L = 450 \text{ mm}$
N 130 - " 50 mm^2 $L = 280 \text{ mm}$	N 174 - " 1.5 mm^2 $L = 200 \text{ mm}$

Increase in the wire length of the wires with respective increase in the cross section is allowed.

A, V - Parameter checking devices (voltmeter-magneto-electric system shielded class of accuracy 0.5)