

Results of qualification tests are considered to be unsatisfactory, if unsatisfactory results have been obtained even as per one test group or total number of defective lamp holders, lights or caps exceeds the set value.

3.2.2.6 While obtaining the unsatisfactory results of qualification tests as per group K-11 modifications of packages or packing technology, should be carried out, after that new tests as per this group for lamp holders, lights or caps of the same initial series should be carried out.

3.2.2.7 Lamp holders, lights or caps subjected to the tests as per groups K-3, K-10 are not subjected to the shipment.

3.2.3 Approval tests.

3.2.3.1 Volume of batches of lamp ^{ho}lders, lights or caps submitted for acceptance should not be less than 100 pieces and not more than 2000 pieces

Remark: while placing a small order, it is allowed to submit for acceptance the batches of smaller volumes upon the agreement with customer.

3.2.3.2 Content of tests, ~~tests content~~ division for test group and sequence of tests within the limits of each group and also order of tests groups within the limits of category should be according to table 6.

TABLE 6

Tests group	Sequence of tests	Type of tests	Items of technical specifications		Remarks
			Technical requirements.	Test methods	
B-1	1.	Appearance check	2.1.3	3.3.1.2	
	2.	Marking check	2.7.1	3.3.7.1	
B-2	1	Checking of design and dimensions	2.1.2	3.3.1.1	
B-2	2	Checking of contacts mobility	2.1.5	3.3.1.4	
C-3	1	Checking resistance of electrical contacts	2.2.1.3	3.3.2.1.1	
	2.	Checking of insulation electrical strength	2.2.1.1.	3.3.2.1.2	
	3.	Checking of insulation resistance	2.2.1.2	3.3.2.1.3	

3.2.3.3. For conducting the tests selective single stage and complete control are used:

Selective control is used for the batches of 100 pieces and more than that.

3.2.3.4 During selective control plans given in the table 7 are used:-

TABLE 7

Tests Group	Standard control	Volume of control pieces.
	Simplified control	Sample pieces.

TABLE 7

Tests group	Standard control		Simplified control		Remark
	Volume of sample, pcs	Acceptance number, pcs	Volume of sample, pcs.	Acceptance number, pcs.	
C-1	50	2	20	1	
C-2	100	0	50	0	
C-3	50	0	20	0	

Remark: 1. Sample for groups C-1 and C-3 is completed from sample C-2.

2. Re-submitted batch is checked with the samples of doubled volume at the same acceptance numbers as at initial presentation.

3.2.3.5 At complete control plans given in table 8 are used:

TABLE 8

Test group	Volume of batch, pieces	Acceptance number, C, pieces, %	
		Initially	Repeatedly
C-1		1	0
C-2	from upto 50 pieces	0	0
C-3		0	0
C-1		2%	0
C-2	Above 50 pieces	0	0
C-3		0	0

3.2.3.6 Quantity of returned batches, according to which decision about stopping of acceptance, is taken is equal to 3.

3.2.3.7 Lamp holders, lights, caps are subjected to rechecking, before delivering to consumer, if they were in the store houses during the time exceeding six months.

Rechecking date should be additionally shown in accompanying document.

3.2.4 Periodic tests

3.2.4.1 Content of tests, tests content of division for tests groups periodicity of tests for each group, sequence of tests within the limits of each group and also order of tests within the limits of category should be according to table 9.

TABLE 9

Tests group	Sequence of tests	Type of tests	Periodicity, months	Items of technical specifications		Remarks	
				Technical requirements	Test methods		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Π-1	*	Test for failure-free performance	3	2.6.1	3.3.6.1.1		
	1.	Checking of mass		2.1.4	3.3.1.3		
	2.	Test for vibration resistance		2.3.1.a	3.3.3.2		
	3.	Test for vibration strength at short term effect		2.3.1.a	3.3.3.3		
	4.	Test for impact strength and impact stability	6	2.3.1b	3.3.3.4 3.3.3.5		
	5.	Test for heat resistance during operation,		2.4.1.a	3.3.4.2		
	6.	Test moisture resistance at short term effect.		2.4.2b	3.3.4.5		
	Π-2	7.	Test for cold endurance during operation		2.4.1a	3.3.4.3	
		8.	Test for the effect of change in temperature		2.4.1b	3.3.4.4.	
		9.	Test for the effect of reduced atmospheric pressure		2.4.1c	3.3.4.6	
10.		Test for wear resistance		2.1.6	3.3.1.5		
Π-3		Check ^{ing} of packages	12	2.7.1	3.3.8		

Remark:

1. Lamp holders, lights, caps as per each test group, are tested with independent samples.
 2. Lamp holders ~~lights~~ and caps which are the component part of lights (see the Table. 1) are not subjected to the tests.
- 3.2.4.2 Samples should be completed for test groups П-1, П-2 from lamp holders, lights, caps of any climatic version as per the same type from each group, given in Table 10.

Table 10.

Group of articles of signalling devices	Types of articles of signalling devices
1	ПМ1, ФМ1, ФМ2
2	ФМ3, ФМ4, ФМ5
3	ПМ1, ФМ1, ФМ2, ФМ3
4	ПММ1, ФММ1, ФММ2, ФММ3, ФММ5
5	ПММ2
6	ПММ3
7	ПММ3, ПММ4
8	КС8

Test results refer to all types of given group and climatic versions.

3.2.4.3 For test group П-3, the samples are equally completed from the total number of lamp holders, lights and caps, provided by the present technical specifications.

3.2.4.4 Test as per group П-1 is carried out according to plan of single stage control with sample of 50 pieces with acceptance number, equal to zero.

- 3.2.4.5 Test as per group $\Pi-2$ is carried out according to plan of double stage control with samples of $\Pi_1=15$ pieces, $\Pi_2=15$ pieces with acceptance number equal to zero.
- 3.2.4.6 Test as per group $\Pi-3$ is carried out according to plan of double stage control with samples $\Pi_1=30$ pieces, $\Pi_2=60$ pieces with acceptance number $C_1=0, C_2=0$.
- 3.2.4.7 Total number of defective articles for tests group $\Pi-1, \Pi-2$ should not exceed 1.
- 3.2.4.8 While obtaining the unsatisfactory results of tests as per group $\Pi-3$, delivery of lamp holders lights or caps should be stopped.

Supplier in common with customer's representative analyses the causes of unsatisfactory results of tests, work ^{out} and agree the measures for improvement of packing quality. ~~With the customer's representation.~~ After introduction of the measures in production, the new tests as per given group are carried out.

When obtaining the satisfactory results of new tests, the delivery of lamp holders, lights or caps may start again.

- 3.2.4.9 Lamp holders, lights, caps subjected to periodic tests are not subjected to the delivery.

Lamp holders, lights, caps undergone the tests as per group Π_3 , are subjected to delivery if their parameters correspond to the norms of acceptance and delivery.

- 3.2.5 Test for durability. -

3.2.5.1 The periodicity of tests-every two years.

3.2.5.2 Duration is tested with sample of 20 pieces, of ~~same~~ lamp holders, lights of any climatic version of the same type, each group, ~~announced~~ specified in table 10 with

acceptance number equal to zero.

Test results refer to all types of given group and climatic versions.

3.2.5.3 Lamp holders, lights undergone the tests for durability, are not subjected to the delivery to consumers.

3.2.6 Test for keeping quality.

3.2.6.1 Test for keeping quality.

Tests are evaluated as positive if experiment value of probability of reliable storage for each storage condition during established periods of keeping quality will be not less than $P_x = 0.98$.

Failure free performance is tested as per the plan of single stage control with sample in quantity of 30 pieces with acceptance number, equal to $C=0$.

If the tests for failure-free performance were carried out at the end of keeping quality period and unsatisfactory results, were obtained according to them, supplier and customer's representative analyse the defective lamp holders, lights or caps and according to obtained results, they take a decision about the necessity of conducting the measures for increasing keeping quality of lamp holders, lights or caps of current production.

If tests for failure free performance were carried out during keeping quality ^{period} control and unsatisfactory results were obtained as per them, supplier works out and agrees with customer's representative the required measures for removing the causes of emergence of defective lamp holders, lights or caps and introduces them in production.

In this case earlier introduced measures are taken into account.

Repeated tests are carried with lamp holders lights or caps manufactured with regard to specified above measures after their storage for the time, equal to that, after which initial tests of lamp holders, ^{lights} or caps for failure free performance had been carried out.

Remark: Value F_x should be considered only as evaluation criterion of tests results for keeping quality.

These index should not be used at calculation of apparatus reliability.

3.2.6.2 Defective lamp holders, lights or caps, detected during tests should be analysed immediately after their revealing.

Defective lamp holders, lights or caps detected in sample Π_1 during the tests as per plans of selective double stage control are analysed by the manufacturer in common with customer's representative till the tests of sample Π_2 are over.

On the basis of analysis results, manufacturer and customer's representative take decision about necessity and periods of development and introduction of measures into production for elimination of causes of defective lamp holders, lights or caps emergence.

3.3 Methods of control.

3.3. All tests, if there are no special instructions in the present technical specifications should be carried out in the normal climatic conditions according to GOST 16962-71.

All measurements should be carried out with the same devices before starting and after finishing ^{of} each test. See List of test equipment and measuring instruments is given in Appendix 3 of the present technical specifications.

3.3.1 Checking of the conformity to the requirements for designs.

3.3.1.1 General view, overall mounting and connecting dimensions (item 2.1.1) are checked by collation with drawings and by measurements of dimensions with the help of measuring facilities ensuring the measurement with error, not exceeding the set in the drawings value.

3.3.1.2 Appearance of lamp holders, lights or caps (item 2.1.2) is checked by external inspection and collation with the model of appearance in accordance with OTY 11.110.070.001.

3.3.1.3 Mass of lamp holders, lights and caps (item 2.1.4) is checked by weighing on balance ensuring the weighing accuracy $\pm 5\%$

3.3.1.4 Mobility of contacts (item 2.1.5) is checked by 3 times insertion of the gauge, in this case contact should come back to initial position.

3.3.1.5 Lamp holders and lights for wear resistance (item 2.1.6) are tested by 100 times insertion of the gauges in normal climatic conditions.

The first and the last 10 insertions should be carried out under electrical load, shown in table 11.

In this case, the presence of electrical contact, is controlled.

TABLE 11

Type of Lamp holders, lights	Electric load Voltage, V	Current, A
$\Gamma PM1, \Gamma PM2, \Phi PM1, \Phi PM2, \Phi PM3$	2,3	1,5
$\Gamma WM1, \Gamma WM3, \Phi WM1, \Phi WM2$	2,5	0,54
$\Gamma PM3$	3	0,2
$\Gamma M1, \Phi M1, \Phi M2$	28	0,05
$\Gamma WM2, \Gamma WM4, \Phi WM3, \Phi CM 5$	95	0,003
$\Phi M3, \Phi M4, \Phi M5$	without electrical load	

After test, resistance of electrical contact is checked.

Lamp holders, lights are considered to have passed the tests if:

- a) during the test under electric load, breaking of electrical contact is not observed and electric ~~is not~~ breakdown and surface spark over of insulation are absent;
- b) after test, ^{me}mechanical damages, which caused or may cause (according to analysis results) the loss of serviceability; are absent, resistance of electrical contact, corresponds to the requirements of item 2.2.1.3 movement of movable contacts is accurate.

3.3.2 Checking of the conformity to the requirements of electrical parameters.

3.3.2.1 Electric parameters of lamp holders and lights (item 2.2.1) are checked according to the methods specified in items 3.3.2.1.1; 3.3.2.1.2; 3.3.2.1.3:

3.3.2.1.1 Resistance of electrical contact of lamp holders and lights (item 2.2.1.3) is checked at DC 0.5 to 1,0A at a voltage of 30V by ammeter voltmeter method or any other

methods, measuring error should not exceed $\pm 10\%$.

3.3.2.1.2. Electrical ^{strength of insulation} of lamp holders and lights (item 2.2.1.1.)

is checked on high voltage test unit ~~with~~ of power not less than 0.5KW by feeding the test voltage, whose value is specified in item 2.2.1.1. between the terminal leads of contacts and between any terminal lead of contact and *body*. Test voltage is supplied starting from zero or from the value not exceeding the rated voltage.

Voltage rise upto test value is done smoothly or equally in steps with a speed of about 10% from the value of test voltage in 1 second.

Insulation is checked by test voltage for 1 min. after that voltage is smoothly or in steps reduced down to zero. Measurement error of test voltage should not exceed $\pm 50\%$.

Holding time of insulation at a voltage in normal climatic conditions may be reduced to 1 second with simultaneous increase of test voltage by 300, in this case increase and decrease of test voltage may be carried out practically in a moment.

3.3.2.1.3 Insulation resistance of lamp holders and lights

(item 2.2.1.2) is checked by devices for measurement of insulation resistance while ^{applying} ~~applying~~ the voltage of about 250V between the terminal leads of contacts and ^{also} ~~also~~ between any contact and body of lamp holders or lights.

Readings, determining the insulation resistance are taken after holding the insulation at a voltage for 1 min.

If device reading is set within the time less than 1 min. the holding time of insulation at a voltage may be shortened.

Insulation resistance is measured with devices with error, not exceeding $\pm 20\%$.

3.3.2.2 Electric parameters of lamp holders and lights during minimum operating time (item 2.2.2) and capability of lamp holders and lights to function within the limits of the values of electrical operating conditions, permitted by the present technical specifications, are checked while testing for durability and failure-free operation.

3.3.2.3 Electric parameters of lamp holders and lights during keeping quality period (item 2.2.3) are checked while testing for keeping quality.

3.3.2.4 Electric parameters of lamp holders and lights during and after the effect of factors, are checked, while checking of conformity to the requirements of stability under the effect of special factors.

3.3.3 Checking of conformity to the requirements for stability against mechanical effects.

3.3.3.1 Stability of lamp holders, lights and caps against mechanical effects (item 2.3.1) is checked by the following tests:

- a) for vibration resistance.
- b) for vibration strength during continuous and short-term effects.
- c) for impact strength
- d) for impact stability
- e) for the effect of ~~single impacts~~ *linear loads*.
- f) ~~for the effect of single impacts~~
- g) for the effect of acoustic noises

Tests are carried out on a special fixture, ensuring the transmission of given ~~at~~ acceleration near the places of articles fastening.

Lamp holders, lights and caps are fixed on the fixture, which in turn ^{is} rigidity fixed to the bench table.

Fastening of articles and plates with the articles to the fixtures should correspond to GOST 16962-71.

Parameters of conditions are set in check point, which is selected on fastening fixture just near the place of articles fastening.

Conductors from devices, soldered to the terminal leads of contacts of lamp holders and lights should be rigidly and without stretching fixed on the fixture.

Articles with one of the types of lamps are rigidly fixed on the bench table simultaneously in three position: vertical, horizontal and vertically inverted.

Quantity of articles, fixed in each position, should be approximately the same.

External inspection is carried out before and after each test.

Tests of lamp holders, lights for vibration resistance, impact resistance, acoustic noises and resistance against linear acceleration are carried out at an electrical load specified in table 11.

Lamp holders and lights are considered to have passed the tests, if:

- a) during the tests for vibration resistance, impact resistance, resistance against linear acceleration, there is no breaking of electric contact
- b) during the tests and after the tests, mechanical damages are absent,
- c) after the tests, for vibration strength, impact strength, *effect of single impact and* effect of linear loads, the marking remains legible and mechanically strong, and stamping preservation is ensured, resi-

contacts

stance of electrical^r corresponds to the requirement of items 2.2.4.3.

Upon the agreement with customer's representative, the external inspection may be carried out before starting and *after* finishing of all mechanical tests.

3.3.3.2 Vibration resistance of lamp holders, ~~and~~ lights and caps (item 2.3.1a) is checked according to GOST 16962-71 by the method ~~of~~ 102-1 degree of rigidity XV.

3.3.3.3 Vibration strength of lamp holders, lights and caps (item 2.3.1a) is checked according to GOST 16962 -71 ~~is~~ by method 103-1-1 degree of rigidity XV.
~~checked according to~~

After checking of vibration resistance, repeated test for vibration resistance by the method shown in item 3.3.3.2 is carried out.

3.3.3.4 Impact strength (item 2.3.1.b) is checked as per GOST 16962-71 by method 104-1 degree of rigidity IV without electrical load.

3.3.3.5 Impact resistance of lamp holders, lights and caps (P.2.3.1d) is checked as per GOST 16962-71 by the method 105-1 degree of rigidity IV.

3.3.3.6 Stability of lamp holders lights and caps against the effect of single impacts (item 2.3.1b) is carried out as per GOST 16962-71 by the method 106-1, degree of rigidity V without electric load.

3.3.3.7 Stability of lamp holders, lights and caps against the linear (centrifugal) loads (P.2.3.1.g) is checked as per GOST 16962-71 by ^{the} method 107-1, degree of rigidity-IV.

3.3.3.8 Stability of lamp holders, lights and caps against the effect acoustic noises (item 2.3.1e) is checked as per GOST 16962-71 by the method ¹⁰⁸⁻¹ ~~108-1~~, degree of rigidity-II.

Test duration - 30 min.

3.3.4. Checking of conformity to the requirements for stability under climatic effects.

3.3.4.1. Stability of lamp holders, lights and caps under climatic effects (item 2.4.1) is checked by the following tests.

- a) for heat resistance
- b) for cold resistance
- c) for the effect of change in temperature
- d) for the effect of hoar frost and dew.
- e) for moisture resistance (continuous and short-term)
- f) for the effect of decreased atmospheric pressure.
- g) for the effect of salt fog.
- h) for mould growth.

All tests, excluding the tests for heat resistance are carried out without electrical load.

External inspection is carried out before test.

Remarks: 1. During continuous sequence of tests; the parameters, checked at the end of previous type of tests, may not be checked upon the agreement with customer.

2. Legibility ^{and} ~~and~~ mechanical strength of marking, stamping preservation may be checked, once after all types of climatic tests.

3.3.4.2 Heat resistance of lamp holders, ^{Lights} and caps (item 2.4.10) is checked as per GOST 16962-71, by the method 201-2 at temperature of about $+85 \pm 3^{\circ}\text{C}$ ($358 \pm 3^{\circ}\text{K}$).

Before ~~heat~~ ^{test} resistance of electrical contact and insulation resistance are measured. Lamp holders, lights and caps are placed in the chamber at a distance not less than 5cm from each other and not less than 5cm between the articles and devices measuring the temperature.

Electrical load is supplied to the lamp holders, lights ~~and~~ in accordance with table 11, this load is held for 5 minutes, after that the temperature in the chamber is increased upto 85°C (358°K) and the articles are allowed to stand at this temperature for 1 hour.

On expiry of the exposure time, without extraction of lamp holders, lights from the chamber or within 3 minutes after extraction, insulation resistance should be measured.

After extraction of lamp holders, lights and caps from the chamber and exposure in normal climatic conditions for 1 hour, external inspection and the following checks ~~for~~ should be carried out:

- of legibility and mechanical strength of marking;
- of stamping preservation;
- of resistance of electrical contact, ~~lamp holders, lights~~ *Lamp holders, lights* and caps are considered to have passed the tests, if:-
 - a) at the ^{end} ~~end~~ of test, insulation resistance corresponds to the requirements of item 2.2.1.2
 - b) after test and exposure in ~~the~~ normal climatic conditions marking remained legible and mechanically strong, stamping preservation was ensured, resistance of electrical contact corresponds to the requirements of item 2.2.1.3.

3.3.4.3 Cold resistance of lamp holders, lights and caps (item 2.4.1a) is carried out as per COST 16962-71 by the method 203-1 at temperature of about $-60 \pm 3^{\circ}\text{C}$ ($213 \pm 3^{\circ}\text{K}$).

Before test insulation resistance is measured. Lamp, holders, lights and caps is held at given temperature for 1 hour.

On expiry of exposure time, without extraction of lamp holders, lights and caps from chamber or within 3 minutes,

after extraction, insulation resistance and electrical strength of insulation are checked.

After extraction of lamp holders, lights and caps from the chamber and exposure in normal climatic conditions ~~for~~ for 1 hour, external inspection and the following checks should be carried out:

- of legibility and mechanical strength of marking;
- of stamping preservation ~~of resistance of electric~~
- ~~contact~~ of resistance of electric contact;

Lamp holders, lights and caps are considered to have passed the tests, if

a) at the end of test, insulation resistance corresponds to the requirements of item 2.2.1.2; electrical strength of insulation corresponds to the requirements of item 2.2.1.1.

b) after test and exposure in normal climatic conditions, corrosion on the metallic parts has not been found, marking remained legible and mechanically strong, stamping preservation was ensured, resistance of electric contact corresponds to item 2.2.1.3.

3.3.4.4. Testing of holders, lights and caps for the effect of change in temperature (item 2.4.1.6) is carried out as per COST 16962-71 by the method 205-1 at temperature of about $-60 \pm 3^{\circ}\text{C}$ and $+85 \pm 3^{\circ}\text{C}$ ($213 \pm 3^{\circ}\text{K}$) and ($358 \pm 3^{\circ}\text{K}$).

Quantity of cycles is equal to three.

Before test external inspection is carried out and resistance of electrical contact and insulation resistance are measured.

Lamp holders, lights and caps are subsequently held.