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INDICATIVE DRAWING

**RUBBER – METAL BUSHES
AND PINS**

TECHNICAL SPECIFICATIONS

TY 10542-88

EXTRACT

CONTRACT

No PB/835606213601

FOR REFERENCE ONLY

TY 10542-88

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INDICATIVE DRAWING

RUBBER – METAL BUSHES AND PINS

**TECHNICAL SPECIFICATIONS
TY 10542-88**

Extract

These drawings are only for reference. Actual drawings may be different and shall be issued at the time for procurement.

Present technical specifications pertain to rubber – metal bushes and pins, henceforth named as bushes and pins meant for works in press fitted condition as balls, receiving alternate radial loads and reciprocating rotation at ambient air temperature minus 45 to 50°C in different roads and climatic conditions.

Conventional designation of bushes and pins during ordering consists of their name, drawing number and designation of technical specifications; for example:

Bush 105.44.sb112 TY 10542-88
 Pin 675-35.sb119 TY 10542-88

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1. TECHNICAL REQUIREMENTS

1.1. Bushes and pins should comply with requirements of present technical specifications, drawings, upon agreement between manufacturer and customer as per technological document approved in established order.

1.2. Fittings for bushes and pins should comply with drawings of manufacturer, upon agreement with customer, and requirements specified in enclosure 2 as per delivery and acceptance of fittings.

1.3. Bushes and pins are manufactured from rubber type ИРП-1393.

Physico-mechanical parameters of rubber should comply with norms specified in table 1.

Table 1

No	Nomenclature of parameter	Norm	Method of testing
1.	Nominal tensile strength MPa (kgf/cm ²), not less than	25.5 (2)	As per GOST 270-75 (sample type II, with thickness 2 mm)
2.	Relative elongation at rupture, % not less than	500	Same as
3.	Relative residual deformation after rupture, %, not more than	45	-//-
4.	Hardness unit as per Shore A, max for rubber type ИРП-1393	65 ⁺⁵ ₋₃	As per GOST 263-75
5.	Hardness as per HCO, international units for rubber type ИРП-393	69 ⁺⁵ ₋₄	As per GOST 20403-75
6.	Brittleness temperature limits, °C, not above	Minus 50 °C	As per GOST 7912-74

Note: Checking of hardness is carried out by two parallel methods as per GOST 263-75 and GOST 20403-75 every year not less than for 100 batches. Acceptance parameter of hardness is considered as hardness as per GOST 263-75.

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TY 10542-88

or GOST 20403-75 upon agreement with customer representative at manufacturer's premises for bushes and pins.

1.4. Every batch of rubber mixture should be checked for service life of sample bush before starting production, as per drawing specified in appendix 3 for stand HJI-203 in mode

$$P = (1500^{+175}_{-150}) \text{ kgf}$$

$$\alpha = (12 \pm 1)^\circ$$

$$\omega = (312^{+31}) \text{ cycles/min.}$$

Norm of service life of standard bush is not less than 250 thousand cycles.

Note. It is permitted to check batches of rubber mixture of bush or pin and with norm, upon agreement between manufacturer, customer or designer and during presence of customer representative.

1.5. Deviation of parameters of outer appearance should not exceed norms, specified in table 2.

Table 2

	Denomination of parameter	Norm
1	Surface of rubber rings	
1.1	Porosity, cracks, mechanical damages	Are not allowed
1.2	Inclusion dimension, mm, not more than	0.3
1.3	Standard defects	
	with depth, mm, not more than;	1.5
	with height, mm, not more than;	1.5
	with width, not more than;	2
1.4	Bubbles on internal edges	
	with diameter, mm, not more than	2
	with depth, mm, not more than	1
	number of samples for one ring, not more than	1
1.5	Under pressing on internal edges	
	with depth, mm, not more than	1
	with length, mm, not more than	4
	with width, mm, not more than	2
	number of samples for one ring, not more than	1
1.6	Swelling of glue (without scaling)	
	with length, mm, not more than	5
	with width, mm, not more than	2
1.7	Press fitting to suit connector of die	
	with thickness, mm, not more than	0.5
	with height, mm, not more than	1.5

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TY 10542-88

Continuation of table 2

	Nomenclature of parameter	Norm
1.8	Shift to suit connector of dies, mm, not more than	0.5
1.9	Depression with depth and width, mm, not more than with length, mm, not more than number of samples for one ring, not more than	0.5 3 1
1.10	Cuts and traces from trimming of gates with depth and height, mm, not more than	2
2	Non-rubberized part of fitting surface	
2.1	Swelling of rubber on internal surface of fitting	It is not allowed
2.2	Swelling of rubber on external surface of fitting with thickness, mm, not more than	1
2.3	Press fitting of rubbers on external surface of fitting along connector die with thickness, mm, not more than with height, mm, not more than	0.5 1.5
2.4	Traces from gate on internal and external surface of fitting	It is allowed
2.5	Scaling between rubber rings and fitting	It is not allowed
2.6	Internal edge on end with fittings for rubberized metal parts manufactured by casting under pressure, with diameter specified as per drawing	It is permitted

Note.

1. Permissible place of swelling rubbers on external surface of fittings as per p.2.2 of table 2 is to be specified in the drawings.
2. Maximum number of different outer type deviations on one ring of bush or pin should not be more than 3.

1.6. In technical and economical based cases question about using bushes and pins with outer type deviations, differentiating from those specified in table 2, it is to be decided by separate agreement (decision) between manufacturer, customer and in the presence of customer representative.

1.7. It is permitted to accept control samples between manufacturer, customer or designer and during presence of customer's representative for approving outer appearance of bushes and pins.

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TY 10542-88

Dimensions of outer appearance and deviations of control samples should comply with those specified in table 2.

1.8. Bonding strength of rubber with metal should not be less than 4.9 N/mm (5.0 kgf/cm).

1.9. Norm of service life of pin 219-35-173 on stand is not less than 150 thousand cycles.

1.10. Marking and packing

1.10.1. Following marking is applied on surface of bushes and pins:

Conventional designation of manufacturer or its trademark, applied with terrain mark;

Year of manufacturing (the last digit by adding points, designating subsequently year of manufacturing), inscribed by engraving method;

If it is necessary, the number (for bushes and pins) and order number (for pins) should be applied in colour paint, which is resistant to the effect of water and spirit.

Quarter (if it is necessary) and year of manufacturing should be applied in lines or digits with colour paint, which is resistant to water and spirit.

Number of lines and digits specify the quarter, and colour - year of manufacturing.

Following marking of colours are set for determining year of manufacturing.

For years, completing

For 0 and 5 - white

For 1 and 6 - red

For 2 and 7 - green

For 3 and 8 - blue

For 4 and 9 - orange

Place of marking should be specified in drawings as per p.1.1 of present technical specifications.

1.10.2. Bushes and pins are to be packed in wooden or metallic boxes, manufactured as per drawings of customer or in wooden boxes as per GOST 18573-78, wrapped with paraffin paper as per GOST 9569-79 or anti-corrosion paper as per GOST 16295-82 or in metallic containers manufactured as per customer drawings, approved by manufacturer.

Metallic containers should protect bushes and pins from falling of atmospheric precipitates.

While packing in metallic containers, bushes and pins should be coated with paraffin or anti-corrosion paper from edges and from the side of opening door, bottom plates of metallic container should be covered with paraffin or anti-corrosion paper.

Note. In case of presence of free space in one box or metallic container, bushes and pins of subsequent batch may be kept by ensuring with separate packing

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TY 10542-88

in packing paper or other soft container.

1.10.3. Label should be fixed to the every packing place. After main heading following are specified on label:

- Conventional designation of bushes or pins during order;
- Grade of rubbers;
- Main number and additional batch;
- Number of pieces in main and additional batches;
- Date of manufacturing (quarter, year);
- QAD stamp;
- Customer representative stamp.

1.10.4. Every batch of bushes and pins should be accompanied by one quality document (certificate).

Certificate should be packed in polyethylene packet and inserted in one of the boxes or containers in which main batch is packed with specification «Certificate is here».

Certificate is permitted to deliver through post.

2. ACCEPTANCE RULES

2.1. Bushes and pins are presented for acceptance in batches.

Bushes of one name for quantity 2000 pieces or pins of one name for quantity not more than 500 pieces are considered as one batch with accompanying one quality document (certificate).

2.2. Bushes and pins are subjected to presentation, acceptance, periodical and type tests for checking the quality as per the requirements of present technical specifications.

Parameters as per which the testing is carried out and quantity of samples are shown in table 3.

Table 3

	Name of parameter	Quantity of checking samples	Type of test			
			Presentation	Acceptance	Periodical	Type
1	Physico-mechanical parameters of rubber as per p.1.3 of table 1: Nominal tensile strength during expansion, relative elongation during rupture, relative residual deformation after rupture, hardness;	Every batch of rubber mixture	X	X	-	X

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TY 10542-88

Continuation of table 3

	Name of parameter	Quantity of checking samples	Type of test			
			Presentation	Acceptance	Periodical	Type
	Brittleness temperature limit, change of relative elongation during rupture after aging in air	One time in a month from current batch of rubber mixture	-	-	X	X
2.	Service life of control bush or pin on stand as per p.1.4	One control bush or pin from every 5 th batch of rubber mixture	X	X	-	X
3.	Outer appearance as per p.1.10.1	100 %	X	X	-	-
4.	Dimensions, controlling as per drawing	0.5 % from batch	X	X	-	X
5.	Bonding strength of rubbers with metal as per p.1.8	0.3 % from batch, but not less than 3 pieces of bushes and 2 pieces of pins	X	X	-	X
6.	Service life of bushes and pins on stand as per p.1.9	2 pieces from batch	X	X	-	X

INDICATIVE DRAWING

Note.

1. Designated signs:

«X» - Test is conducted;

«-» - Test is not conducted.

2. Absence of deviations of rubber as per physico-mechanical parameters and service life of control bushes or pins as per p.1.4 on stand is permitted upon agreement with customer at the manufacturer testing of rubber mixtures on stand as per p.1.4 should be carried out selectively, from every 5th batch but not less than 20 % from the quantity of produced batches when the technology of mass production is set.

Sequence of selective control of batches of rubber mixtures on stand for control of bushes or pins is specified in agreement with customer representative.

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TY 10542-88

Checking of every batch of rubber mixtures on stand for control of bush or pin till obtaining 10 satisfactory parameters sequentially when un-satisfactory results are obtained during selective checking.

3. Checking of bushes and pins for serviceability as per p.1.9 upto failure from every name should be carried out once in every quarter for not less than two samples.

Either obtaining permissible limit value of radial residues or occurring contact between metallic pulley and fitting as a result rubber is destructed from automatic switching off of stand is considered as failure.

4. During presentation tests quantity of checking samples as per p.6 of table 3 is doubled (0.2 % from batch, but not less than 4 pieces) when:

Obtaining negative results of tests of bushes and pins of one name more than 5 batches sequentially or 20 % of batch in 1 month, increased norm of selection is stored upto liquidation increase, causing deviation and obtaining positive results of tests but not less than 2 batches sequentially;

Interruption in mass production or mastering in production of new design of bushes or pins, composition of rubber mixtures and glues after type tests, increased norm is stored till obtaining positive results of tests for not less than 20 batches sequentially.

Bonding strength with metal for pins is determined not less than for 50 % of rubber rings of pins, but not less than for 6 rubber rings of each pin.

2.3. It is permitted to mix acceptance tests with presentation tests upon agreement with customer representative formulated by decision.

2.4. In case of obtaining unsatisfactory results of presentation tests even for one of the established parameters, repeat tests are carried out to the same parameter for doubled quantity of samples.

When obtaining unsatisfactory results of repeat tests, except dimensions, checked as per drawings, all the batch of bushes (pins) or batch of rubber is considered as defective.

In case of unsatisfactory results of repeated test of bushes and pins along dimensions, then 100 % checking of bushes or pins is carried out along control dimensions.

Checking is subjected to every batch of rubber mixtures till obtaining positive results for not less than 5 batches sequentially. In case of obtaining unsatisfactory results of repeated tests of rubber mixture along brittleness temperature limit.

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2.5. After acceptance of batch of bushes and pins, representative of QAD presents to customer representative with quality document (certificates) and notification.

Following are enclosed to notification:

Results of analysis of bushes and pins:

Root charts:

Vulcanization diagrams.

2.6. In case of non-compliance of bushes or pins to the requirements of present technical specifications, customer representative send back the batch to QAD by specifying the cause of rejection.

2.7. Bushes and pins, rejected by customer representative may be presented secondarily, after elimination of defects. In this case notification should have heading «secondary» and should be signed by head of factory and head of QAD – manufacturer.

2.8. In case of repeated presentation of bushes or pins, customer representative should present with certificate about causes of permissible deviations from requirements of present technical specifications, about the measures taken to eliminate and prevent failures in further.

2.9. In case of non-compliance of secondary presentation of batch of bushes or pins with the requirements of technical specifications, batch of bushes or pins are considered as defective.

3. METHOD OF TESTS

3.1. Physico-mechanical testing of rubbers is carried out in compliance with requirements of p.1.3 as per GOST 269-66 and standard, specified in table 1.

3.2. Testing of control bushes or pins on stand as per p.1.4 is carried out for not earlier than 48 hr after vulcanization as per method, specified in enclosure 9.

3.3. Checking outer appearance of bushes and pins as per p.1.5, 1.10.1 is carried out visually or comparing with control specimen.

Normally the outer appearance deviation is checked by vernier calipers IIII-Q-1 with measuring range from 0 to 125 mm as per GOST 166-80.

It is allowed to use other measuring tools with metrological characteristics not lower than the specified.

3.3.1. Checking of bushes and pins for absence of scaling between rubber rings and armature as per p.2.5 table 2 is carried out in the way of pressing massive rubber ring manually with metallic blade width (15 ± 5) mm, thickness (3 ± 0.5) mm, length (150 ± 50) mm with fillet radius at end not less than 2 mm for distance not less than 2 mm from the fitting.

3.4. Controlling dimensions as per drawings are checked with vernier calipers IIII-Q-II with measurement limit from 0 to 250 mm with calculating value as per vernier 0.1 mm, for diameters above 250 mm with vernier calipers IIII-Q-III with

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measurement limit from 0 to 500 mm as per GOST 166-80, with metallic scale as per GOST 427-75 with measurement limit 500 mm.

It is allowed to use other measuring tools with metrological characteristics not lower than specified.

3.5. Bonding strength of rubber with metal as per p.1.8 is determined not earlier than 24 hr after vulcanization of bushes and pins as per method specified in enclosure 8.

3.6. Service life of bushes and pins as per p.1.9 is checked on stands.

Testing of bushes and pins as per p.1.4, 1.9 is carried out as per method specified in enclosure 9.

4. TRANSPORTATION AND STORAGE

4.1. Bushes and pins are transported in packing of any type of transport.

4.2. During transportation and storage of bushes and pins at minus temperatures they should be subjected to mechanical effect.

4.3. Bushes and pins should be stored in premises, protected from effect of direct sunrays, for distance not less than 1m from heating devices. Heating devices should be protected to eliminate the effect of direct heat rays.

It is allowed to store bushes and pins in metallic containers under weight.

4.4. It is allowed to store bushes and pins in one premises with organic solutions, petroleum products, lubricant materials, acids, alkyls, oxides and other aggressive products, destructing rubber and metals.

4.5. Bushes and pins in free condition may stored in heating and non-heating premises at temperature not above 25 °C.

It is allowed to store bushes and pins at temperature from 26 to 40 °C not more than 80 days totally and from them 15 days at temperature from 36 to 40 °C.

4.6. Assembled parts of bushes and pins may stored in non-heating premises, at outer area under weight, in field conditions at temperature from minus 50 to 50 °C.

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5. MOUNTING AND OPERATING SPECIFICATIONS

5.1. Rubber metallic bushes and pins are press fitted in track lugs.

5.2. Before press fitting bushes and pins are kept at temperature $(23 \pm 5) ^\circ\text{C}$ not less than 24 hr, if during storage and transportation temperature should not be less than $15 ^\circ\text{C}$.

5.3. Lubricant is used during press fitting: 30% of industrial castor oil GOST 6757-96 and 70 % of ethyl spirit GOST 17299-78, GOST 18300-87 in volume.

It is allowed to use other lubricant upon agreement with designer.

Lubricant should be applied with thin layer without leak and accumulation of lubricant between rings immediately before press fitting.

Holding time of bushes and pins after application of lubricant before press fitting should not be more than five minutes.

5.4. Level of press fitting of bushes and pins should be in limits $(35 \pm 7) \%$. Level of press fitting is determined by the formula

$$E_{\text{q}} = \frac{\delta_0 - \delta}{\delta} 100 \%$$

Where:

δ_0, δ – thickness of rubber layer before and after press fitting.

δ_0 is determined as per formula for bushes and pins with complete base and bended element:

$$\delta_0 = \frac{\delta_0' + \delta_0''}{2}$$

Where:

δ_0' and δ_0'' – maximum and minimum thickness of rubber layer before press fitting respectively.

5.5. Press fitting of bushes and pins in track lugs is carried out as per technology approved in established order ensuring non-destruction of ring.

Recommended specific speed of press fitting

For bushes – 5.6 M/min;

For pin – 2.6 M/min.

Bushes and pins are press fitted further nominal position not less than for 3 mm and under press fitting in reverse direction comes back to nominal position.

Press fitting is permitted to carryout on press fitting tracks on pins.

5.6. Projection and sinking of rubbers beyond the faces of lugs is allowed not more than 3 mm for pins and bushes with local shrinkage upto 5 mm.

5.7. Mechanical damages or scaling of rubber rings from fittings are not allowed during press fitting.

Surface finishing of machined surfaces of chamfers and holes in lug grains of tracks should be in limits from Rz80 to Rz20 as per GOST 2789-73, GOST 2.309-73.

5.8. Surface of holes of lug grains of tracks subjected to assembly should not have scales, corrugation, residues of the mixture, chips, acids, alkalines, petro-products and other foreign inclusion (dirt).

5.9. Level of filling rubber quantity of lugs «K» should be not less than 0.95. Calculation is carried out as per the nominal dimensions as per formula:

$$K = \frac{V_1}{V_2}, \text{ where}$$

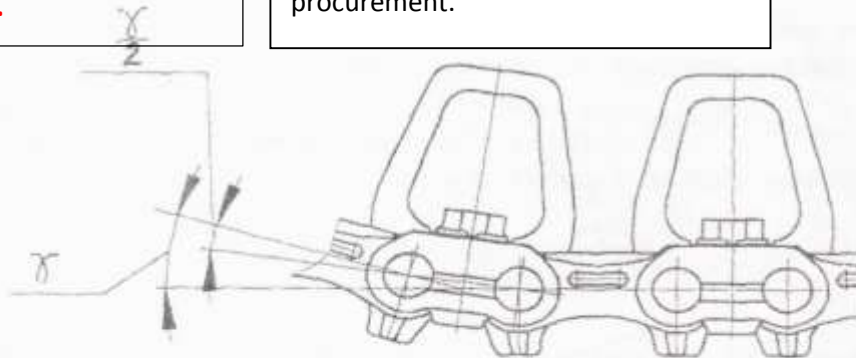
V_1 – volume included between fitting of bushes and pins and surface of lugs of track.

V_2 – volume of rubber rings.

6. Preliminary angle of setting bushes and pins in lug of track « γ » should not be less than 50 % from the angle of rotation of adjacent tracks.

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TY 10542-88

APPENDIX 2

DELIVERY AND ACCEPTANCE OF FITTINGS FOR RUBBER METALLIC BUSHES AND PINS

1. TECHNICAL REQUIREMENTS

1.1. Fittings should comply with drawing of manufacturer, upon agreement with customer, and requirements specified in given enclosure.

1.2. Fittings should be manufactured from metal, grade, which is specified in, approved drawing.

1.3. Dimensions and surface finishing of fittings should comply with values specified in approved drawing.

1.4. Surface finishing should not have burrs and sharp cutting edges.

1.5. Surface preparation should be clean, presence of scales, corrosion, oil marks, colour, all scale, cracks, foreign inclusions are not permitted.

Requirements for internal surfaces of fittings and surface, not subjected to cutting, are specified in drawing as per manufacturer.

Fitting is supplied in shot blasting type and fittings is subjected to additional grinding (refreshing) as per GOST 26327-84 with shot of copper rammer grades ДЧК-0.5 as per GOST 11964-81.

Note:

1. Corrosion deposit formed on the surface of fitting during transportation and storage is allowed and machineability to eliminate without damaging dimensions of fitting.

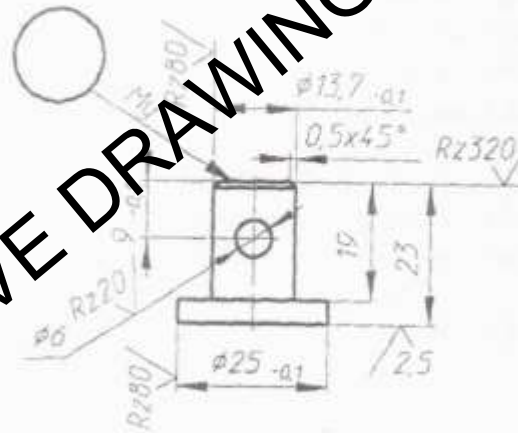
2. Smoothing of lines are permitted on surface.

3. It is permitted to supply in non-shot blasting form upon agreement between manufacturer and customer.

4. It is permitted to supply and use phosphotised fitting for rubber metallic bushes upon agreement with manufacturer of PMIII.

1.6. For checking the quality of glue, applied on metal – for bonding strength of rubbers with metals, metallic discs (mushroom shape) from steel for the same grade of material is used as that of fitting and passed same machining.

1.7. Metallic discs (mushroom shape) in design and dimensions should correspond to the drawing specified below.



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1.7.1. Unspecified limit deviation of dimensions $\pm \frac{Jt14}{2}$.

2. ACCEPTANCE RULES

2.1. Fitting is supplied in batches. Quantity of fitting of one name is considered as one batch, formulated as one quality document.

Volume of batch for each name of fitting is upon agreement between manufacturer and customer.

2.2. Checking of fitting in outer appearance and dimensions should be carried out by manufacturer.

2.3. Control checking of external appearance, dimensions and absence of alkalis on fitting surface is carried out by customer for 0.5 % of fittings from receiving batch.

2.4. Standard metallic discs (mushroom shape) for a quantity of 32 pieces, manufactured from the same steel grade as that of fitting and passed same machining are supplied along with batches once in six months.

4. MARKING, PACKING AND STORAGE

4.1. Fittings are accepted by QAD section of manufacturer and are packed in wooden or metallic boxes, manufactured as per manufacturer drawings, placed in anti-corrosion paper as per GOST 16295-82 or in metallic containers, manufactured as per drawings of manufacturer upon agreement with customer.

While packing in metallic containers, bushes and pins should be covered with anti-corrosion paper from faces from the side of opening door, bottom plate of metallic containers should be placed in anti-corrosion paper. Every row of fitting for bushes should be additionally covered with anti-corrosion paper.

Fitting should be supplied in packing, ensuring its serviceability at any type of transport.

4.2. Label should be attached to the every packing place. Following should be specified after main heading:

- Number of fitting;
- Number of bush or pin;
- Grade of metal;
- Number of pieces;
- Batch number;
- QAD stamp.

4.3. Every batch of fitting is accompanied with certificate.

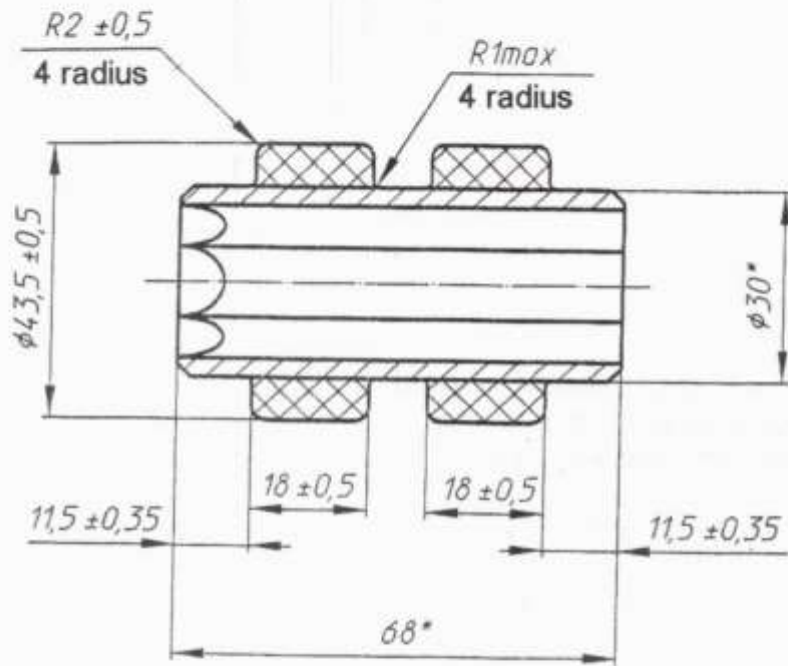
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INDICATIVE DRAWING

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INDICATIVE DRAWING

1. Dimensions to be ensured by tool.
2. Dimensions for reference.
3. Other requirements as per TY.

			Rubber metallic bush, small	Weight (kgs)	Scale
				0.19	1:1
			Assembly drawing	Page	Page total
				16	
ISSUE SHEET		REFERENCE			
APPROVED					
CHECKED					
			TY 10542-88	HEAVY VEHICLES FACTORY A/ROD	

Лист примен

Склад. №

Подп. и дата

Взам инд. №

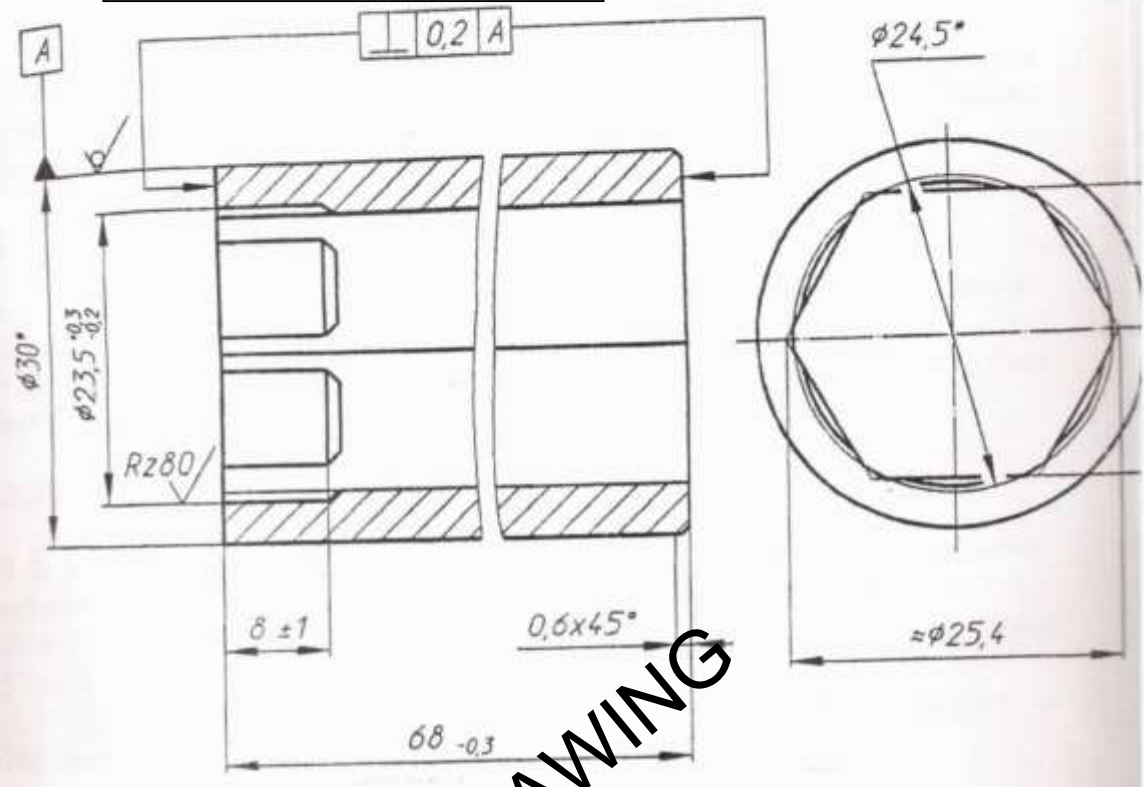
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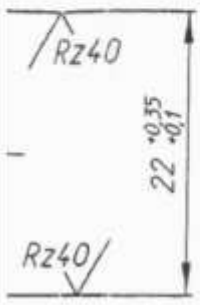
INDICATIVE DRAWING

Rz40/ ✓(✓)

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1. 37.2...43.5HRC.
2. Check the hardness on surface A. In this case flat is allowed, parallelity to the plane of edge to a distance of not less than 20mm from any face with depth not more than 0.5 mm.
3. It is allowed to decrease diameter A upto 29.7 mm.
4. *Dimensions for reference.
5. Other requirements are as per TY.

			BUSH, SMALL	Weight (kgs)	Scale
				0.157	2:1
				Page	Page total
				17	
ISSUE	SHEET	REFERENCE	Pipe 22-40X TY 14-3-232-74	HEAVY VEHICLES FACTORY AVADI	
APPROVED					
CHECKED					
DRAWN					

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METHOD OF DETERMINING BONDING STRENGTH WITH RUBBER METALS DURING SCALING ON RUBBER METALLIC BUSHES AND PINS

Method is meant for determining bonding strength during scaling rubber rings from metal on bushes and pins on breaking machine with speed of movement of moving fixture 50 mm/min or 100 mm/min at temperature (23±5) °C.

1. SAMPLES FOR TESTING

1.1. Bushes or pins are used as samples for tests, corresponding to present technical specifications as per dimensions and outer appearance.

1.2. Bushes and pins are subjected to testing not less than 24 hr after their manufacturing.

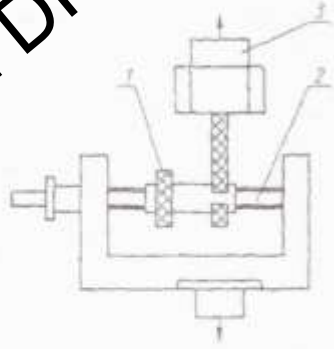
2. EQUIPMENT AND FIXTURES

2.1. Breaking machine of any type ensuring measuring of breaking power, obtained during testing, with error not more than ±3% from measuring value.

Breaking machine should ensure speed of movement of moving clamp (50±15) mm/minute or (100±15) mm/min.

2.2. Fixture for fixing bushes and pins in clamp of breaking machines is specified in drawing 1.

INDICATIVE DRAWING



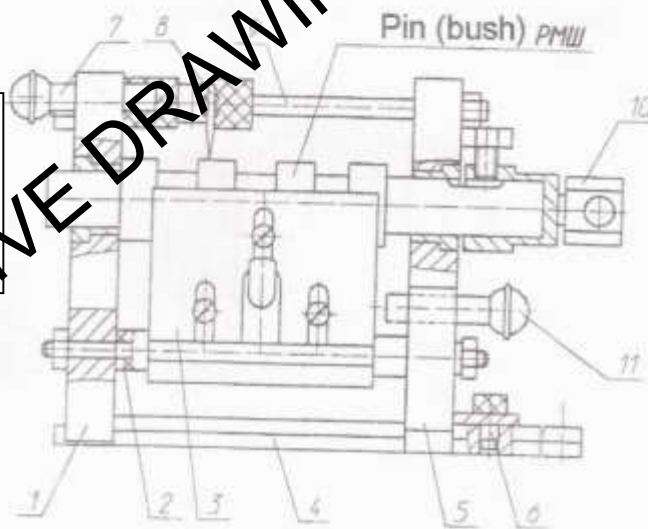
- 1. Rubber metallic bush or pin
- 2. Metallic pin
- 3. Clamp (fixture)

Fig. 1

3. PREPARATION FOR TESTING

3.1. Bushes or pins with cylindrical rubber rings are fixed in vice and rubber rings are cut upto contact with metallic fitting with manual knife or on special (recommended) fixture (figure 2), afterwards ring is cut along perimeter for a length upto 15 to 20 mm for fixing scaling part in fixture of breaking machines.

3.2. Width of scaling part of rubber ring for calculation is considered as equal width of ring as per drawing or is measured and adjusted upto 0.5 mm.



1. Stationary stand
2. Bush - limiter
3. Big blade
4. Base
5. Movable stand
6. Locator stand
7. Upper stopper
8. Small blade
9. Axis
10. Lever
11. Lower stopper

Fig. 2

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3.3. On bushes and pins with complete base on rubber body with the help of lathe machine (or manual) slots are cut in perimeter upto surface of fitting (it is permitted to cut in metal with depth upto 3 mm) as per drawing 3, 4.

Bushes or pins with obtained rings are set in vice and with knife or on special recommended fixture (figure 2) rubber half rings are cut in contact upto the fitting and afterwards semi ring is peeled from fitting with entrance on complete base for (4 ± 2) mm.

Width of scaling cavities is equal to nominal width of semi ring and is measured with error ± 1 mm.

3.4. During the presence of squeeze out and final swelling along the edges of rings, cut with knife upto metal during preparation of ring for tests.

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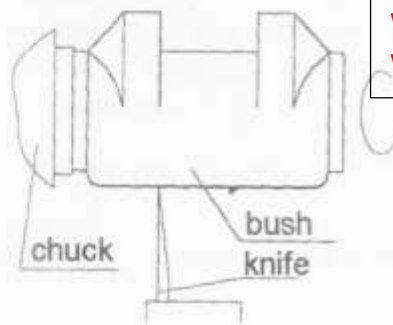


Fig. 3

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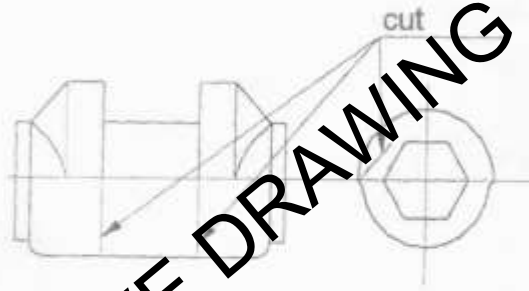


Fig. 4

INDICATIVE DRAWING

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TV 10542-88
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4. CONDUCTING TESTS

4.1. Set fixture for fixing bushes and pins in lower fixture of breaking machines.

4.2. Fix bush and pin in special fixture, allowing them to rotate freely around the longitudinal axis.

Peeled rubber layer part is fixed with the help of additional fixture in upper clamp of breaking machine. Moving part of fixture is in that way vertical axis of testing rubber ring is coinciding with vertical axis of upper and lower fixtures for excluding the bends during scaling.

4.3. If during the process of testing in rubber layer of sample, breaking is held in place of scaling of metal, then broken part should be cut with knife upto metal and again testing should be continued.

4.4. During the process of scaling, every rubber ring is recorded not less than 10 readings of load scale (Ten minimum and five maximum values).

Calculation of load is started after scaling for not less than 10 mm of rubber from metal, after which scaling is carried out.

5. PROCESSING OF RESULTS OF TESTS

5.1. Bonding strength of rubber with metal during scaling is calculated as per formula:

$$\sigma = \frac{P_1 + P_2 + P_3 + P_4 + P_5 + \dots + P_n}{b.n}, \text{ Where}$$

σ - Bonding strength of rubbers with metal for every ring;

$P_1, P_2, P_3 \dots P_n$ - load, as per which scaling is carried out for each ring, N

(kgf);

b - width of rubber ring, mm (cm);

n - Number of parameters.

5.2. Results of tests are to be recorded in protocol, which should have following data:

Bush or pin number as per drawing;

Batch number;

Load during scaling of each ring, N (kgf);

Bonding strength of rubbers with metal during scaling of each ring, N (Kgf/cm).

Protocol should be signed by head of testing laboratory, authorized to conduct the testing.

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TY 10542-88

APPENDIX 9

METHOD OF STAND TESTS FOR RUBBER METALLIC BUSHES AND PINS FOR SERVICE LIFE

Method meant for determining service life of bushes and pins during tests on stand.

Method of stand tests of pins and bushes for service life is concluded in setting their capability of withstanding determined number of cycles (hours) in conditions of alternate rotating during simultaneous effect of radial loads.

1. BUSHES AND PINS

1.1. Bushes and pins are samples for tests, corresponding to the present technical specification as per dimensions, external appearance and bonding strength of rubber with metal.

1.2. Bushes and pins are subjected to tests for not less than 48 hr after their manufacturing. During this period samples should be at ambient air temperature $(20_{-5}^{+10})^{\circ}\text{C}$.

2. REQUIREMENTS FOR STAND

2.1. Stand should ensure symmetric alternate harmonic rotating with an amplitude angle α_0 and with frequency h of testing PMIII during simultaneous effect of radial load P .

2.2. Rotating and radial load of PMIII is carried out by any method, ensuring limit deviations of parameters of testing mode $\alpha_0 \pm 1^{\circ}$; $2\alpha \pm 1^{\circ}$.

$$P_{-10}^{+5} \%$$

$$h_{-3}^{+10} \%$$

2.3. Stand may be manufactured in any structural design upon agreement with factory manufacturer of bushes and pins of factory designer.

2.4. Type of stand and parameters of stand are specified in testing chart for actual bushes and pins. Parameters of testing mode are selected by manufacturer of bushes and pins and designer and upon agreement with customer.

2.5. Stand should be equipped with automatic device, by switching OFF it after obtaining maximum condition as per p.2.2.

2.6. Work of parts of stand should not cause additional heat formation, effecting on testing sample.

3. PREPARATION FOR TESTING

3.1. Sample should be press fitted in casing, basic dimensions of which should be recorded in chart of tests. Surface finishing of internal surface of casing R_a as per GOST 2789-73 should be 3.2 microns.

3.2. Internal surface of casing should be thoroughly cleaned with brush, dipped in nephrase grades C3-80/120 or C4-80/120 as per TY 38.401-67-108-92 or in kerosene as per OST 38 01407-86. After clearing, casing should be completely dried.

3.3. Press fitting of bushes and pins in casing is carried out at a speed specified in chart of tests.

Bushes or pins are press fitted at 5^{+3} mm in the depth of middle position in casing, afterwards they are free from press fitting force and are press fitted in reverse direction into average position of bushes or pins in relation to edges of casing with accuracy of setting ± 1 mm. It is permitted to rotate end rings in casing and projecting rubber rings beyond the limits of cylindrical part of casing.

3.4. Lubricant type of which is specified in chart of testing is used for press fitting of testing sample in casing.

Thin layer of lubricant is applied immediately before press fitting rubber ring and internal surface of casing from the side of press fitting in compliance with chart of tests.

3.5. Bushes or pins with complete base is set on stand in such a way that direction of radial load is on the middle of complete base.

4. CONDUCTING TESTS

4.1. Bushes or pins are press fitted on stand before testing should be kept for not less than 24 hr at a temperature of ambient air (20^{+10}_{-5}) °C.

4.2. After setting at temperature of ambient air medium (20^{+10}_{-5}) °C the press fitted bushes and pins are set on stand for tests for service life.

4.3. Testing of bushes and pins is carried out upto given value of cycles (hrs, min) or upto failure.

4.4. During testing permissible limit values of radial residue or occurring metallic casing of fitting, as a result, destruction of rubber is recorded.

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procurement.

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5. RECORD OF RESULTS

Results of tests of bushes or pins are recorded in protocol of tests, which should be of following data:

- Bush or pin number as per drawing;
- Batch number;
- Stand number;
- Readings of counter (or time);
- Date (number, month).

Protocol should be signed by head of testing laboratory authorized to carryout given testing.

INDICATIVE DRAWING

These drawings are only for reference. Actual drawings may be different and shall be issued at the time for procurement.