APPROVED
Chief Engineer of MBP JSC
_____ S.A. Moroz
18.05 2021

CUSTOMER'S TECHNICAL REQUIREMENTS, dated_____2021
TO SPECIAL EQUIPMENT

1. To manufacturing: NC machine for grinding of roller spherical end face.
2. Description of processed parts Roller
3. Drawing No. 3553205.04, 3520.04; 3622AM.04; 3656AM.04
4. Material Steel ШХ-15, ШХ15СГ, ШХ20СГ GOST 801-78 hardness 59…65 HRC

Steel grade	Mass share of alloying elements, %								
	C	Si	Mn	Cr	S	P	Ni	Cu	Ni+Cu
ШХ15	0,95… 1,05	0,17… 0,37	0,20… 0,40	1,30… 1,65	0,02 max	0,027 max	0,30 max	0,25 max	0,50 max
ШХ 15СГ	0,95… 1,05	0,40… 0,65	0,90… 1,20	1,30… 1,65	0,02 max	0,027 max	0,30 max	0,25 max	0,50 max
ШХ 20СГ	0,90… 1,00	0,55… 0,85	1,40… 1,70	1,40… 1,70	0,02 max	0,027 max	0,30 max	0,25 max	0,50 max

5. Blank Roller after complete lathe turning, thermal processing and grinding of end faces
6. Mechanical procession performed on the ordered equipment
Grinding of roller spherical end face
7. Machine capacity: minimum 750 pcs/hour for 3553205.04 or 670 pcs/hour for 3520.04 or 550 pcs/hour for 3622AM.04 or 300 pcs/hour for 3656AM.04 with coefficient Kp=0.75
8. Additional conditions for equipment manufacturing
- external diameter of processed rollers (12 - 80) mm;
- length of processed rollers (10 - 90) mm;
- radius of spherical end (150 - 1300) mm.
- mass of processed parts (0.003 - 3) kg;
- closed procession zone;
- process repeatability index $C_P \geq 1.33$;
- automation of blank loading/unloading system;
- control of tool damage and wear;
- in-process gauge;
- grinding with a forming roller by means of axles interpolation;
- device for circle area balancing adjustment;
- infinitely variable adjustment of electromagnetic face plate rotation frequency;
- circles drawing off a part, when voltage is disconnected during a working cycle;
- fast delivery and automatic switching to the working feeding;
- maintenance of constant periphery circle speed;
- fast readjustment from a part to another one –max. 20 minutes;
- device for automatic cleaning of clamping appliances;
- intellectual cleaning and cooling system;
- fume exhaust system with condensate returning to the system;

- centralized lubrication system of the lubrication system with controlled filters clogging and oil delivery to all points;
- pneumatic system, which secures air cleaning not below the 7th contamination class according to GOST 17433-80;
- hydraulic system providing control of the working fluid temperature mode, its sufficient level, contamination;
- possible installation of blocks is to be foreseen, in particular, for non-sanctioned access to change of procession modes, working modes of the lubrication, pneumatic systems, hydraulic actuator, maintenance of equipment;
- the following NC systems are preferable: SIEMENS 810Dsl, 840Dsl or MITSUBISHI M64. E68, M60S, M70 in accordance with limiting lists of components used at MBP JSC;
- in the control system - a built-in register of performing and controlling maintenance works with equipment according to the operation manual.

9. The following shall be supplied with the equipment:

9.1 The operation manual in Russian, including operation instructions for an adjuster and an operator
9.2 The maintenance and servicing instructions (including subcontractors) in Russian, including:
- assembly drawings of the most important units, wearing parts and units of equipment
- directives for lubrication modes along with provision of specifications for applied oils and lubricating and cooling fluids (along with indication of specifications and manufacturers (suppliers), including analogues from CIS countries;
- pneumatic and hydraulic circuits;
- detailed list of works performed during daily, weekly, semiannual and annual maintenance;
- detailed description of operation of main equipment units in accordance with assembly drawings, and Recommendations for their adjustment;
- electric circuits are provided according to DIN/EN standard;
- two copies of documentation on printed carrier an one on CD in format ^.doc, ^dwg AutoCAD 2002;
- program control with comments, description of the used functions, cycles, subprograms and their parameters, technological processes for the parts mentioned in clause 3.
- a set of working drawings of replaceable components of clamping accessories in the printed out form and on a CD;
- schematic circuit diagrams with the list of components and the list of manufacturers;
- machine parameters and PLC program in the printed out form and on CD with comments
- methods, software and hardware for restoration of machine parameters and PLC programs, as well as machine diagnostics;
9.3 Lubricants, coolants, oils and other consumables for the first filling;
9.4 By 2 sets of replaceable clamping accessories for manufacturing of parts indicated in clause 3
9.5 Wearing components and spare parts for 8000 hours of operation*;
9.6 Abrasive tools in the quantity sufficient for the performance of tests in accordance with clause 10.
9.7 Special fittings for testing the geometric precision of equipment*;
9.8 Compressed air preparation system: filter, compressor and other equipment required for equipment operation with buyer's energy sources;
9.9 Information on precious metals available in equipment;

10. Additional terms of supply:

- guaranteed servicing period for equipment – minimum 24 months;
- availability of a service centre and a storehouse of spare parts in the Republic of Belarus;
- training of the servicing personnel*;
- preliminary acceptance of equipment at the supplier by geometric precision, productivity, meeting the requirements of drawings must be performed during 8 hours at idle running ant under load by 1 hours for each part indicated in clause 3, with Seller's blanks and with the use of Seller's tools;

- final acceptance of equipment at the Buyer's sites by geometric precision, productivity, meeting the requirements of drawings must be performed during 8 hours at idle running ant under load by 8 hours for each part indicated in clause 3, with Seller's blanks and with the use of Seller's tools;
- a template of the machine should be provided in a set of tender documents on a paper carrier by mentioning overall dimensions, main units, loading-unloading places for parts, places of chips removal, installed capacity of electric motors is to be indicated. Description of machine operation, installation scheme and location of parts and technology of parts procession are to be indicated by showing abrasive tools (tools manufacturer should be indicated , including analogues of CIS countries).

Responses to all items of the present technical requirements of the customer shall be indicated in the proposal.

*Completing of an order with working and auxiliary tools, spare parts to equipment, special fittings for checking equipment for geometric precision, quantity of parts for acceptance, training of personnel are to be discussed and executed during execution of a supply contract.

The customer's plant has 3-phase AC voltage 220/380 V, frequency 50 Hz. Working voltage 380 V with circuit fluctuations +15% – 10%.

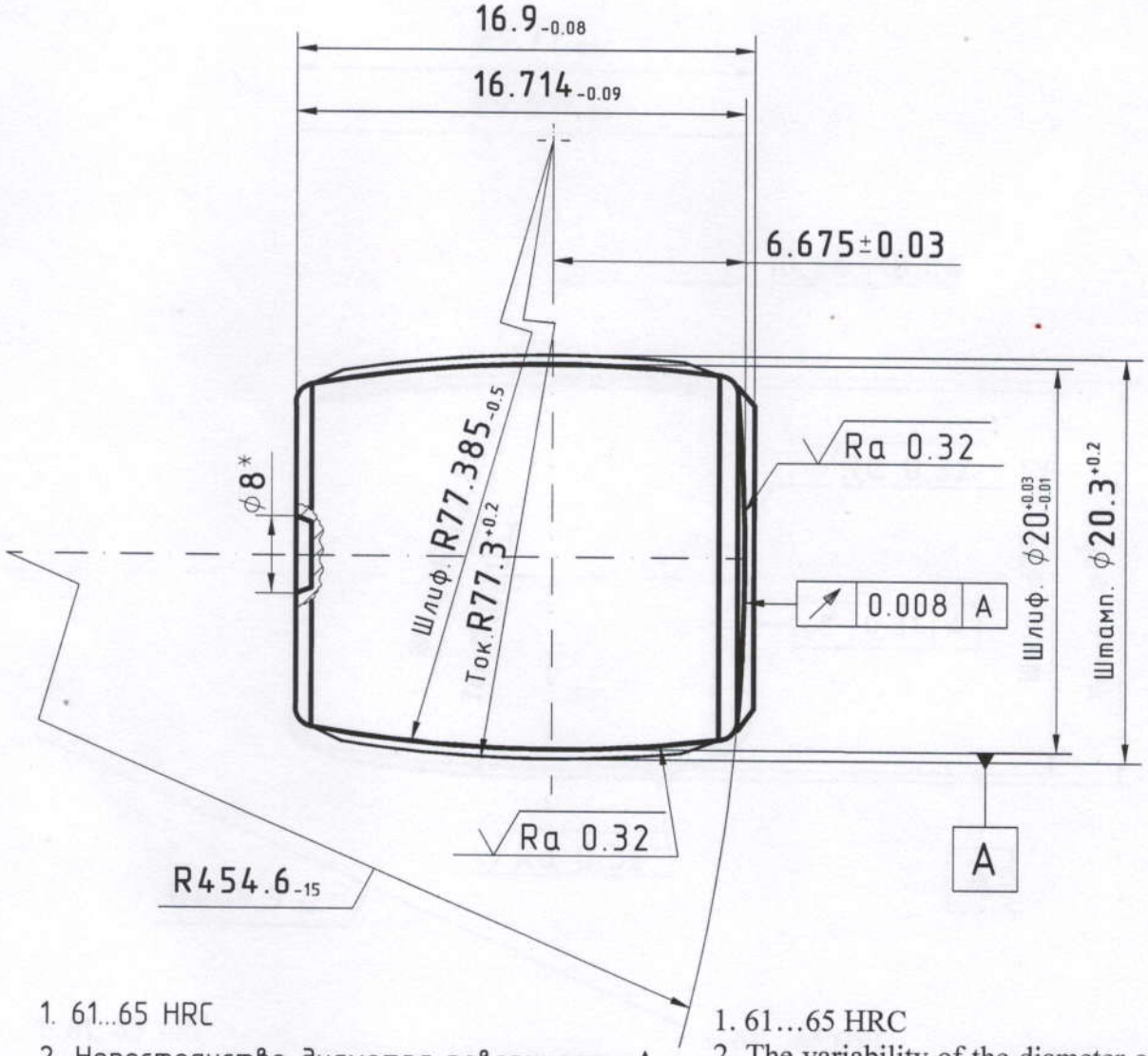
There is a pneumatic circuit having air pressure in the circuit 0.4–0.5 MPa.

Air temperature fluctuation in the shop from $+5^0$ to $+35^0$ C.

Attachment – sketches of parts 3553205.04, 3520.04; 3622AM.04; 3656AM.04 according to clause 3 on 4 sheets in one copy.

Chief Process Engineer D.A. Cherej

Attachment to the technical order for a special machine for grinding of roller spherical end face 3520.04



1. 61...65 HRC
2. Непостоянство диаметра поверхности А в единичной плоскости не более 0,002 мм
3. Отклонение от круглости поверхности А не более 0,0023 мм

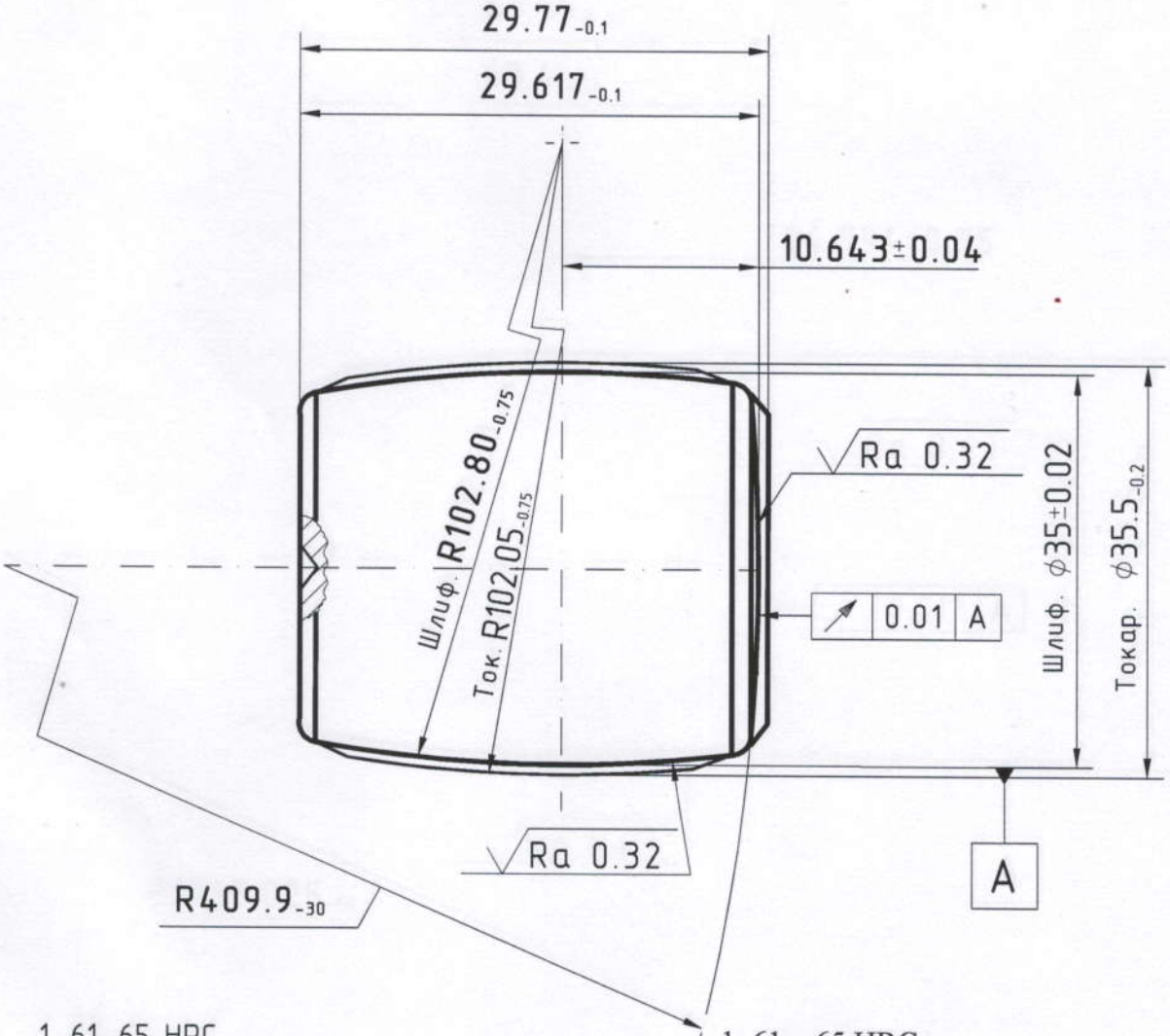
Масса ролика 0.038 кг.

1. 61…65 HRC
2. The variability of the diameter of the surface A in a single plane is not more than 0,002 mm.
3. Deviation from the roundness of the surface A no more 0,0023 mm.

Roller mass – 0,038 kg

Chief Process Engineer D.A. Cherej

Attachment to the technical order for a special machine for grinding of roller spherical end face 3622.04



1. 61...65 HRC
2. Непостоянство диаметра поверхности А в единичной плоскости не более 0,003 мм
3. Отклонение от круглости поверхности А не более 0,003 мм

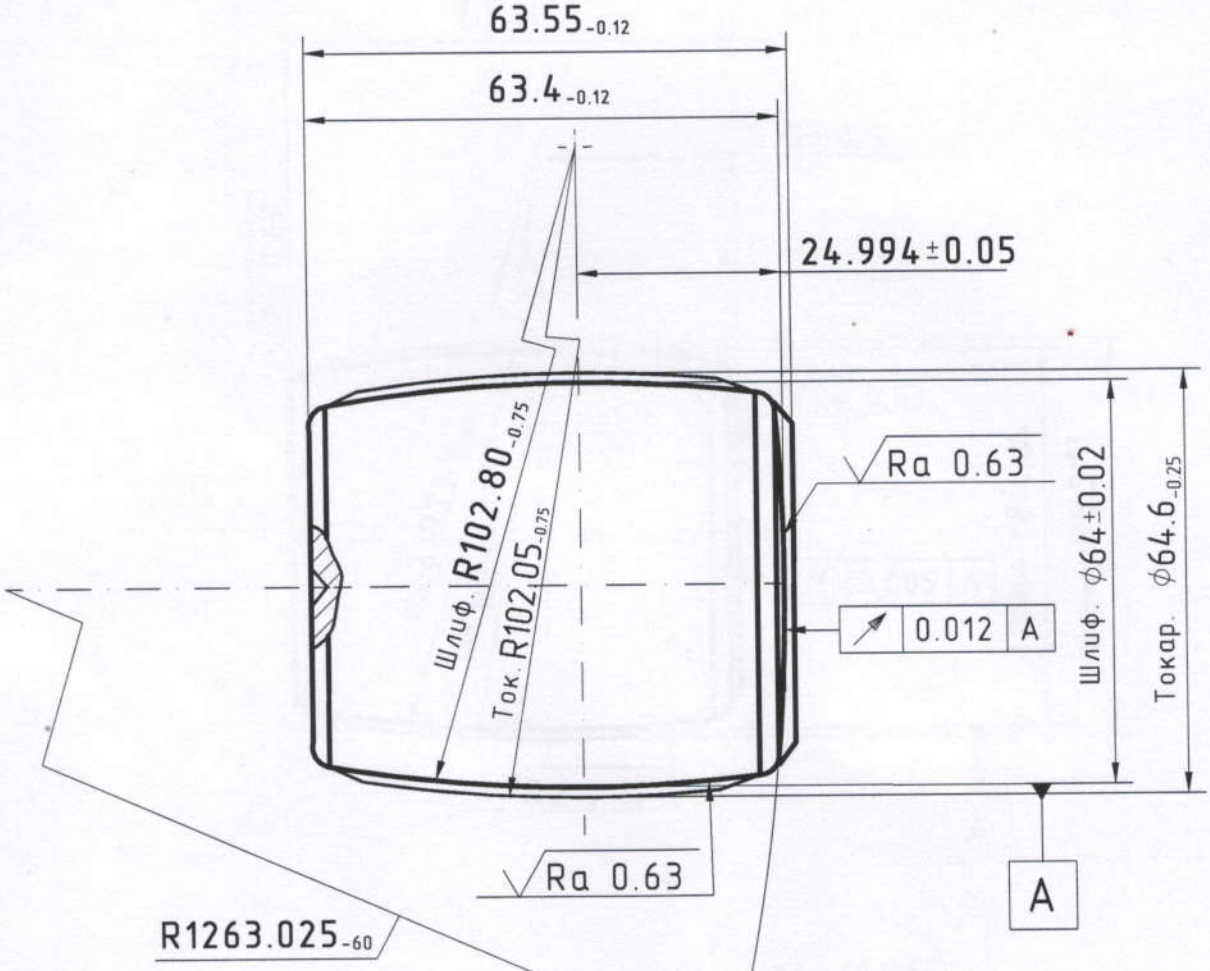
Масса ролика 0.21 кг.

1. 61…65 HRC
2. The variability of the diameter of the surface A in a single plane is not more than 0,003 mm.
3. Deviation from the roundness of the surface A no more 0,003 mm.

Roller mass – 0,21 kg

Chief Process Engineer D.A. Cherej

Attachment to the technical order for a special machine for grinding of roller spherical end face 3656AM.04



1. 58...62 HRC
2. Непостоянство диаметра поверхности А в единичной плоскости не более 0,004 мм
3. Отклонение от круглости поверхности А не более 0,004 мм

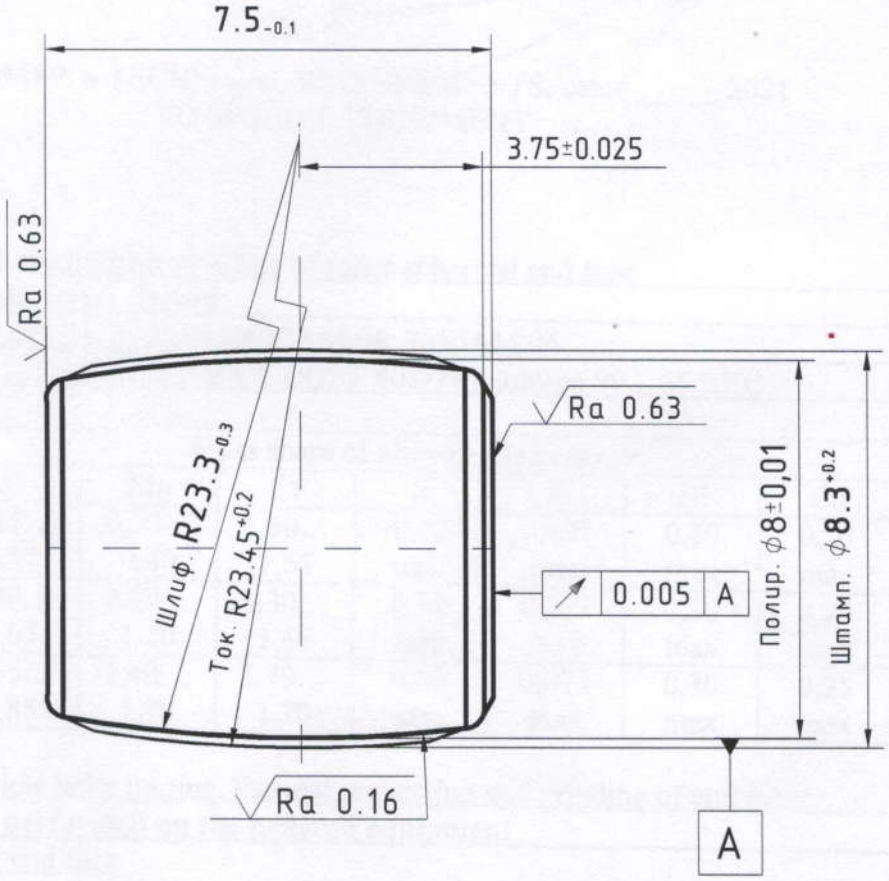
Масса ролика 1.52 кг.

1. 58…62 HRC
2. The variability of the diameter of the surface A in a single plane is not more than 0,004 mm.
3. Deviation from the roundness of the surface A no more 0,004 mm.

Roller mass – 1,52 kg

Chief Process Engineer D.A. Cherej

Attachment to the technical order for a special machine for grinding of roller spherical end face 3553205.04



1. 61...65 HRC
2. Непостоянство диаметра поверхности А в единичной плоскости не более 0,0015 мм
3. Отклонение от круглости поверхности А не более 0,0015 мм

Масса ролика 0,0028 кг.

1. 61…65 HRC
2. The variability of the diameter of the surface A in a single plane is not more than 0,0015 mm.
3. Deviation from the roundness of the surface A no more 0,0015 mm.

Roller mass – 0,0028 kg

Chief Process Engineer D.A. Cherej