

Original



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TP NO. TP - 42/78

MANUFACTURER: ZVL

DOLNY KUBIN

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H & P

TECHNICAL CONDITIONS
FOR
FORMED BUSHES AND THRUST RINGS

13

TEXNO PRODUCTS

These technical conditions are applicable for formed bushes and thrust rings of bearings manufactured from material KU and KX as per the dimensional series given in the tables of enclosures.

The same is applicable for bushes and thrust rings manufactured from material KU and KX which differ from the dimensions in the tables and are manufactured as per confirmed drawings.

The technical conditions come into force on the day they are signed by the authorised representatives of the customer and the supplier. They are applicable and remain in force till they are revoked and may be subjected to revision from time to time, subject to mutual agreement between the customer and the supplier.

I. TERMINOLOGY

1. The term formed bush of material KU and KX is understood to mean bush manufactured by bending and sizing of strips to a precise dimension.

2. By thrust ring is understood to mean washers for taking up the axial thrust, manufactured by blanking to respective shape out of material KU or KX.

3. By the title 'bush from material KU' is also understood to mean a bush, where the sliding layer is of polytetra fluorethylene /PTFE/ plus lead.

4. By this title 'bush from material KX' is also understood to mean a bush, where the sliding layer is of the material polyacetal.

5. Surface treatment of bushes of material KU is carried out by galvanic tin plating or zinc plating.

On bushes & rings manufactured from material KX and rings from material KU, surface treatment is not carried out, this is inherently formed by the copper plated surface of the strip.

II. GENERAL

6. Besides the information prescribed in the relevant announcement, the order must contain,

- a/ the name of the product
- b/ the designation as per the dimensional series given in the enclosed tables.
- c/ required number of pieces
- d/ required delivery schedule
- e/ reference to this TPP.

7. The order is considered as valid only if it contains all the points required as above for ordering. For non-standard types of bushes, the order will be valid only after approval of the production drawing as per this TP by the customer.

III TECHNICAL REQUIREMENTS

8. Dimensions of the bushes or the rings shall correspond to the dimensional series and relevant tables as given in this TP.

9. The bushes are manufactured to such sizes, that after press fitting into a H7 hole and use of pin in bush KU, with a tolerance f7 there is sufficient clearance for the correct functioning of the bush. For bushes KX, the mounting as per table/ vide enclosure/ is applicable.

10. The clearance during contact in the free condition is 0 to 5 mm. After press fitting into the specified hole - without clearance.

11. Deviations in length of the bushes given in the relevant tables are supplied to an accuracy of ± 0.25 mm.

12. Chamfering of corners of outer and inner diameters are as per enclosure number 1 and 2 of this TP. Chamfering of corners is irregular.

13. In bushes KX, types as per relevant tables, the lubricating hole is at $1/2$ the length of bush ± 0.5 mm. Circularity of the lubricating hole is not guaranteed.

14. Bushes of material KX can be supplied without lubricating hole, but during ordering this is distinguished with the index 01 for example 2425 KX - 01.

15. Bushes of material KU are supplied in the finished condition and it is not permissible to carryout any mechanical working on them. Bushes KX are supplied with an allowance on the internal ϕ , which is to be machined as required. It is possible to use bushes KX without machining the internal diameter by the use of shafts as per dimensional series in the enclosures of the TP.

16. The bushes are marked on the outside diameter with the manufacturer's mark, catalogue part number., and the quarter and year of manufacture. The markings mentioned above are done during the course of production before sizing.

17. Individual lines, dents and pores extending upto $1/4$ the tolerance of the thickness of the steel base are allowed on the outside diameter of bushes and thrust rings/ vide CSN 42 01C7, 42 5350.21/. Steel base of the bushes and rings of material KU and KX are made of steel 11 320.21.

18. The surface of the bushes and thrust rings from the steel side can have local counterbores and at these places the thickness of wall can be less to the extent of the counterbore. Because of this reason, the thickness of the wall is measured at the bearing surfaces outside the counterbores.

19. Thrust rings of material XU or XX can be supplied without hole for pin, however the drawing for this must be approved by both parties.

IV INSPECTION AND THE METHOD OF MEASUREMENT

20. Inspection and tests are carried out by the technical inspection wing (OTK) of the manufacturer, as per applicable technical documentation and as per this TP.

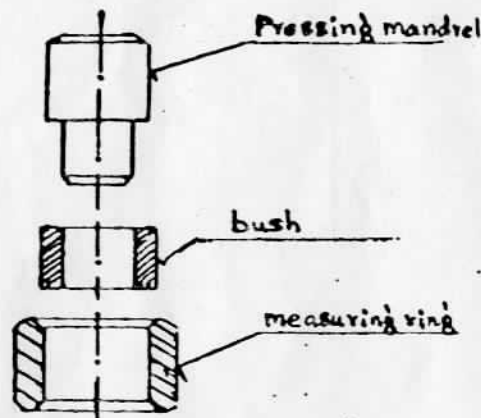


Figure 1

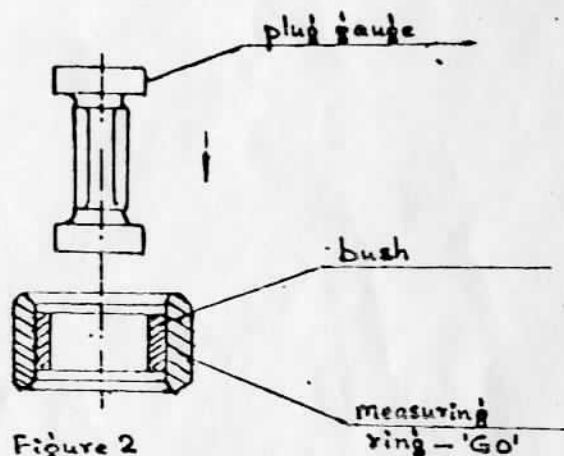


Figure 2

21. Inspection of the outer diameters of spacer rings are carried out by means of measuring rings - 'GO' measuring ring, 'NO.GO' measuring ring, figure 1.

The outer diameter is considered as acceptable when the bush can be easily pushed manually into the 'GO' measuring ring by means of the pressing mandrel, and cannot be pushed into the 'NO GO' measuring ring.

22. The internal diameter of the bush is inspected by, pressing in the plug gauge of specified dimension, when the bush is pressed-in into the 'GO' measuring ring, figure 2 as per table 1 or 2 of this TP.

23. The dimension of the 'GO' ring corresponds to the upper limit of dimension of outside diameter of the bush with a manufacturing tolerance of $+ 0.003$
 $- 0.001$.

24. 'GO' side of plug gauge corresponds to the lower limiting dimension of the internal diameter of the bush with a manufacturing tolerance of $+ 0.003$
 $- 0.001$.

25. The dimension of the 'NO GO' ring corresponds to the lower limiting dimension of the outside diameter of bush with a manufacturing tolerance of $+ 0.003$
 $- 0.001$.

26. The dimension of the 'NO GO' side of the plug gauge corresponds to the top limiting dimension of inside diameter of the bush with a manufacturing tolerance of $+ 0.001$
 $- 0.003$.

V. ACCEPTANCE

27. Acceptance is done at the factory of the customer according to the principles of sampling inspection with double sampling as per CSN 01 0255. table IV/37. During acceptance appearance and dimensions are checked.

In case, during acceptance the bushes do not suit the rings, the inspection of the defective bushes are carried out on the ring for dimensions of hole for making to size, where the internal diameter must correspond to table 1 for bushes KU and table 2 for bushes KX.

Bushes which can be pushed through the 'NO GO' ring by hand are considered to be defective.

In case of finding defective products, the supplier has a right to recheck the technology of measurement as well as the gauges along with the customer.

VI PACKING, TRANSPORT AND STORAGE

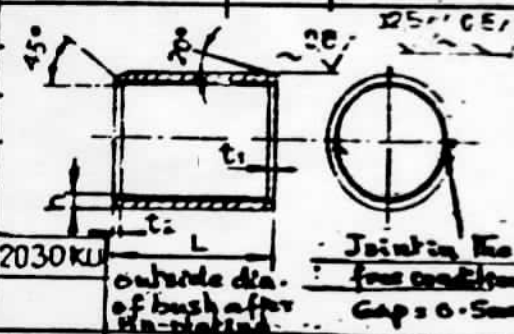
28. The bushes and thrust rings are placed freely in paper cartons, which are placed in pallets or transport containers and are packed such that, during the period of transport no damages occur to them. In the consignment a packing list is enclosed, with the indication of type, as well as the number of products supplied. The products despatched correspond to this TP.

29. Thrust rings are protected with oil OL J2, J3, J4 as per CSN 65 6610.

Nominal		Dimension of bushes before building-in		Wall Thickness	Dimension of bushes after building-in		Shaft diameter
Inner diameter	Outside diameter	Outside diameter - ring	Internal diameter - plug gauge		hole for building-in	Internal diameter after building-in.	
10	12	12,065 - 12,030	10,055 - 10,105	1,005 0,980	+ 0,018 0,000	9,990 - 10,058	9,987 - 9,972
12	14	14,065 - 14,030	12,055 - 12,105			11,990 - 12,058	- 0,015 - 0,034
14	16	16,065 - 16,030	14,055 - 14,105			13,990 - 14,058	
15	17	17,065 - 17,030	15,055 - 15,105			14,990 - 15,058	
16	18	18,065 - 18,030	16,055 - 16,105			15,990 - 16,058	
18	20	20,075 - 20,035	18,065 - 18,115			17,990 - 18,061	
20	23	23,075 - 23,035	20,065 - 20,125	1,505 1,475	+ 0,021 0,000	19,990 - 20,071	- 0,028 - 0,041
22	25	25,075 - 25,035	22,065 - 22,125			21,990 - 22,071	
24	27	27,075 - 27,035	24,065 - 24,125			23,990 - 24,071	
25	28	28,075 - 28,035	25,065 - 25,125			24,990 - 25,071	
30	34	34,085 - 34,045	30,075 - 30,145			29,990 - 30,065	
35	39	39,085 - 39,045	35,075 - 35,145			34,990 - 35,065	- 0,025 - 0,050
40	44	44,100 - 44,050	40,090 - 40,160	2,005 1,970	+ 0,025 0,000	39,990 - 40,085	
45	50	50,100 - 50,050	45,090 - 45,180			44,990 - 45,105	
50	55	55,125 - 55,065	50,115 - 50,205			49,990 - 50,110	
55	60	60,125 - 60,065	55,115 - 55,205			54,990 - 55,110	
60	65	65,125 - 65,065	60,115 - 60,205			59,990 - 60,110	- 0,030 - 0,060
65	70	70,125 - 70,065	65,115 - 65,205	2,505 2,460	+ 0,030 0,000	64,990 - 65,110	
70	75	75,125 - 75,065	70,115 - 70,205			69,990 - 70,110	
75	80	80,125 - 80,065	75,115 - 75,205			74,990 - 75,110	
80	85	85,170 - 85,100	80,160 - 80,250			79,990 - 80,115	
85	90	90,170 - 90,100	85,160 - 85,250			84,990 - 85,115	- 0,036 - 0,071
90	95	95,170 - 95,100	90,160 - 90,250		+ 0,035 0,000	89,990 - 90,115	
100	105	105,170 - 105,100	100,160 - 100,250			99,990 - 100,115	
110	115	115,170 - 115,100	110,160 - 110,250			109,990 - 110,115	

Diameters before building-in				Diameter of bush after building-in			
Inner diameter	Outside diameter	Outside diameter - ring	Internal diameter - plug gauge	Wall Thickness	hole for building-in	Internal diameter after building-in	Shaft diameter
10	12	12,065 - 12,030	9,849 - 9,901	1,108 1,082	+ 0,018 0,000	9,784 - 9,854	9,960 - 9,930
12	14	14,065 - 14,030	11,849 - 11,901			11,784 - 11,854	11,734 - 11,707
14	16	16,065 - 16,030	13,849 - 13,901			13,784 - 13,854	13,732 - 13,705
15	17	17,065 - 17,030	14,849 - 14,901			14,784 - 14,854	14,731 - 14,704
16	18	18,065 - 18,030	15,849 - 15,901			15,784 - 15,854	15,730 - 15,703
18	20	20,075 - 20,035	17,859 - 17,911	1,608 1,576	+ 0,021 0,000	17,784 - 17,857	17,728 - 17,701
20	23	23,075 - 23,035	19,859 - 19,923			19,784 - 19,869	19,726 - 19,699
22	25	25,075 - 25,035	21,859 - 21,923			21,784 - 21,869	21,724 - 21,697
24	27	27,075 - 27,035	23,859 - 23,923			23,784 - 23,869	23,722 - 23,695
25	28	28,075 - 28,035	24,859 - 24,923			24,784 - 24,869	24,721 - 24,694
30	34	34,085 - 34,045	29,869 - 29,941	2,108 2,072	+ 0,025 0,000	29,784 - 29,881	29,718 - 29,691
35	39	39,085 - 39,045	34,869 - 34,941			34,784 - 34,881	34,711 - 34,672
40	44	44,105 - 44,050	39,884 - 39,956			39,784 - 39,881	39,706 - 39,667
45	50	50,105 - 50,050	44,832 - 44,924			44,732 - 44,849	44,649 - 44,610
50	55	55,125 - 55,065	49,857 - 49,949			49,732 - 49,854	49,644 - 49,605
55	60	60,125 - 60,065	54,857 - 54,949	2,634 2,568	+ 0,030 0,000	54,732 - 54,854	54,639 - 54,595
60	65	65,125 - 65,065	59,857 - 59,949			59,732 - 59,854	59,634 - 59,588
65	70	70,125 - 70,065	64,857 - 64,989			64,732 - 64,894	64,629 - 64,583
70	75	75,125 - 75,065	69,857 - 69,989			69,732 - 69,894	69,624 - 69,578
75	80	80,125 - 80,065	74,857 - 74,989			74,732 - 74,894	74,619 - 74,573
80	85	85,170 - 85,100	79,902 - 80,034	2,634 2,568	+ 0,035 0,000	79,732 - 79,899	79,614 - 79,568
85	90	90,170 - 90,100	84,902 - 85,034			84,732 - 84,899	84,609 - 84,565
90	95	95,170 - 95,100	89,902 - 90,034			89,732 - 89,899	89,604 - 89,558
100	105	105,170 - 105,100	99,902 - 100,034			99,732 - 99,899	99,604 - 99,558

of shaft		of wall		of building-in		10	12	15	20	25	30	40	50	60	80
t ₁	t ₂	t ₁	t ₂	t ₁	t ₂										
10	12	1010 KU	1012 KU	1015 KU	1020 KU										
12	14		1212 KU	1215 KU	1220 KU										
14	16			1415 KU	1420 KU										
15	17			1515 KU	1520 KU	1525 KU									
16	18			1615 KU	1620 KU	1625 KU									
18	20			1815 KU	1820 KU	1825 KU									
20	23			2015 KU	2020 KU	2025 KU	2030 KU								
22	25			2215 KU	2220 KU	2225 KU									
24	27			2415 KU	2420 KU	2425 KU	2430 KU								
25	28			2515 KU	2520 KU	2525 KU	2530 KU								
30	34				3020 KU		3030 KU	3040 KU							
35	39				3520 KU		3530 KU	3540 KU	3550 KU						
40	44				4020 KU		4030 KU	4040 KU	4050 KU						
45	50						4530 KU	4540 KU	4550 KU						
50	55						5030 KU	5040 KU	5050 KU	5060 KU					
55	60							5540 KU		5560 KU					
60	65							6040 KU		6060 KU					
65	70							6540 KU		6560 KU					
70	75							7040 KU		7060 KU	7080 KU				
75	80							7540 KU		7560 KU	7580 KU				
80	85							8040 KU		8060 KU	8080 KU				
85	90							8540 KU							
90	95							9040 KU							
100	105														
110	115														

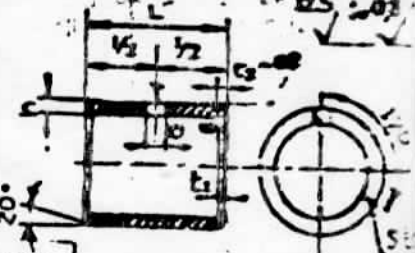


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Internal diameter	external diameter	building-in	Shaft diameter	Wall Thickness	Shaft diameter	Internal diameter of bush with finishing.	Outer diameter		diameter of hole for oil	length of bushes KX (tolerance ±0.25)														
							t ₁	t ₂		10	15	20	25	30	40	50	60	80						
10	12	+0.018 0.000	9.731	1.108 1.062	9.969	+0.015 0.000	0.7 ± 0.3	4	4	1010KX	1015KX	1020KX												
12	14		11.734		11.950																			
14	16		13.737		13.950																			
15	17		14.731		14.950																			
16	18		15.730		15.950																			
18	20	+0.021 0.000	17.725	1.608 1.576	17.950	+0.021 0.000	0.7 ± 0.3	5	5	1615KX	1620KX	1625KX												
20	23		19.726		19.935																			
22	25		21.724		21.935																			
24	27		23.722		23.935																			
25	28		24.721		24.935																			
30	34	+0.025 0.000	29.716	2.108 2.072	29.935	+0.025 0.000	1.2 ± 0.4	6	6	2015KX	2020KX	2025KX	2030KX											
35	39		34.711		34.920																			
40	44		39.706		39.920																			
45	50		44.640		44.881																			
50	55		49.644		49.920																			
55	60	+0.031 0.000	54.639	2.634 2.568	54.900	+0.030 0.000	1.2 ± 0.4	8	8	3020KX		3030KX	3040KX											
60	65		59.634		59.900																			
65	70		64.629		64.900																			
70	75		69.624		69.900																			
75	80		74.619		74.900																			
80	85	+0.035 0.000	79.614	2.634 2.568	79.900	+0.035 0.000	1.2 ± 0.4	9	9	4020KX		4030KX	4040KX	4050KX										
85	90		84.609		84.880																			
90	95		89.604		89.880																			
95	100		94.599		94.880																			
100	105		99.594		99.880																			

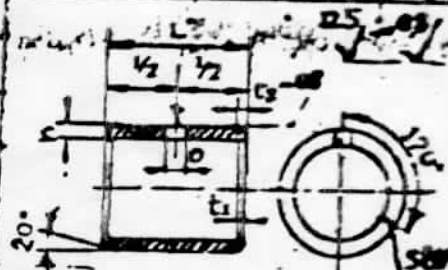
Technical drawing of a bush assembly. The main view shows a bush with dimensions: length 25, outer diameter 25, inner diameter 12, and a hole diameter of 10. A cross-section view shows the bush with dimensions: outer diameter 25, inner diameter 12, and a hole diameter of 10. The text 'In the free condition gap ±0.5mm.' is written below the drawing.

FEENO PRODUCTS



In the free condition
gap ±0.5mm.

10	12	+0.018 0,000	HX	9,738 9,714	1,108 1,062	9,960 9,936	+0.018 0,000	0.7 • 0.3	4	1010 KX	1015 KX	1020 KX								
12	14			11,734 11,707		11,950 11,923														
14	16			13,732 13,705		13,950 13,923					1215 KX	1220 KX								
15	17			14,731 14,704		14,950 14,923					1415 KX	1420 KX								
16	18	+0.021 0,000	1,608 1,576	15,730 15,703	2,108 2,072	15,950 15,923	+0.021 0,000	0.5 • 0.3	5		1515 KX	1520 KX	1525 KX							
18	20			17,725 17,701		17,950 17,923					1615 KX	1620 KX	1625 KX							
20	23			19,726 19,693		19,935 19,902					1815 KX	1820 KX	1825 KX							
22	25			21,724 21,691		21,935 21,902					2015 KX	2020 KX	2025 KX	2030 KX						
24	27	+0.025 0,000	2,634 2,588	23,722 23,689	2,634 2,588	23,935 23,902	+0.025 0,000	1.2 • 0.4	6		2215 KX	2220 KX	2225 KX							
25	28			24,721 24,686		24,935 24,902					2415 KX	2420 KX	2425 KX	2430 KX						
30	34			29,716 29,683		29,935 29,902					2515 KX	2520 KX	2525 KX	2530 KX						
35	39			34,711 34,672		34,920 34,881						3020 KX		3030 KX	3040 KX					
40	44	+0.030 0,000	2,634 2,588	39,706 39,667	2,634 2,588	39,920 39,881	+0.030 0,000	1.8 • 0.6	7			3520 KX		3530 KX	3540 KX	3550 KX				
45	50			44,640 44,610		44,920 44,881						4020 KX		4030 KX	4040 KX	4050 KX				
50	55			49,644 49,605		49,920 49,881								4530 KX	4540 KX	4550 KX				
55	60			54,639 54,593		54,900 54,854								5030 KX	5040 KX	5050 KX	5060 KX			
60	65	+0.035 0,000	2,634 2,588	59,634 59,588	2,634 2,588	59,900 59,854	+0.035 0,000	2.4 • 0.8	8						5540 KX		5560 KX			
65	70			64,629 64,583		64,900 64,854									6040 KX		6060 KX			
70	75			69,624 69,578		69,900 69,854									6540 KX		6560 KX			
75	80			74,619 74,573		74,900 74,854									7040 KX		7060 KX			
80	85	+0.035 0,000	2,634 2,588	79,614 79,568	2,634 2,588	79,900 79,854	+0.035 0,000	3.0 • 1.0	9						7540 KX		7560 KX			
85	90			84,609 84,555		84,880 84,826									8040 KX		8060 KX			
90	95			89,604 89,550		89,880 89,826									8540 KX		8560 KX			
95	100			94,599 94,545		94,880 94,826									9040 KX		9060 KX			
100	105			99,594 99,540		99,880 99,826									9540 KX		9560 KX			



In the free condition
gap = 0.5mm

Dimensions of shaft before building-in		Dimensions of shaft after building-in		Wall Thickness		hole for building-in		Internal diameter after building-in		Shaft diameter	
Inner diameter	outside diameter	Outside diameter — ring	Internal diameter — plug gauge	Wall Thickness		hole for building-in	Internal diameter after building-in				
10	12	12,065 - 12,030	9,849 - 9,901	1,108 1,082	+ 0,018 0,000	112	9,784 - 9,854	9,960 - 9,930	9,736 - 9,714		
12	14	14,065 - 14,030	11,849 - 11,901				11,784 - 11,854	- 0,050 - 0,077	11,734 - 11,707		
14	16	16,065 - 16,030	13,849 - 13,901				13,784 - 13,854		13,732 - 13,705		
15	17	17,065 - 17,030	14,849 - 14,901				14,784 - 14,854		14,731 - 14,704		
16	18	18,065 - 18,030	15,849 - 15,901				15,784 - 15,854		15,730 - 15,703		
18	20	20,075 - 20,035	17,859 - 17,911				17,784 - 17,857		17,728 - 17,701		
20	23	23,075 - 23,035	19,859 - 19,923	1,608 1,576	+ 0,021 0,000		19,784 - 19,869	- 0,065 - 0,098	19,726 - 19,693		
22	25	25,075 - 25,035	21,859 - 21,923				21,784 - 21,869		21,724 - 21,691		
24	27	27,075 - 27,035	23,859 - 23,923				23,784 - 23,869		23,722 - 23,689		
25	28	28,075 - 28,035	24,859 - 24,923				24,784 - 24,869		24,721 - 24,688		
30	34	34,085 - 34,045	29,869 - 29,941				29,784 - 29,881		29,718 - 29,683		
35	39	39,085 - 39,045	34,869 - 34,941				2,108 2,072	+ 0,025 0,000	34,784 - 34,881	- 0,080 - 0,119	34,711 - 34,672
40	44	44,105 - 44,050	39,884 - 39,956	39,784 - 39,881	39,706 - 39,667						
45	50	50,105 - 50,050	44,832 - 44,924	44,732 - 44,849	44,649 - 44,610						
50	55	55,125 - 55,065	49,857 - 49,949	49,732 - 49,854	49,644 - 49,605						
55	60	60,125 - 60,065	54,857 - 54,949	54,732 - 54,854	54,639 - 54,593						
60	65	65,125 - 65,065	59,857 - 59,949	2,634 2,568	+ 0,030 0,000				59,732 - 59,854	- 0,100 0,146	59,634 - 59,588
65	70	70,125 - 70,065	64,857 - 64,989				64,732 - 64,894	64,629 - 64,583			
70	75	75,125 - 75,065	69,857 - 69,989				69,732 - 69,894	69,624 - 69,578			
75	80	80,125 - 80,065	74,857 - 74,989				74,732 - 74,894	74,619 - 74,573			
80	85	85,170 - 85,100	79,902 - 80,034				79,732 - 79,899	79,614 - 79,568			
85	90	90,170 - 90,100	84,902 - 85,034				+ 0,035 0,000	84,732 - 84,899	- 0,120 - 0,174	84,609 - 84,565	
90	95	95,170 - 95,100	89,902 - 90,034	89,732 - 89,899	89,604 - 89,550						
100	100	105,170 - 105,100	99,902 - 100,034	99,732 - 99,899	99,594 - 99,540						

TP-4A/18