

STUDY ABOUT THE TOLERANCES PROBLEMS DETERMINATION FOR CYLINDRICAL AND SCREW THREADED PARTS WITH ELECTRODEPOSITION

ИССЛЕДОВАНИЕ ОПРЕДЕЛЕНИЯ ПРОБЛЕМ ДОПУСКОВ ДЛЯ ЦИЛИНДРИЧЕСКИХ И ВИНТОРЕЗНЫХ ДЕТАЛЕЙ С ГАЛЬВАНИЧЕСКИМ ПОКРЫТИЕМ

Lecturer. dr. eng. Pascu I.¹, Prof. dr. eng. Popescu I.²,

Abstract: This paper presents a study about the problems of the galvanic coatings assembling for cylindrical and screw threaded pieces. It is proposed a calculus method for determination the tolerance field positions. Also, there are performed the calculus diagrams and technological details and are offered technological and constructional solutions for the assurance of the screw threaded assembly after the electro-deposition, too.

KEYWORDS: GALVANIC COATING, TOLERANCES, TOLERANCE SCREW THREAD.

1. Introduction

The international standards and other internal regulations establish the tolerances of the different types of the pieces used in varied domains. Thus, there are limited pieces and products with dimensions of non-mating parts for that are provided standard tolerances [1].

Generally, the pieces with tolerated levels are purposed for different assemblies, which can be fixed or unfixed (moveable fit).

For the pieces that have some relative motions are necessary very accurate specifications (technical orders) about the areas, which can result clearances. The big clearances can failed the mounting because of the vibrations and the small clearances can produce gripping.

Usually, the pieces used at the permanent mountings, in one-part assemblies, are protected against the corrosion through dyeing.

The pieces, which have relative motions or form build up dismountable assemblies to support the corrosion, must be electrodeposited [2].

The galvanic coatings are varied kinds, with different thickness and materials, depending on the medium that will be working.

Commonly, are practiced the following galvanic coatings: zinc plating, anodization, cadmium coating, chromium plating, silvering, nickel cladding, and so on.

If a shaft and a bushing are calculated under the tolerances aspect that fit loosely, between J_{max} and J_{min} , after the galvanic coatings they present another tolerance.

2. Dimensional changes of cylindrical parts shaft-bushing kinds.

In the figure 1 are presented the positions of the tolerance fields for a shaft and a bushing after deposition (the graphical plotting has been made at the both sides for pointing out the roughness role).

The bushing has the T_D tolerance and, on the each side a certain roughness R_y – the maximum height of the profile, on the gauge length (it is thought that not appear bends).

The roughness is involved into the tolerance, but has her personal influence about the assembling quality, in time, with blunting of the micro-roughness, the clearance increases. Analogous, there is a tolerance T_d for the shaft and another roughness R_y .

In the diagram are noted the maximum and minimum clearances.

Initially, the pieces, resulting a certain roughness on each surface.

Through the galvanic coating, this roughness is enclosed into h thickness, thus not appears in calculus.

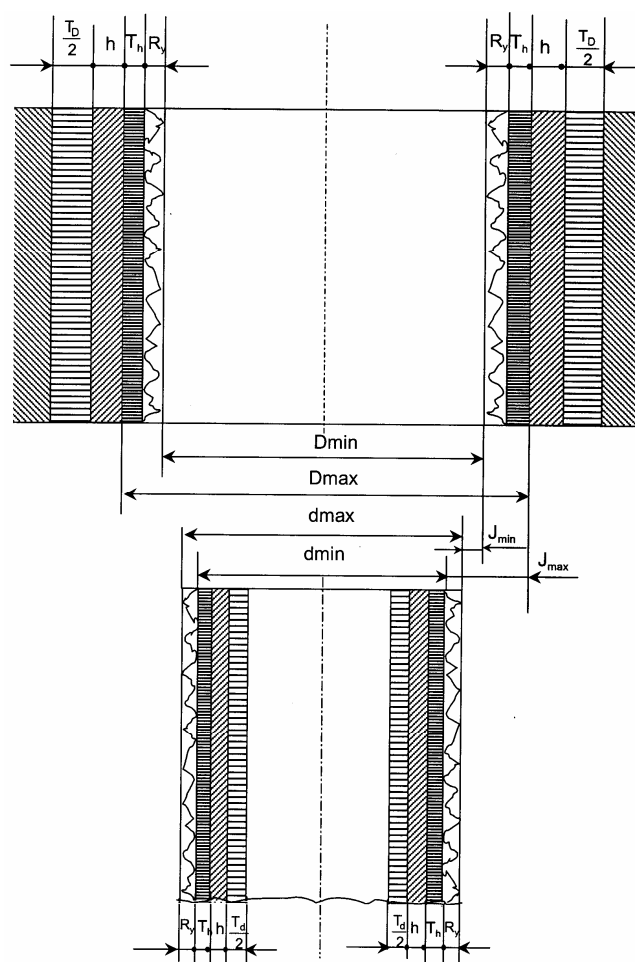


Fig.1. The positions of the tolerance fields for a shaft and a bushing after deposition.

Because of technological reasons concerning the chemical process of the galvanic coating, the depth of the deposited layer is non-uniform and, thus, here is a tolerance T_h .

Thus, can be observed that appears a roughness R_y , much smaller than the roughness resulting after the mechanical working, but must be assumed in calculus.

The shaft performing can be made easy and accurate through the turning and then, grinding.

Here can be adjusted the dimensions depending on the requisite thus can be obtained the calculated dimensions requirement.

This situation appears at the bushing kind of pieces with large diameters, which are turning and then grinding.

Difficult problems appear at the manufacturing of the circular bores with small diameters. In that situation cannot be established the dimensions obtained from calculus without the observed the standardized drill diameter. But, the drills are mechanical worked pieces and have their tolerances, too.

The diameter of the bore performed through drilling depends on the all specified drill tolerances and the drilling precision, too. This situation appears because during the mechanical there is possible or not possible the bushing guide or loose working without device.

In this case the diameter results larger than at the guidance with bushing guide.

On the basis of the previous reasons, there is established the following calculus method for the adjustment tolerances:

- on the basis of the figure 1 and the standard specifications about the drill required tolerances it is settled the bore tolerance;
- depending on the working conditions of the respectively subassembly, is established the thickness of the galvanic coating layer;
- depending on the claddings technology, it is established the tolerance of the deposited layer and the roughness R_y resulted after the electro-deposition;
- there are settled the maximum and minimum diameter of the bore;
- depending on the maximum and minimum clearances established for the respectively mounting, because of functional reasons, and (including the dependency on this tolerance, too) there are determined this maximum and minimum diameter for the shaft;
- if it is possible, are enclosed the positions of the tolerance fields in the standardized values; generally, this is not possible, and for this reason there are necessary special gauges for the shaft and bushing.

3. Tolerance of the screw thread assemblies with galvanic coatings.

A such problem was a great topical interest because the thread pieces was realised with standardized tools, then was galvanic coated and, at the assembling, they was unable to be mounted only constrained, that it was removed the deposited layer and having negative action concerning the products performances.

In the figure 2 is shown the alteration of the screw-thread profile because of the galvanic coatings.

An applied solution, in the case of a screw thread M22×1,5 was consisted in tolerance field position maintenance for the nut according to the standards and the displacement of the screw tolerance field with the sum of the films depths galvanic coated, like in the diagram 3.

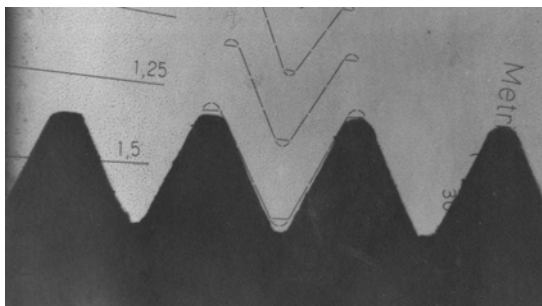


Fig. 2. The alteration of the screw-thread profile because of the galvanic coatings.

In ISO 4042 are presented the conditions for the electro depositions, and for other conditions concerning the coating there is established an "agreement between the customer and supplier".

In the most situations, the product engineer proceeds from that stipulation that the small coatings must be enclosed into the standard tolerance fields.

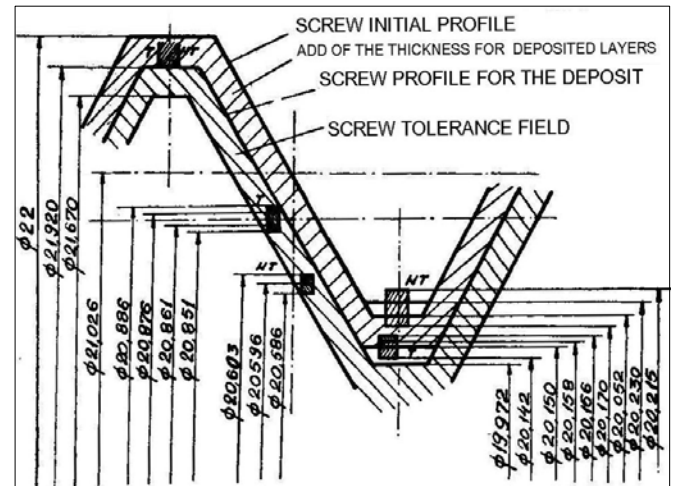


Fig.3. The screw tolerance field with the sum of the films depths galvanic coated.

This means that must be diminished the manufacturing tolerances but this requires some technological measures.

Because these tolerances are not assessed, it is used the selective fit that is an accommodation for the average and mass quantity production of the repeated testing.

For the products purposed for some working wet agents (like the tropical zone) is necessary to make galvanic coatings with plating having large thickness.

The designing engineer establishes the setting up solutions.

This operation is possible through the sortable selection of the tolerances size, thus the stipulating of that precision class with the largest tolerances.

It is obvious that the designing engineer must refers to the other implications of this expand tolerances, for example the mounting precision.

In this way, this problem can solve a lot of situations, because the designing engineer has chosen between 2 variables: the deposit thickness and the precision class.

Under technological aspect this solution purposes that the screw taps will be assigned in certain execution classes with certain tolerance classed.

This solution must be specified on the work drawing or in the technology, for be pour sued at the tools ordering and the screw taps manufacturer must observe the rules for established precision class.

In this solution can not be applied because the galvanic coatings are too large, then can be settled the following solutions:

- if the screw can be performed with the cutting tool, then is maintained the regular nut, produced with normal screw tap and is removed the tolerance field of the screw with the add of coatings for the nut and the screw tap and subsequent performing special gauges for the threads control ;
- if the screw is produced with the threading die and the nut with the screw tap is maintained the regular screw, achieved with normal threading die and is removed the tolerance field of the nut with the amount of the galvanic coatings thickness deposited on the screw and nut, and will be performed special screw tap with another position of the tolerance field; for the control are necessary special gauges;
- if the screw or nut are performed with other tools (roller, cam) then is removed the tolerance field for one of the pieces through the alteration of the rigging and/or the respective tool profile.

3. Conclusions.

- a. The technological parameters influence the positions of these fields.
- b. The galvanic coatings convert the values and positions of the tolerance fields of the pieces.
- c. For solving the problem of the assurance of the necessary clearance after the galvanic plating there are used special gauges.
- d. For small thickness of the galvanic coatings deposited is required that these be including in the permissible variation, following that at the mounting to be realized the selective fit.
- e. For larger thickness of the galvanic coatings laid-down will be maintained one of the pieces through the regular execution and will be performed special tools and gauges for the mating member.

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