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ORDER OF DEPENDENT ADMITTANCE CALCULATION

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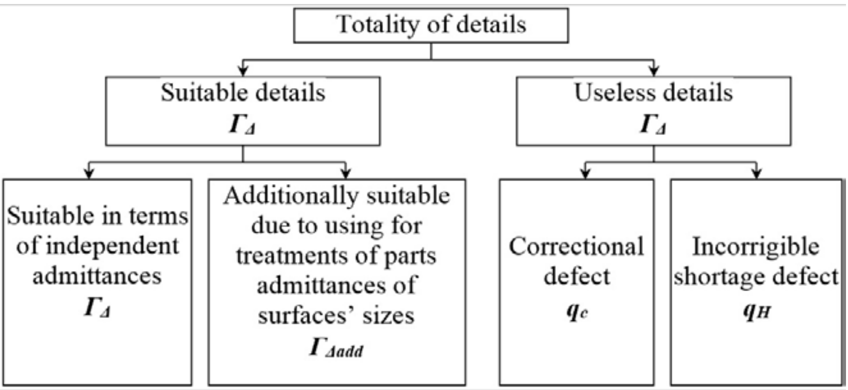
First of all quality and capacity of composed units and mechanisms depend on exactness of geometrical parameters that influences their durability, therefore all component elements of machines can be divided by the categories of fitness at independent and dependent admittances into two groups: suitable and useless details, the methodology of dependent admittance calculation is expounded. The calculation formulas are given for definition constructive factor relative accuracy of the details (product) is calculated and a rate of technological precision machining parts on a surface. The patterns of dependent admittance calculations and determination of suitable possible part imperfect details are set out.

Key words: *Dependent admittance, suitable details, final defect, correctional defect.*

First of all quality and capacity of composed units and mechanisms depend on exactness of geometrical parameters that influences their durability.

All component elements of machines can be divided by the categories of fitness at independent and dependent admittances into two groups: suitable and useless details.

By the category of fitness at detail's independent admittances can be as suitable so useless, and at dependent admittances it is shown on the Scheme 1.



Scheme 1. Classification of details is by the category of fitness at dependent admittances.

At independent admittances suitable are details in that rejections of location are in the borders of admittance on a draft. All last details are useless, here a shortage is final. At independent admittances suitable are details in that rejections of location are in borders extended, comparatively with indicated on a draft, admittance of location, which is determined correlation (1) and (2).

When dependent admittance is related to the sizes of both examined elements, then

$$\Delta_{dep} = \Delta + \frac{|Z_1| + |Z_2|}{2} , \qquad (1)$$

where Δ_{dep} is a maximum rejection of location for each specific detail (in terms radius); Δ is minimum size of maximum rejection of location, that is filled in on a draft in radius expression (e.g., at the admittances of alignment $\Delta = T_c/2$) ; $|Z_1|$ and $|Z_2|$ is absolute values of sizes' rejections of coordinating details surfaces are from communicating borders (the largest size limit shaft or smallest hole size limit).

When location admittances mark in diametrical expression, then, for example, in relation to alignment.

$$T_{cdep} = T_c + |Z_1| + |Z_2| . \qquad (2)$$

Here T_{cdep} is admittance value of the alignment diametrically expression for specific details; T_c is a minimum admittance's value of alignment in diametrically expression, which is filled in on a draft.

At the complete use of admittances of sizes' surfaces which are coordinated when their sizes answer impassable boundaries, boundary location in radial deviation of the expression is calculated by the formula

$$\Delta_{dep.max} = \Delta + \frac{T_1 + T_2}{2} , \qquad (3)$$

where T_1 and T_2 is size surfaces, which are coordinated.

When dependent admittance is related to the actual sizes only shown or only base element, then

$$\Delta_{dep} = \Delta + \frac{|Z|}{2}. \qquad (4)$$

Here |Z| is an absolute value of a size rejection is from the communicating border of that element to that dependent admittance is related.

Indemnification of rejections of sizes location by the rejections of surfaces sizes, which are coordinated, it can take place not only automatically, because of the relationship of chance variations location and size variations, but deliberately, when such compensation is additionally used in the initial processing under-particle admittances on the sizes of detail surfaces.

A defect at dependent admittances is subdivided into correctional and final.

Correctional defect of detail is where the absolute value of the deviation arrangement is in the range of values which are defined as (1) and (3) (when dependent admittance is related to the sizes of both examined surfaces). Details with a correctional defect can be translated in correctional by the repeated treatment of coordinating surfaces in the borders of not fully used parts of sizes admittances and approaching of them to the impassable borders (for example, repeated opening out of opening without some special setting). In other words, there are corrective parts, whose share of error location, which is beyond the boundaries marked on the drawing admission, not offset used in the processing of particles admittances of linear and angular dimensions, but compensation can be made deliberately without special installation by re-processing of parts size coordinating the boundaries of the surface tolerances on these dimensions. Thus, a detail is translated in the digit of suitable due to fully using sizes admittances of coordinating surfaces, but not due to the error of location of these surfaces.

A final defect at dependent admittances are details in that admittances of corresponding sizes of coordinating surfaces appear insufficient for indemnification of complementary part of rejection of location, that is, in such details the absolute value of rejection of location exceeds a value, determine correlation (4).

An order of calculation of possible parts of suitable and defective details of dependency upon technological exactness treatment is after the location of surfaces and type of admittance. Methodology of calculation [2].

1. From drawing details admittance dimensions coordinating surfaces is defined T, T_1 and T_2, to which dependent admittance, and admittances of location (or forms), is related: T_C is admittance of alignment, to symmetry, crossing axes at diametrically terms; T_L is axis straightness admittance surface of the product in terms of diametrically; $T_\perp$ is admission axis perpendicular to the plane of the surface of the product; ±δL is a maximum deviation of size between axes from a basic value; $T_{п1}$, $T_{п2}$ is the position admitting of axes to diametrical expression.

2. Constructive factor relative accuracy of the details (product) is calculated:

- for details on an admission alignment, symmetry, crossing axes:

if dependent admittance, associated with the actual size of both elements considered, so

$$P = \frac{T_1 + T_2}{T_C}; \quad (5)$$

if dependent admittance associated with the actual size of only one element (the review or base) then will be

$$P = \frac{T}{T_C}; \quad (6)$$

- for details on admission distance between the axes of surfaces specified size limit symmetric deviation between the axes of the surfaces of the nominal value:

if dependent admittance is related to the actual sizes of both elements, which are researched, so then

$$P = \frac{T_1 + T_2}{2\delta \cdot L}; \quad (7)$$

if dependent admittance is related to the actual sizes by only one element (considered or based), then

$$P = \frac{T}{2\delta \cdot L}; \tag{8}$$

- for details in which admittances of location are set by the position:

if dependent admittance is related to the actual sizes of both elements which are examined, so then

$$P = \frac{T_1 + T_2}{T_{И1} + T_{И2}}; \tag{9}$$

if dependent admittance associated with the actual size of only one element, so then

$$P = \frac{T}{T_{И1} + T_{И2}}; \tag{10}$$

- for details on admission axis perpendicular to the plane of the surface:

$$P = \frac{T_1}{T_2}; \tag{11}$$

- for details of straightness admittance axis surface:

$$P = \frac{T}{T_L}; \tag{12}$$

- with zero admittances dependent coefficient of relative accuracy is not defined.

3. Determine the right technological dispersion error location (or forms) for ГОСТ 16467-70.

4. Rate of technological precision machining parts on a surface that is equal to the scattering field placement error (or shape) to the field of access is calculated:

- admittance for alignment, symmetry, crossing axes

$$K_{T\Delta} = \frac{\omega}{0,5T_C}; \tag{13}$$

• admission by the distance between the axes of surfaces caused symmetric boundary size deviation from the nominal value ±δL

$$K_{T\Delta} = \frac{\omega}{2\delta \cdot L}; \qquad (14)$$

• for admission axis perpendicular to the plane of the surface

$$K_{T\Delta} = \frac{\omega}{T_{\perp}}; \qquad (15)$$

• axis straightness admittance for surface

$$K_{T\Delta} = \frac{\omega}{T_{L}}; \qquad (16)$$

• for zero admittance dependent alignment, symmetry, crossing axes:

if dependent admittance associated with the actual size of both elements, which are considered, so then

$$K_{T\Delta 0} = \frac{\omega}{TD + Td}; \qquad (17)$$

if dependent admittance associated with the actual size of a single element, then

$$K_{T\Delta 0} = \frac{\omega}{0{,}5T}; \qquad (18)$$

• at a zero dependent admittance of distance between axes:

if dependent admittance connected with the actual size of the two elements,

$$K_{T\Delta 0} = \frac{\omega}{TD + Td}; \qquad (19)$$

if dependent admittance associated with the actual size of a single element, then

$$K_{T\Delta 0} = \frac{\omega}{T}; \qquad (20)$$

• at a zero dependent admittance of perpendicularity of axis of surface in a relation to a plane, straight forwardness of axis of surface

$$K_{T\Delta} = \frac{\omega}{T};\qquad (21)$$

12,detail will have deviation from alignment at radius expression in borders 55 ≤ $T_{c.depRmax}$ ≤ 62,5 mkm so it is not correlated defect.

It can be converted into suitable by the repeated treatment of opening in the borders of admittances and approaching of their sizes to the impassable borders (for example, opening out each of opening or one of them without any or reconciling). When in the detail of deviation from alignment in radius expression it will be more than 62,5 mkm , so it is a final shortage defect.

Example 2. Calculate the value of the dependent admittance, if the size of coordinating surface level $Ø_{85,054}$ i $Ø_{30,021}$, and the numerical value of the dependent admittance associated only with the size of the surface in question (Fig. 2).

From the draft of detail find the minimum value of the dependent admitting to the diametrical expression $T_{cØ}$=50 mkm.

From the problem of size base rejection of surface specifications from a communicating border Z_1 = 85,054 - 85 = 0,054 mm = 54mkm.

A numerical value of dependent admittance of alignment is in diametrical expression for this detail: $T_{c.depØ} = T_{cØ}+Z_1$=50+54=104 mkm.

The greatest value of dependent admittance of alignment is in diametrical expression after the complete use of admittance of surface size which is examined: $T_{c.dep.Ømax}=T_{cØ}$+TD=50+54=104 mkm.

Example 3. To expect possible parts of the suitable and imperfect details represented at the Fig. 1 (see an example 1), when weeds dispersion of deviations from alignment presents 60 mkm, a defect after the sizes of coordinating surfaces is absent. The numerical value of the dependent admittance is related to the actual sizes of both surfaces.

From the draft of the detail we can determine that the dependent admittance is related to the actual sizes of both elements which are examined. Find admitting of alignment to the diametrical expression $T_{c\varnothing}$=54 mkm and admittances of coordinated surfaces T_1=54 mkm, T_2 =21 mkm.

Calculates the value of constructive factor relative accuracy of the details by the formula: $P=(T_1+T_2)/T_c=(54+21)/50=1,5$.

With the right technological conditions of the problem of alignment deviations scattering (in terms of radius) w = 60 mkm. Calculates the coefficient of technological precision machining on a surface by the expression (13): $K_{T\Delta}$= =60/(0,5·50)=2,4.

Find suitable and possible share of defective parts:

- Suitable according to the independent admittances. Look table. Д 7 with $K_{T\Delta}$= 2,4 we find Γ_{Δ}= 64,20% ;
- additionally suitable for the use for the treatment of particle size tolerances surfaces. Look table. Д 8 with P=1,5 i $K_{T\Delta}$= 2,4 we find $\Gamma_{\Delta дод}$= 30,76%;
- it is a final defect of the surfaces location. At the table. Д 9 with P=1,5 i $K_{T\Delta}$= 2,4 find q_0=0,16% ;
- Correctional defect of location surfaces $q_в=100-(\Gamma_{\Delta}+\Gamma_{\Delta дод}+q_0)=100-(64,20+30,76+0,16)=4,88\%$.

If calculate by the table Д 10 with P=1,5 i $K_{T\Delta}$= 2,4, then we find interpolation $q_в$=4,96%. The difference in results is explained by the interpolation error.

Example 4. Calculate the proportion of suitable and possible defective parts shown in Fig. 2 (see. Example 2) when the stray field deviations from the alignment is 60 mkm, like in Example 3. The numerical value of the dependent admittance associated only with the size of the surface in question.

From the drawing of details we determine that dependent admittance is associated with the actual size of the element in this problem. Find the admission of alignment in terms diametrically $T_{c\varnothing}$=50 mkm and admittance of size surface, with which a dependent admittance is connected T=54 mkm (admittance of the element, which is established).

We calculate the value of constructive factor relative accuracy of the details by the formula: $P=T/T_c=54/50=1,08$. With the right technological conditions of the problem of alignment deviations scattering (in terms radius) w = 60 mkm..

The coefficient of technological precision machining placement surfaces (similar to Example 3) the expression (5): $K_{T\Delta}$= 2,4.

We find suitable and possible shares of defective parts:

- suitable to the independent admittances. By the table. Д 7 with $K_{T\Delta}$= 2,4 we find Γ_{Δ}=64,20%;
- additionally suitable for the use for the treatment of particle size surfaces admittances At the table. Д 8 with P=1,08 and $K_{T\Delta}$= 2,4 we find interpolation $\Gamma_{\Delta дод}$=26,46%;
- final defect of the surfaces location. At the table. Д 9 with P=1,08 and $K_{T\Delta}$= 2,4 we find q_0=1,22%;
- correctional defect of the surfaces location $q_в=100–(\Gamma_{\Delta}+\Gamma_{\Delta дод}+q_0)=100–(64,20+26,46+1,22)=8,12\%$.

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П. М. Полянський. ***Порядок розрахунку залежного допуску.***

Якість і працездатність складанних одиниць і механізмів в першу чергу залежить від точності геометричних параметрів, що впливає на довговічність, тому всі складові елементи машин можна поділити за категоріям придатності при незалежних і залежних допусках на дві групи: придатні і непридатні деталі.

Викладено методику розрахунку залежного допуску. Наведено розрахункові формули для визначення конструктивного коефіцієнта відносної точності деталі, коефіцієнт технологічної точності обробки деталей за розташуванням поверхонь. Дано приклади розрахунків залежного допуску, визначення можливої частки придатних і дефектних деталей.

Ключові слова: *залежний допуск, придатні деталі, остаточний брак, виправний брак.*

П. Н. Полянский. ***Порядок расчета зависимого допуска***

Качество и работоспособность соединительных единиц и механизмов в первую очередь зависят от точности геометрических параметров, влияющих на долговечность, поэтому все составляющие элементы машин можно разделить по категориям годности при независимых и зависимых допусках на две группы: пригодные и непригодные детали.

Изложена методика расчета зависимого допуска. Приведены расчетные формулы для определения конструктивного коэффициента относительной точности детали, коэффициент технологической точности обработки деталей по расположению поверхностей. Даны примеры расчетов зависимого допуска, определения возможной доли пригодных и дефектных деталей.

Ключевые слова: *зависимый допуск, годные детали, окончательный брак, исправительный брак.*