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Accuracy of cycloidal gear and pin wheel for cycloidal drives

摆线针轮行星传动　摆线齿轮和针轮　精度

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1 Scope

This Standard specifies the terms and definitions, symbols, accuracy grades, tolerances and limit deviations, and inspection items for the accuracy of cycloidal gears and pin wheels in cycloidal pin wheel planetary transmissions.

This Standard applies to cycloidal gears and pin wheels in cycloidal pin wheel planetary transmission reducers.

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For dated references, the subsequent amendments (excluding corrigendum) or revisions do not apply to this Standard, however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 1184-1996, *Geometrical tolerancing. Geometrical tolerance for features without individual tolerance indications* (eqv ISO 2768-2:1989)

GB/T 1800.4-1999, *Limits and fits Tables of standard tolerance grades and limit deviations for holes and shafts* (eqv ISO 286-2:1988)

GB/T 10107.1-1988, *Basic terminology of cycloidal drives*

GB/T 10107.3-1988, *Symbols of geometrical data for cycloidal drives*

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 10107.1 and GB/T 10107.3 as well as the following terms, definitions and symbols apply.

3.1 Single pitch deviation of cycloidal gears (f_{pt})

The algebraic difference between the actual tooth pitch and the theoretical tooth pitch on the end plane, on a circle concentric with the axis of the cycloidal gear close to the middle of the tooth height (see Figure 1).

3.2 Cumulative pitch deviation of cycloidal gears (F_{pk})

The algebraic difference between the actual arc length and the theoretical arc length of any K pitches (see Figure 1). Theoretically, it is equal to the algebraic sum of the individual pitch deviations of these K pitches.

The tooth pitch number K is given by design.

3.3 Cumulative total deviation of cycloidal gear pitch (F_p)

The maximum cumulative pitch deviation within any arc segment (K=1 to K=Z_c, Z_c is the number of teeth of the cycloidal gear) on the same side of the tooth surface of the cycloidal gear. It is expressed as the total amplitude of the cumulative pitch deviation curve.

3.4 Cycloidal gear tooth profile deviation (F_α)

The amount by which the actual tooth profile deviates from the designed tooth profile within a complete tooth profile on the end plane. This amount is measured in the normal direction of the designed tooth profile.

The complete tooth profile refers to the tooth profile corresponding to a theoretical pitch angle between the roots of any two adjacent teeth of the cycloidal gear. The designed tooth profile refers to the tooth profile that meets the design requirements.

3.5 Cycloidal gear tooth deviation (F_β)

The end face distance between two theoretical tooth lines that encompass the actual tooth line on a cylindrical surface coaxial with the cycloidal gear axis near the middle of the tooth height, in the working part of the tooth width.

3.6 Cycloidal gear top-root distance deviation (M)

The difference between the actual distance and the theoretical distance between the top of any tooth of a cycloidal gear and a tooth root at a 180° central angle relative to it.

NOTE: Pin tooth diameter is the diameter of the pointer tooth pin, and the outer diameter of the tooth sleeve for pin tooth pointers with pin tooth sleeves.

3.13.2 Pin tooth roundness (f_{dy}')

The roundness of the pin teeth on the end plane.

NOTE: The pin tooth roundness is the roundness of the pointer tooth pin. For pin teeth with pin tooth sleeves, it refers to the roundness of the pin tooth sleeve.

3.14 Pin wheel tooth deviation (F_{β}')

In the working part of the tooth width, the pin wheel tooth deviation F_{β}' is composed of the pin wheel tangential tooth deviation $F_{\beta t}'$ and the pin wheel radial tooth deviation $F_{\beta r}'$. The maximum value of the two is taken as the pin wheel tooth deviation.

3.14.1 Tangential tooth deviation of pin wheel ($F_{\beta t}'$)

The tangential distance between the two theoretical tooth lines on the center cylindrical surface of the pin tooth, which contains a generatrix on the cylindrical surface of the pin tooth.

3.14.2 Radial tooth deviation of pin wheel ($F_{\beta r}'$)

Relative to the axis of the pin wheel mounting hole, the end face radial distance between the two theoretical tooth direction lines that encompass the inner generatrix of the pinion teeth.

The axis of the pin wheel mounting hole refers to the straight line passing through the center of the pin wheel mounting hole and perpendicular to the plane of the pin wheel end. The inner busbar of the pin tooth refers to the busbar closest to the axis of the pin wheel mounting hole.

3.15 Pin tooth center circle diameter deviation (F_d')

The difference between the actual diameter of the center circle of the pin teeth and the theoretical diameter.

3.16 Pin tooth radial runout (F_r')

The maximum change in the probe position relative to the axis of the pin wheel mounting hole when the probe radially contacts the inner generatrix of each pinion tooth within one rotation of the pin wheel.

4 Accuracy levels, tolerances and limit deviations

4.1 The precision of cycloidal gears and pin wheels is divided into levels 5, 6, 7, 8 and

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