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Basic terminology of harmonic gear drive

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1 Scope

GB/T 12601-1990 is the Chinese national standard on basic terminology of harmonic gear drive, in the field of mechanical systems and components. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 18 December 1990 by the State Bureau of Technical Supervision, and has been in force since 1 December 1991. Classification: ICS 21.200, CCS J17. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This standard specifies the basic terms and definitions of harmonic gear drives. This standard applies to harmonic gear drives.

2 Normative references

GB 3374 Basic terminology of gears

GB 11366 Basic terminology of planetary drives

GB 10853 Terminology for the theory of machines and mechanisms SJ 2604 Single-stage harmonic gear reducer SJ 2557 Accuracy calculating method for spur gear-driven chain with fine pitch

3.1 Transmission elements and components

3.1.1 Harmonic gear drive Harmonic gear drive is mainly composed of three basic components: wave generator, flexspline and circular spline. It is a drive that relies on wave generator to make flexspline produce controllable elastic deformation and mesh with circular spline to transmit motion and force.

3.1.2 Mechanism of the harmonic gear drive The main components in the mechanism of harmonic gear drive are: a. Wave generator; b. Flexspline; c. Circular spline; d. Input shaft connection;

3.1.8 Deflection Under the action of the wave generator, the amount of deformation (radial, tangential or axial) at any point on the neutral layer of the flexspline toothed ring. Synonym: displacement

3.1.8.1 Radial deflection Under the action of the wave generator, the amount of deformation in the radial direction at any point on the neutral layer of the flexspline toothed ring. Synonym: Radial displacement

3.1.8.2 Tangential deflection Under the action of the wave generator, the amount of deformation in the tangential direction at any point on the neutral layer of the flexspline toothed ring. Synonym: Tangential displacement

3.1.8.3 Axial deflection Under the action of the wave generator, the amount of deformation in the axial direction at any point on the neutral layer of the flexspline toothed ring. Synonym: Axial displacement

3.1.8.4 Maximum deflection Refers to the maximum value of deformation (radial, tangential, axial) at any point on the neutral layer of the flexspline toothed ring under the action of the wave generator. Synonym: Maximum displacement

3.1.8.5 Coefficient of maximum deflection The ratio of maximum deformation to modulus.

3.1.9 Distortion When the drive mechanism is overloaded, the actual profile of the neutral layer of the flexspline's toothed ring will deviate or twist from its original profile under no load.

3.1.10 Equidistant curve The lost motion caused by the backlash between the flexspline and the circular spline as well as the gaps in other components, which is called the lost motion caused by clearance.

3.2.5.2 Lost motion caused by elastic deflection Lost motion as caused by elastic deformation of components.

3.2.6 Moment of inertia The sum of the product of each mass or the mass of mass unit in the component and the square of the distance from the given axis, which is called the moment of inertia of the rigid component to the given axis.

3.2.7 Natural frequency The frequency determined by the mass (moment of inertia) and stiffness (torsional stiffness) of the system itself.

3.2.8 Resonance frequency The vibration when the excited frequency coincides with the natural frequency of the system, which is called resonance. The forced vibration frequency when resonance occurs is called the resonance frequency.

3.3 Gear characteristics and size parameters

3.3.1 Mating flank In a gear pair, two flanks that mesh with each other are called mating flank.

3.3.2 Working flank A flank on a gear tooth that meshes with the flank of a mating gear and transmits movement.

3.3.3 Non-working flank The opposite side of the working flank of the gear tooth.

3.3.4 Left flank When an observer looks at the end face of the gear selected as the reference The process from the point when the flexspline starts withdrawal from the maximum depth of engagement to the point when the flexspline's teeth is disengaged.

3.4.1.3 Total number of teeth in engagement The number of teeth meshed simultaneously between the flexspline and the circular spline.

3.4.1.4 Region of engagement Under the action of the wave generator, the region where there is engagement between the flexspline's teeth and the circular spline's teeth.

3.4.1.5 Engaging-in region The region passed by the engaging-in process.

3.4.1.6 Engaging-out region The region passed by the engaging-out process.

3.4.1.7 Circular arc angle of engagement The center angle corresponding to the region of engagement.

3.4.1.8 Normal engagement The contact point between the flexspline tooth and the circular spline tooth is located within the working section of the tooth profile.

3.4.1.9 Tip edge engagement The engagement where the tooth tip edge of the flexspline is in contact with the tooth profile of the circular spline, or the tooth tip edge of the circular spline is in contact with the tooth profile of the flexspline.

3.4.1.10 Maximum depth in engaging In the engagement state, the absolute value of the

difference between the radius of the addendum circle on the long shaft's half shaft (or short shaft's half shaft) and the radius of addendum circle of the circular spline after the flexspline is deformed.

3.4.2 Interference The phenomena when the tooth profile of the matched gear overlaps due to improper selection of design parameters, or crosses the normal limit, or overcuts.

4 Commonly used harmonic gear drives

4.1 Harmonic gear reducer Harmonic gear drive mechanism whose output shaft speed is less than the input shaft speed.

4.2 Harmonic gear increaser Harmonic gear drive mechanism whose output shaft speed greater than input shaft speed.

4.3 Vertical harmonic gear drive The harmonic gear drive whose output shaft is a vertically arranged.

4.4 Horizontal harmonic gear drive The harmonic gear drive whose output shaft is horizontally arranged.

4.5 Single-stage harmonic gear drive A drive composed of a wave generator, a flexspline and a circular spline.

4.6 Two-stage harmonic gear drive A drive composed of two single-stage harmonic gear drives in series.

4.7 Multiple-stage harmonic gear drive A drive composed of several single-stage harmonic gear drives in series.

4.8 Dual harmonic gear drive The two toothed rings on the flexspline are respectively meshed with the two circular splines through the action of a wave generator to produce a drive of composite motion.

4.9 Hermetically sealed harmonic gear drive The drive that the wave generator transmits motion or force under the conditions of strict isolation of two different spaces through a closed flexspline.

4.10 Harmonic gear drive with radial gear meshing Under the action of the wave generator, the flexspline and the circular spline mesh in a radial direction, the deformation wave between them is perpendicular to the output shaft of the harmonic gear drive.

5.1.9 Disk-type wave generator A non-active control wave generator which is eccentrically arranged on the input shaft by a disc.

5.1.9.1 Two disc wave generator A non-active control wave generator whose two equal-diameter discs are symmetrically and eccentrically arranged on the input shaft.

5.1.9.2 Three disk wave generator A non-active controlled dual-wave generator whose