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Sheet Metal Parts Fabricated by Fine Blanking Combined with Extrusion Process - Technological Specification

金属板料精冲挤压复合成形件 工艺规范

Issued on: June 4, 2019 **Implemented on: January 1, 2020**

Issued by: State Administration for Market Regulation;

Standardization Administration of the People's Republic of China.

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Table of Contents

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Sheet Metal Parts Fabricated by Fine Blanking Combined with Extrusion Process - Technological Specification

1 Scope

This Standard stipulates the technological specification of sheet metal parts fabricated by strong blank-holding, fine blanking combined with extrusion process (hereinafter referred to as “fine blanking extrusion parts”), including the classification of molding modes, the design of technological procedure, and selection of materials, moulds and equipment.

This Standard is applicable to fine blanking extrusion parts, which are produced through strong blank-holding and fine blanking, combined with extrusion process.

2 Normative References

The following documents are indispensable to the application of this document. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB 8176 *Safety Production Codes for Presswork;*

GB/T 8541 *Terminology of Forging and Stamping;*

GB/T 30572 *Fine Blanked Parts - Compiling Rules of Processes;*

GB/T 30573 *Fine Blanked Parts - General Technical Requirements;*

JB/T 6541 *Shape and Structure Elements for Cold Forging Part;*

JB/T 9175.1 *Fine Blanked Parts - Part 1: Structural Processability;*

JB/T 9175.2 *Fine Blanked Parts - Part 2: Quality*

3 Terms and Definitions

What is defined in GB/T 8541, and the following terms and definitions are applicable to this document.

3.1 Fine Blanking Combined with Extrusion Process

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Fine blanking combined with extrusion process refers to the process which adopts fine blanking molding equipment and realizes the molding of sheet metal parts through the combined action of fine blanking and extrusion.

4 Symbols

The following symbols are applicable to this document.

D---diameter of extrusion concave die cavity, expressed in (mm);

d---diameter of extrusion convex die, expressed in (mm);

S_0---before extrusion deformation, cross sectional area of sheet blank, expressed in (mm^2);

S_1---after extrusion deformation, cross sectional area of molded parts, expressed in (mm^2);

H---extrusion stroke of extrusion convex die, expressed in (mm);

H_1---motion stroke of extrusion reverse ejector pole, expressed in (mm);

h---height of blank holder's V-shaped tooth, expressed in (mm);

L_R---perimeter of blank holder's V-shaped tooth, expressed in (mm);

L_t---shearing perimeter of fine blanked parts, expressed in (mm);

F---total molding force, expressed in (N);

F_s---fine blanking force, expressed in (N);

F_E---extrusion force, expressed in (N);

F_1---blank-holding force, expressed in (N);

F_2---fine blanking back pressure, expressed in (N);

F_3---extrusion back pressure, expressed in (N);

R_m---material tensile strength, expressed in (MPa);

t---metal sheet thickness, expressed in (mm);

t_1---extrusion web thickness, namely, the distance between extrusion convex die and extrusion reverse ejector pole, expressed in (mm);

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a) Fine blanking extrusion part drawing, including dimensions, shape tolerance, extrusion quality and fine blanking section quality, etc.;

b) Fine blanking extrusion part process card, including the model number of fine blanking machine, fine blanking and extrusion pressure, blank-holding force, back pressure, mould number, mould closing height, etc.;

c) Material preparation process card, including material designation, specification, coil material or strip material, etc.;

d) Fine blanking extrusion mould installation and adjustment specification, including stipulations of mould installation, mould trial and adjustment;

e) Fine blanking extrusion process operating specification;

f) Fine blanking extrusion part inspection instruction.

6.3 Feasibility Analysis of Fine Blanking Extrusion Process

6.3.1 Please refer to JB/T 9175.1 for the feasibility of the fine blanking process.

6.3.2 Combine part drawing in the analysis of the extrusion deformation mode; through section reduction rate, determine the degree of extrusion deformation. In accordance with extrusion materials, determine whether one-time extrusion molding can be realized. In accordance with the cross sectional area of extrusion parts, the degree of extrusion deformation shall be selected. When the cross sectional area is small, $[\varepsilon_f]$ value is large; on the contrary, $[\varepsilon_f]$ value is small. The selection shall comply with the stipulations in JB/T 6541. When fine blanking extrusion parts are in mass production, the selected $[\varepsilon_f]$ value shall be properly smaller.

6.4 Calculation of Extrusion Stroke

Extrusion stroke H of extrusion convex die may be calculated in accordance with Formula (1):

$$H = H_1 \left(\frac{D}{d}\right)^2 \qquad \cdots\cdots (1)$$

When $d/D > 1$, the extrusion stroke H of extrusion convex die calculated through Formula (1) is smaller; in accordance with the practical situation, it shall be adjusted to 1.1 H ~ 1.3 H.

When $d/D < 1$, the extrusion stroke H of extrusion convex die may also be calculated in accordance with Formula (2):

$$H = t + H_1 - t_1 \qquad \cdots\cdots (2)$$

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Fine blanking extrusion part drawing is the basis of the design of technological specification of fine blanking combined with extrusion process, the design of fine blanking extrusion molding mould, the selection of fine blanking equipment and the formulation of the subsequent processing process. Moreover, it is also a technical document for the inspection acceptance of fine blanking extrusion parts. The drawing of fine blanking extrusion part drawing shall comply with the following stipulations:

a) Structural processability shall comply with the stipulations in JB/T 9175.1;

b) Quality shall comply with the stipulations in JB/T 9175.2.

6.7 Drawing of Fine Blanking Extrusion Molding Layout Diagram

6.7.1 If fine blanking extrusion parts do not have a requirement for fiber direction, on the premise of guaranteeing the demand of technological process and the quality of shearing surface, the layout scrap shall be the minimum.

6.7.2 During the layout, place the part with a high requirement for the quality of shearing surface on the feeding side, so as to guarantee that during the fine blanking extrusion, the shear deformation zone of this part can be thoroughly restrained. It shall also comply with the stipulations in GB/T 30572.

6.7.3 When V-shaped tooth is adopted for blank-holding, the range of the edge value needed by fine blanking extrusion parts shall comply with the stipulations in GB/T 30572.

6.7.4 Based on the selection of blank layout and edge, and step arrangement, draw a mould layout diagram. In addition, through the calculation of the fine blanking force and the extrusion deformation force, verify the pressure center of the mould. The molding load center should be the pressure center of the equipment.

6.8 Determination of Subsequent Procedures

6.8.1 In terms of fine blanking extrusion parts which have reserved process allowance, subsequent machining shall be conducted.

6.8.2 Fine blanking extrusion parts shall receive deburring treatment.

6.8.3 In terms of fine blanking extrusion parts that need to adopt thermal treatment, the effect of such thermal treatment on fine blanking extrusion parts shall be considered.

7 Selection of Materials, Moulds and Equipment

7.1 Materials

7.1.1 In accordance with the quality level requirement for fine blanking extrusion parts,

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