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**Non-destructive testing - Phantom of maximum  
detectable steel thickness for industrial computed  
tomography (CT) testing**

无损检测 工业计算机层析成像(CT)检测用最大可检测钢厚度测试卡

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## Table of Contents

Foreword .....	3
1 Scope .....	4
2 Normative references .....	4
3 Terms and definitions.....	4
4 Classification, types and marks.....	4
5 Technical requirements.....	9
6 Inspection methods .....	13
7 Inspection rules .....	15
8 Marks and labels .....	17
9 Packaging, transport and storage .....	17

# Non-destructive testing - Phantom of maximum detectable steel thickness for industrial computed tomography (CT) testing

## 1 Scope

This Standard specifies the classification, types and marks, technical requirements, inspection methods, inspection rules, packaging, transport and storage for phantom of maximum detectable steel thickness for industrial computed tomography (CT) testing.

This Standard is applicable to type inspection and exit-factory inspection for phantom of maximum detectable steel thickness for industrial CT testing of which radian energy is 225keV and above. This Standard can also be used as the basis for acceptance of user orders.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 34365, *Non-destructive testing - Terminology - Terms used in industrial computed tomography testing*

GB/T 37158, *Non-destructive testing - Test method for measuring the maximum detectable steel thickness by industrial computed tomography (CT)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 34365 and GB/T 37158 apply.

## 4 Classification, types and marks

### 4.1 Classification

#### 4.1.1 Overview

provides marking pattern for ring of phantom of maximum detectable steel thickness.

#### 4.3.2 Pattern 1:

XD-I-0200 GB

Where,

XD - Line-pair phantom;

I - I-type line-pair phantom;

0200 - Minimum sheet thickness is 0.20mm;

GB - Comply with this Standard.

#### 4.3.3 Pattern 2:

YK-II-0400 GB

Where,

YK - Round-hole phantom;

II - II-type round-hole phantom;

0400 - Minimum aperture is 0.40mm;

GB - Comply with this Standard.

#### 4.3.4 Pattern 3:

YH-090-110 GB

Where,

YH - Ring;

090 - Inner diameter of ring is 90mm;

110 - Outer diameter of ring is 110mm;

GB - Comply with this Standard.

## 5 Technical requirements

### 5.1 Ring

**5.2.2.8** Tolerance of sheet thickness in line-pair phantom T does not exceed  $\pm 0.005\text{mm}$ . Tolerance of clearance width of adjacent sheets T is  $\pm 0.01\text{mm}$ .

**5.2.2.9** Measured value of sheet length in line-pair phantom does not exceed  $\pm 0.05\text{mm}$ .

### 5.2.3 Materials

**5.2.3.1** Substrate of line-pair phantom is made of No. 35 high-quality carbon structural steel or materials of equivalent performance. Substrate material of slot part of internal rectangle is transparent resin or air.

**5.2.3.2** Sheet in line-pair pair is made of 65Mn or material of equivalent performance.

**5.2.3.3** The material of line-pair phantom sealing cover is polymethyl methacrylate (plexiglass). Use glue to bond along with the edge of cylinder. Bonding shall not affect the transparency of the cover of substrate slot part.

## 5.3 Round-hole phantom

### 5.3.1 Appearance

**5.3.1.1** Round-hole phantom shall use the upper and lower covers made of transparent material to bond, playing a role as sealing. There is no debris in the round hole. It shall mark testing position.

**5.3.1.2** The marking content and position shall be correct. It shall use laser engravement in obvious places. The package does not block it.

**5.3.1.3** The surface of round-hole phantom shall be clean, smooth and rust-proof.

### 5.3.2 Size

**5.3.2.1** Outer diameter of round-hole phantom is  $D_0$ . Tolerance is  $D_0^{+0.01}_{-0.05}$  mm.

**5.3.2.2** See Table 4 for models of round-hole phantom and corresponding outer diameter sizes.

**Table 4 -- Models of round-hole phantom and corresponding outer diameter sizes**

Model	I-type	II-type
Outer diameter $D_0$ mm	20	30

**5.3.2.3** Thickness of sealing cover of round-hole phantom  $\delta$  is 1mm.

**6.2.1.2** For exit-factory inspection, it shall take three directions at an angle of 60° on the circumference of the ring to measure.

### **6.2.2 Inner diameter of ring d**

**6.2.2.1** Use an appropriate method of which error is not greater than 0.02mm to measure.

**6.2.2.2** For exit-factory inspection, it shall take three directions at an angle of 60° on the circumference of the ring to measure.

## **6.3 Line-pair phantom**

### **6.3.1 Sheet thickness T**

**6.3.1.1** Use an appropriate method of which error is not greater than 0.001mm to measure.

**6.3.1.2** For type inspection, it shall appropriately select two points in upper and lower parts as measurement points on each metal sheet. And horizontally select three different positions at left, center and right at each measurement point.

**6.3.1.3** For exit-factory inspection, it may measure the thickness of all metal sheets before line-pair phantom assembly.

### **6.3.2 Sheet spacing 2T**

**6.3.2.1** Use an appropriate method of which error is not greater than 0.005mm to measure.

**6.3.2.2** For type inspection, it shall appropriately select two points in upper and lower parts as measurement points. And horizontally select three different positions at left, center and right at each measurement point.

**6.3.2.3** For exit-factory inspection, it shall measure spacing of each two adjacent sheets.

### **6.3.3 Sheet length L**

**6.3.3.1** Use an appropriate method of which error is not greater than 0.02mm to measure.

**6.3.3.2** For exit-factory inspection, it shall appropriately select three positions on each metal sheet as measurement points to measure. And randomly extract 50% of metal sheet for length measurement.

### **6.3.4 Outer diameter of line-pair phantom D<sub>0</sub>**

**6.3.4.1** Use an appropriate method of which error is not greater than 0.02mm

to measure.

**6.3.4.2** For exit-factory inspection, it shall take three directions at an angle of  $60^\circ$  on the circumference to measure.

## **6.4 Round-hole phantom**

### **6.4.1 Aperture $d_0$**

**6.4.1.1** Use an appropriate method of which error is not greater than 0.02mm to measure.

**6.4.1.2** For type inspection, it shall measure each round hole in two directions perpendicular to each other on the circumference.

**6.4.1.3** For type inspection, it shall measure each round hole in two directions perpendicular to each other on the circumference.

### **6.4.2 Hole spacing $S_0$**

**6.4.2.1** Use an appropriate method of which error is not greater than 0.02mm to measure.

**6.4.2.2** For type inspection, it shall measure spacing between each adjacent two holes.

**6.4.2.3** For exit-factory inspection, it shall measure spacing between each adjacent two holes.

### **6.4.3 Outer diameter of round-hole phantom $D_0$**

**6.4.3.1** Use an appropriate method of which error is not greater than 0.02mm to measure.

**6.4.3.2** For exit-factory inspection, it shall take three directions at an angle of  $60^\circ$  on the circumference to measure.

### **6.4.4 Substrate round hole of round-hole phantom and reference plane perpendicularity**

Use an appropriate method of which error is not greater than 0.02mm to measure.

## **7 Inspection rules**

### **7.1 Classification of inspection**

#### **7.1.1 Type inspection**

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