ICS 91.060.50
CCS Q 73

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 24601-2024

Replacing GB/T 24601-2009

Tilt and turn hardware system for building windows

建筑窗用内平开下悬五金系统

Issued on: August 23, 2024 **Implemented on: March 1, 2025**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

Table of Contents

1 Scope

The document lays down the classification, designation and marking, the requirements, the test methods, the inspection rules and the marking, packaging, transport and storage of tilt and turn hardware systems for building windows.

It applies to tilt and turn hardware systems for building windows, called hardware systems in the text.

2 Normative references

Dated references apply only in the edition bearing that date; undated references apply in their latest edition, including all amendment sheets.

The documents cited are GB/T 2828.1 Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection; GB/T 5823 Terminology of building doors and windows; GB/T 14436 General principles for guarantee documents of industrial products; GB/T 29048-2012 Test method for the operating force of windows; GB/T 31433 General specification for building curtain walls, doors and windows; and GB/T 32223 Hardware for building doors and windows - General requirements.

3 Terms and definitions

The terms and definitions of GB/T 5823 and GB/T 32223 apply, together with the three that follow.

3.1 tilt and turn hardware system - a hardware system installed on a window which, through operation of the handle, gives the window inward opening, bottom-hung tilting and locking functions. Note: the basic configuration of the hardware system is shown in Annex A.

3.2 anti-mishandling device - a device that prevents the sash from being switched directly to the tilt or turn position while it is already in the turn or tilt position.

3.3 scissor stay - a device connecting the upper hinge of the window to the sash, which restrains and limits the sash while it is in the bottom-hung tilt position.

4 Classification, designation and marking

4.1.1 By window installation position there are two classes: hardware systems for ordinary windows, designation C, and hardware systems for floor-height windows, designation L.

4.1.2 By opening sequence there are two classes: tilt and turn hardware systems, that is lock, turn, tilt, designation PX; and turn and tilt hardware systems, that is lock, tilt, turn, designation XP.

4.1.3 By the mounting form of the hinge there are two classes: hardware systems with surface-mounted hinges, designation MZ, and hardware systems with concealed hinges, designation YC.

4.1.4 Repeated opening and closing durability is divided into three grades, designated I, II and III.

4.1.5 The load class is expressed as an integer multiple of 10 kg.

4.1.6 The number of locking points is marked as the actual number.

4.2 The marking of a hardware system consists of the system name, the standard number, the window installation position designation, the opening sequence designation, the mounting form designation, the repeated opening and closing durability grade designation, the load class and the number of locking points, in that order. Example 1: a tilt and turn hardware system for an ordinary window with concealed hinges, durability grade II, load class 60 kg and 3 locking points is marked GB/T 24601 C-PX-YC-II-60-3. Example 2: a turn and tilt hardware system for a floor-height window with surface-mounted hinges, durability grade III, load class 90 kg and 4 locking points is marked GB/T 24601 L-XP-MZ-III-90-4.

5 General requirements

The material properties of the main load-bearing components conform to GB/T 32223.

6 Requirements

6.1 Appearance. The appearance of the exposed surfaces conforms to GB/T 32223.

6.2.1 Static load on the upper hinge. For ordinary windows the tensile load on the upper hinge follows Table 1, which pairs sash mass in kg with tensile force in N: 60 / 1 650, 70 / 1 900, 80 / 2 200, 90 / 2 450, 100 / 2 700, 110 / 3 000, 120 / 3 250, 130 / 3 500, 140 / 3 900, 150 / 4 200, 160 / 4 400, 170 / 4 700, 180 / 5 000, 190 / 5 300, 200 / 5 500. For floor-height windows the tensile load follows Table 2: 60 / 600, 70 / 700, 80 / 800, 90 / 900, 100 / 1 000, 110 / 1 100, 120 / 1 150, 130 / 1 250, 140 / 1 350, 150 / 1 450, 160 / 1 550, 170 / 1 650, 180 / 1 750, 190 / 1 850, 200 / 1 950. After the test the specimen is not to be fractured. For sash masses not listed in Tables 1 and 2 the tensile force is calculated by formula (1), using the test simulation window sizes and masses of Annex B and rounding to a whole number; the specimen is not to be fractured after the test. The symbols of formula (1) are F, the tensile force in newtons (N); m, the sash mass in kilograms (kg); W, the sash width of the test simulation window in millimetres (mm); and H, the sash height of the test simulation window in millimetres (mm).

6.2.2 Static load on the lower hinge. For ordinary windows with surface-mounted lower hinges the compressive load follows Table 3, pairing sash mass in kg with force in N: 60 / 3 400, 70 / 4 000, 80 / 4 550, 90 / 5 100, 100 / 5 700, 110 / 6 250, 120 / 6 800, 130 / 7 400, 140 / 8 000, 150 / 8 550, 160 / 9 150, 170 / 9 700, 180 / 10 300, 190 / 10 850, 200 / 11 450. For floor-height windows with surface-mounted lower hinges the compressive load follows Table 4: 60 / 3 050, 70 / 3 550, 80 / 4 000, 90 / 4 600, 100 / 5 100, 110 / 5 600, 120 / 6 100, 130 / 6 500, 140 / 7 150, 150 / 7 650, 160 / 8 150, 170 / 8 650, 180 / 9 150, 190 / 9 700, 200 / 10 200. For ordinary windows with concealed lower hinges Table 5 gives 60 / 1 700, 70 / 2 000, 80 / 2 275, 90 / 2 550, 100 / 2 850, 110 / 3 125, 120 / 3 400, 130 / 3 700. For floor-height windows with concealed lower hinges Table 6 gives 60 / 1 525, 70 / 1 775, 80 / 2 000, 90 / 2 300, 100 / 2 550, 110 / 2 800, 120 / 3 050, 130 / 3 250. After each test the specimen is not to be fractured. Masses not listed are covered by formula (2) for surface-mounted hinges and formula (3) for concealed hinges, again using the Annex B simulation window and rounding to a whole number. In both formulas F is the compressive force in newtons (N), m the sash mass in kilograms (kg), W the sash width of the test simulation window in millimetres (mm) and H the sash height of the test simulation window in millimetres (mm).

6.2.3 Resistance to damage. After a torque of 25 N.m the handle and the espagnolette are not to suffer material failure. After a static tensile force of 1 800 N applied to a locking point and keeper, the components are not to fracture. The tolerance printed with the tensile figure in 6.2.3.2 was destroyed by the extractor and is not reported.

6.2.4 Operating force. In the turn position the operating force comprises the sash operating force and the locking device operating force, and its grading follows GB/T 31433. In the tilt

position the closing force, that is the push-in force, follows Table 7: for ordinary windows with a sash mass of 60 kg to 130 kg not more than 180 N; for ordinary windows with a sash mass of 130 kg or more not more than 230 N; for floor-height windows with a sash mass of 60 kg or more not more than 150 N.

6.2.5 Repeated opening and closing durability. Table 8 grades durability in units of ten thousand cycles: for hardware systems with surface-mounted hinges, grade I 1, grade II 1.5 and grade III 2; for hardware systems with concealed hinges, grade I is not applicable, grade II 1 and grade III 1.5. After the cycles all operating functions are to remain sound and, in addition, the torque needed at the handle or operating device is not to exceed 10 N.m, the change in the gap measured perpendicular to the sash plane is to be less than 1 mm, and the force needed to push the sash into the frame when closing from the turn position is not to exceed 100 N.

6.2.6 Impact performance. After five repetitions of the sash impact test carried out with a falling weight, the force needed to push the sash into the frame when closing from the turn position is not to exceed 120 N.

6.2.7 Load on the free end. After the free-end loading test the sash is not to come off and the hinges are to remain connected to the frame and the sash.

6.2.8 Opening impact performance. After three repetitions of the test in which the sash strikes the reveal under a falling weight, the sash is not to come off and the hinges are to remain connected to the frame and the sash.

6.2.9 Closing impact performance. After three repetitions of the test in which the sash strikes an obstacle under a falling weight, the sash is not to come off and the hinges are to remain connected to the frame and the sash.

6.2.10 Coating thickness and adhesion. The thickness and adhesion of the usual coatings conform to GB/T 32223.

6.2.11 Corrosion resistance. The corrosion resistance of the various substrates and usual surface coatings conforms to GB/T 32223.

7 Test methods

7.1 Test sequence and specimen preparation. The number of specimens and the test sequence follow Table 9; the test simulation window and the test rig follow Annex B. Table 9 sets four steps: first the static load tests on the upper and lower hinges of 6.2.1 and 6.2.2, on 3 upper hinges and 3 lower hinges; second the resistance to damage of 6.2.3, on 1 handle and 1 espagnolette; third, in the order operating force, durability, impact, free-end load, opening impact and closing impact, on 1 hardware system mounted on the test simulation window; fourth the coating thickness, adhesion and corrosion resistance, on 1 set.