Directive

Attachment of supporting fitting components for turn-only and tilt&turn fittings

with definitions for turn-only and tilt&turn fittings and their possible installation positions

Contents

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Note

Technical details and recommendations in this directive are based on the state of knowledge at the time of going to press. The contents of the disclaimer on the abovementioned website apply.

1 Foreword

In order to ensure the lasting functionability and thereby the safe use of windows and window doors over their expected lifespan, the attachment of safety relevant fitting components is to be given particular emphasis. This includes supporting components such as stay bearings and corner bearings.

This directive sets binding values in tables 1 and 2 (see section 7) for forces in stay and corner bearings when installed; these must be ensured by the manufacturer of doors and window doors in the use of turn-only and tilt&turn fittings in his product. At the same time, as a tool, it provides recommendations on how to fulfil these requirements.

The **responsibility** for sufficient strength of the fitting components lies with the **manufacturer of the fittings**.

The **responsibility** for the correct attachment to the frame material (sashes and frames), and for ensuring the requirements listed here lies with the **manufacturer of windows and window doors**. The forces given in tables 1 and 2 (see section 7) must be ensured by the manufacturer of windows and window doors, depending

- on the maximum weight of the sash which he manufactures
- separate details from the hardware manufacturer combined with appropriate application diagrams.

Evidence as required by this directive may be made available to the manufacturer of windows and window doors together with corresponding system descriptions and fabrication advice.

In order to continuously ensure compliance with the requirements listed here, the contents of this directive must be integrated into the window and window door manufacturer's own internal production controls. Further information on internal production control can be found in EN 14351-1, for example.

2 Area of application

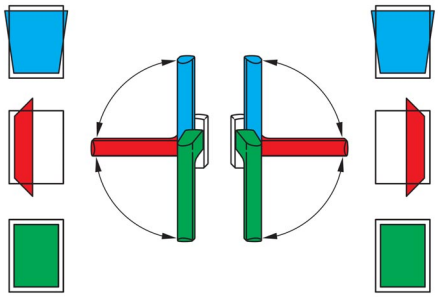
The present directive defines the requirements for the attachment of supporting fitting components for turn-only and tilt&turn fittings as per the definitions in section 3.

The requirements listed should be used correspondingly for comparable fittings for other types of openings.

The values in this directive apply to all materials from which the windows and window doors are manufactured, and their combinations.

3 Definitions

3.1 Tilt&turn fitting



Tilt&turn fittings open and close windows and window doors. Tilt&turn fittings are used so as to bring the active sashes of windows and window doors out of the initial closed position into the turning position and then into the tilted position (stay end position) by activating the window handle (see example for active sashes connected at right or left).

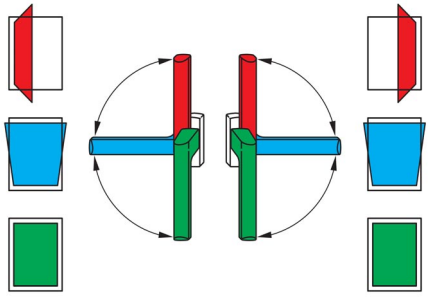
3.1.1 Single-handed tilt&turn fitting

The different positions of the fitting (closed, turning, and tilting positions) can be achieved by activating one window handle.

3.1.2 Two-handed tilt&turn fitting

The different positions of the fitting (closed, turning, and tilting positions) must be achieved by activating at least two window handles.

3.2 Tilt-first fitting



Tilt-first fittings open and close windows and window doors. Tilt-first fittings are used to bring the active sashes of windows and window doors out of the initial closed position into the tilting position (stay end position) and then into the turning position by activating the window handle (see example for active sashes connected at right or left).

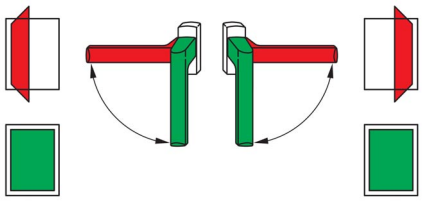
3.2.1 Single-handed tilt-first fitting

The different positions of the fitting (closed, tilting, and turning positions) can be achieved by activating one window handle.

3.2.2 Two-handed tilt-first fitting

The different positions of the fitting (closed, tilting, and turning positions) must be achieved by activating at least two window handles

3.3 Turning fitting



Turning fittings are used to be able to bring the active sashes of windows and window doors out of the initial closed position into the tilting position (stay end position) by activating the window handle. Turning fittings are usually manufactured as single-handed turning fittings (see example for active sashes connected at right or left).

3.4 Installation position of fittings

In the following definitions, the term "fittings" is taken to include all functional elements such as fore-end tracks, closing components and/or drive rods whose purpose is to bring the fitting of the active sash into the closed or else into an open position (for example into a tilting or turning position). The window handles are excepted here.

The installation location of the bearing positions (e.g. a stay angle hinge with a stay bearing and a corner bearing with sash hinge) are defined separately in section 3.5. Therefore in the description of a window construction, the installation position of the fittings and of the bearing positions must be specified separately from each other.

The window handle for activating the fitting of the active sash is usually applied in a visible position. For two handed styles, this is also true for all window handles needed. Styles which deviate are to be separately specified in the description of a window style.

3.4.1 Face-fixed fittings

Fittings whose functional components, such as drive rods or closing components are visible even when the sash is closed. This includes face-fixed rod closures, for example.

3.4.2 Concealed fittings

Fittings whose functional components, such as fore-end tracks and/or drive rods are built into the rebate area between the sash and frame, and are invisible when the sash is closed.

The prerequisites for this are:

- opaque frame materials
- Window constructions in which the rebate area between the sash and frame is covered from the outside and inside when the sash is closed.

3.4.3 Semi-concealed fittings

Fittings whose functional components, such as fore-end tracks, drive rods, and frame components are built into the rebate area between the sash and frame, and are only partially visible when the sash is closed.

The following prerequisites may contribute to this:

- partially transparent frame materials
- Window constructions in which the rebate area between the sash and frame is not completely covered from the outside and/or inside when the sash is closed.

This can occur for example in a window profile design which is flush to the surface, in which a joint visible from all directions (shadow grooves) between the sash and the frame allows visibility into the rebate area when the sash is closed.

3.5 Installation position for bearings

The installation position for the bearings is defined below, and various installation positions for the bearings may be used for one window style:

Example:
A face-fixed bearing position in the lower corner area, and a concealed bearing position in the upper corner area.

3.5.1 Face-fixed bearing positions

Fittings in which all frame-mounted bearing positions are visible when the sash is closed. Usually in this case the corresponding sash-mounted bearing components are at least partially visible.

3.5.2 Concealed bearing positions

Fittings in which all frame-mounted bearing positions are invisible when the sash is closed.

The prerequisites for this are:

- opaque frame materials
- Window constructions in which the rebate area between the sash and frame is covered from the outside and inside when the sash is closed.

3.5.3 Semi-concealed bearing positions

Fittings in which all frame-mounted bearing positions are only partially visible when the sash is closed.

The following prerequisites may contribute to this:

- partially transparent frame materials
- Window constructions in which the rebate area between the sash and frame is not completely covered from the outside and/or inside when the sash is closed.
- Fittings whose bearing positions are let into the sash in such a way that although they are covered when the surface of the closed sash is viewed at a right angle, when viewed from the side they are at least partially visible.

This can occur for example in a window profile design which is flush to the surface, in which a joint visible from all directions (shadow groove) between the sash and the frame allows visibility into the rebate area when the sash is closed.

4 Lasting functionability – testing

Turning and tilt&turn fittings are tested for lasting functionability against European standard EN 13126-8, QM328, or RAL-GZ 607/3. These deal with reproducible testing of fittings. The results from these tests are interpreted through the corresponding fitting documentation and the stipulations in the present directive, so that they can be applied to windows and window doors.

Creation of evidence relating to the lasting functionability of windows and window doors is to be carried out as per EN 1191. The results may be classified as per EN 12400. **The responsibility for the lasting functionability of his products lies with the manufacturer of windows and door windows.**

Regardless of the actual frame material, all guidelines and advice from the system supplier must be complied with by the manufacturer of windows and door windows.

5 Recommendations for attachment

It is generally recommended to use high quality screws of sufficient size. The screws used must be matched to the appropriate window material. The requirements in the documentation from the manufacturer of the screws and of the frame must be implemented.

6 Carrying out the tests

To carry out tests, the samples must be fitted out according to the production method of the manufacturer of windows and door windows, or to the appropriate system description. The samples selected must be representative of the production method, for example corresponding to the most disadvantageous situation (all screws, some of the crews, or no screws in the stiffening profile).

On the website of the publisher of this directive, a proposal for a form (test request) is available for download.

6.1 Sample preparation

- The samples should completely manufactured by the window manufacturer/system supplier in compliance with all details of the intended production method. For this, a detailed description of the sample and its manufacture is required, so that it can be extensively documented in the test report.
- At least 5 identical samples are required for testing. If necessary, 2 additional samples must be prepared for the determination of the tensile load; this may be carried out on the sample.
- The requirements for the tensile load are defined in tables 1 and 2 (see section 7); usually this depends on the intended maximum sash weight. If according to ift guideline "Creation of application diagrams for turn-only and tilt&turn fittings", alternative force requirements relating to the appropriate application diagrams must be complied with, these must be specified by the hardware manufacturer.
- The samples must be stored for at least 8 hours at a temperature of 15 to 30 °C before carrying out the test.

6.2 Sample documentation

The main components of the sample documentation are:

- Description of the sash and frame (profile geometry, material, type, and location of the reinforcement, use of additional insertion parts or other screw-fastening aids, etc)
- Fitting components used (manufacturer, type)
- Maximum sash weight which may be fabricated by the window manufacturer, or alternative details on the forces combined with the appropriate application diagrams
- Fixing devices/screws used (type, length, diameter, penetration depth, number of force-bearing threaded items, etc)
- Type of threaded connection, for example with or without pre-drilling (diameter and depth) or of the alternative attachment, for example by clamping
- If necessary, description of further production details (for example torque or penetration stop during tightening etc)

6.3 Testing of stay bearings

6.3.1 Testing of profile pieces

- If the screw positions on the vertical frame profile are restricted because of design, a profile piece of approx. 300 mm is sufficient for the execution of the test. The external threaded fittings must be positioned at least 50 mm from the cut edges.
- The stay bearing is to be fitted centred in the functional position on the profile piece.
- For the application of the tensile load, the sample is inserted into a support , for example as shown in figure 3. Here, the inner side of the profile piece is laid flat against the upper surface of the support bracket.

  Comment: For systems which open outwards, the outer side of the profile piece is laid flat against the upper surface of the support bracket.
- The ends of the cavity in the support bracket must be positioned at least 10 mm from the ends of the stay bearing.

6.3.2 Testing of frame corners

- If screw positions are planned for design reasons on the vertical and horizontal profile piece (for example for bearing points which are covered), or this occurs in the area of a frame corner connection (for example with wooden windows), a frame corner must be used.
- The frame corner must be selected in such a way that the stay bearing can be screwed on completely. The external threaded fittings must be positioned at least 50 mm from the cut edges of the frame corner.
- The sample is inserted into a suitable holder for application of the tensile load, for example as shown in figure 4. Here, the inner side of the frame corner is laid flat against the upper surfaces of the support bracket.

  Comment: For systems which open outwards, the outer side of the frame corner is laid flat against the upper surfaces of the support bracket.
- The ends of the cavity in the support bracket must be positioned at least 10 mm from the ends of the stay bearing.

6.3.3 Testing sequence

- Together with the stay bearing, a suitable stay arm is always used for transmission of force.
- Suitable measures are to be taken to prevent deformation of the stay arm or distortion of the stay angle hinge, in order that the force transmission point does not change.
- If necessary a pre-test on 2 samples is carried out in order to determine the tensile load which can be achieved with the sample.
- The test itself is carried out on 5 identical samples.
- The samples are loaded at a feed rate of 10 mm/min until the tensile load corresponding to the intended sash weight is achieved. This maximum tensile load is maintained for a period of 5 seconds. After this, the load is relieved.

6.3.4 Assessment of the test results

The previously decided tensile load may not be exceeded on any of the 5 samples. After relieving the load, the following must be true:

- The stay bearing may not have lifted more than 2 mm at any screw location. The reference plane for this is the unformed inner side of the profile piece or of the frame corner.

  Comment: For systems which open outwards, the unformed exterior of the profile piece or of the frame corner is used.

- No screw head may have been pulled out more than 2 mm from the profile piece or from the frame corner. The reference plane for this is the unformed inner side of the profile piece or of the frame corner.

  Comment: For systems which open outwards, the unformed exterior of the profile piece or of the frame corner is used.

- No screw or fixing device may have been scored or torn off.

- None of the heads of the screws or fixing devices may have been pulled into the screw hole of the stay bearing.

- Cracks or other damage must not have been created on any of the tested stay bearings, but slight deformation is permissible.

- No cracks or other damage may have occurred on any of the profile pieces or the frame corners. Deformations, e.g. conical swellings are permitted as long as all other failure criteria have been positively evaluated.

6.4 Testing of corner bearings

The values for the tractive forces given in table 1 are based on the stay used, in interaction with the corresponding stay bearing. It is not absolutely necessary for the corner bearing to be specially tested at the forces in table 2, as long as the attachment system of the corner bearing is technically comparable with that of the stay bearing.

If this technical comparability does not exist, the forces listed in table 2 for the corner bearing must be specifically tested.

7 Requirements for the forces

The forces listed in tables 1 and 2 are derived from the values as per EN 13126-8. Alternative requirements for the forces in connection with the appropriate application diagrams must be determined and stated by the hardware manufacturer as per ift guideline "Creation of application diagrams for turn-only and tilt&turn fittings".

Examples of face-fixed bearing positions are shown in figures 1 and 2. However, they also apply accordingly for the "semi-concealed" and "concealed" installation positions corresponding to the definitions in section 3.

The forces shown in tables 1 and 2 are based on the lasting functionability as per EN 13126-8, and contain neither additional static loads nor additional loads as per EN 14608 or EN 14609. With regards to additional loads, separate testing as per these standards is required on the complete window or window door system according to the desired classification as per EN 13115.

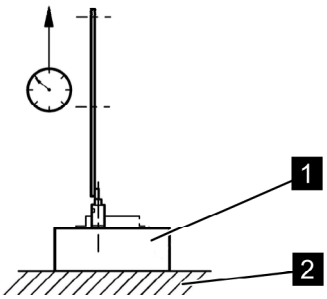


Fig. 1: Testing arrangement for the stay bearing, tractive force F as per table 1

Key

1 Frame material – attachment of the bearing position according to the production method of the window manufacturer

2 Clamping plate – preferably made from steel

Table 1

Testing with static load for hinges with a stay bearing

Application of load at 90° to the direction of opening as per Fig. 1

max. sash weight kg	**Tractive force *F*** N
50	1400
60	1650
70	1900
80	2200
90	2450
100	2710
110	3000
120	3250
130	3525
140	3900
150	4200
160	4450
170	4710
180	5000
190	5300
200	5550

Application of the load (tractive force F) at: 10 mm/min

Related formulae, also for calculation of intermediate values:

For fittings with maximum permitted sash masses (m_F) ≤ 130 kg, also less than 50 kg, the following is valid:

$$F = 5 \times \frac{m_F \times 10 \times 1300}{1200 \times 2}$$

m_F = maximum permitted sash weight in kg

F = tractive force in N to be used for testing

For fittings with maximum permitted sash masses (m_F) > 130 kg and greater than 200 kg, the following is valid:

$$F = 5 \times \frac{m_F \times 10 \times 1550}{1400 \times 2}$$

m_F = maximum permitted sash weight in kg

F = tractive force in N to be used for testing

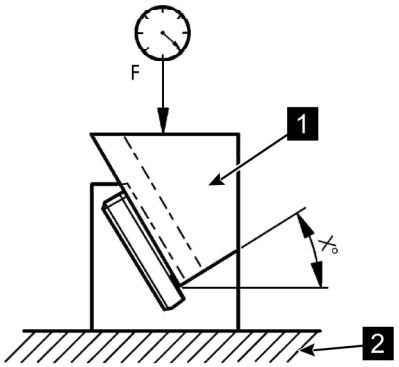


Fig. 2: Testing arrangement for the corner bearing, compressive force F as per table 2

Key

1 Corner area and installation of the corner bearing according to the production method of the window manufacturer

2 Clamping plate - preferably made from steel (angle X = 30°)

Table 1

Testing with static loading for corner bearing with sash hinge,

load applied as per Fig. 2

max. sash weight kg	**Compressive force** F N
50	1450
60	1740
70	2225
80	2310
90	2600
100	2890
110	3180
120	3470
130	3760
140	4050
150	4340
160	4620
170	4910
180	5200
190	5490
200	5780

Related formulae, also for calculation of intermediate values:

For fittings with maximum permitted sash masses (m_F) ≤ 130 kg, also less than 50 kg, the following is valid:

$$F = 2{,}5 \times \sqrt{\left(\frac{m_F \times 10 \times 1300}{1200 \times 2}\right)^2 + \left(m_F \times 10\right)^2}$$

m_F = maximum permitted sash weight in kg

F = tractive force in N to be used for testing

For fittings with maximum permitted sash masses (m_F) > 130 kg and above 200 kg, the following applies:

$$F = 2{,}5 \times \sqrt{\left(\frac{m_F \times 10 \times 1550}{1400 \times 2}\right)^2 + \left(m_F \times 10\right)^2}$$

m_F = maximum permitted sash weight in kg

F = tractive force in N to be used for testing

Application of the load (compressive force F) at: 10 mm/min

Figure 3: *Test on a 300 mm length profile piece*

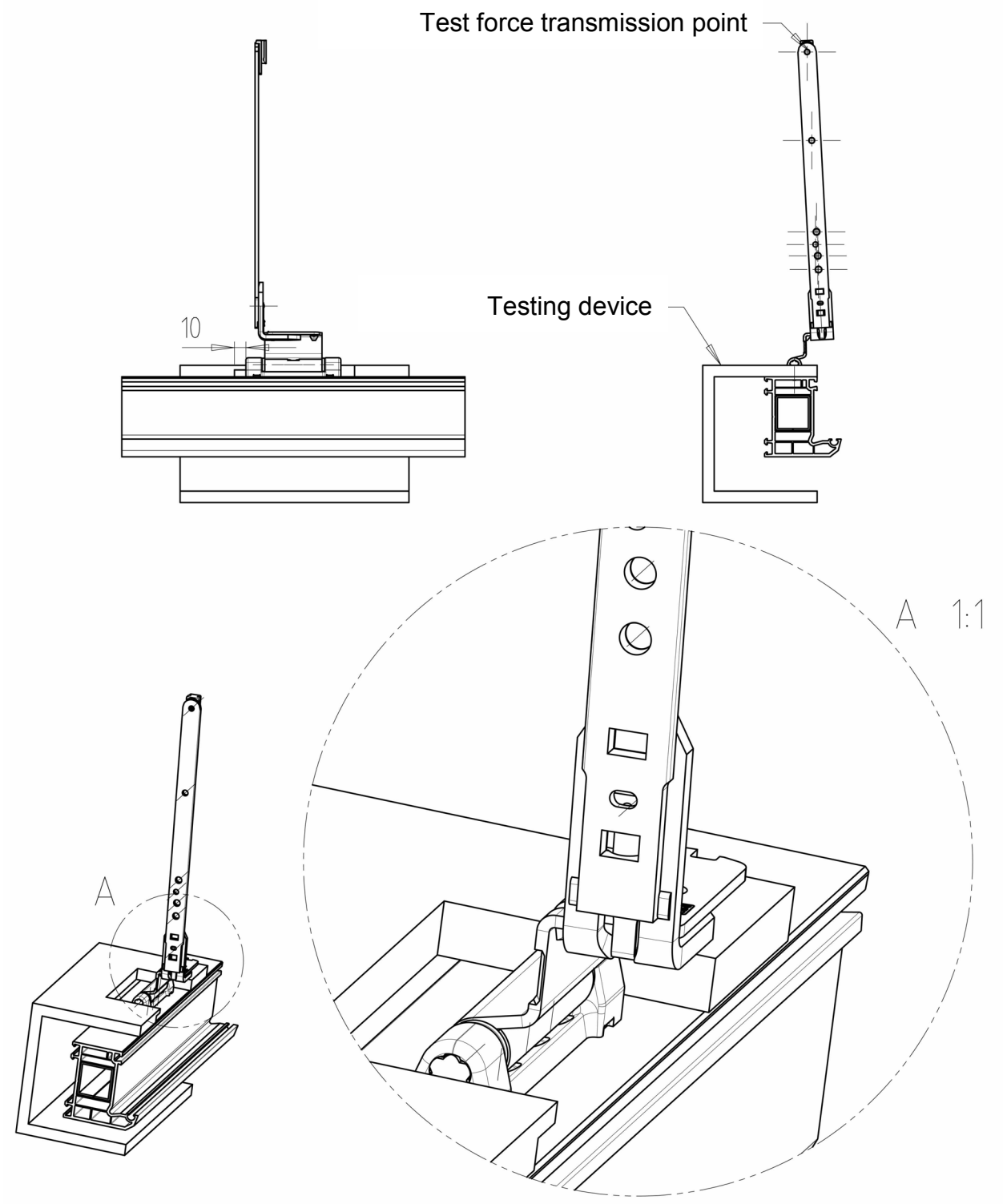
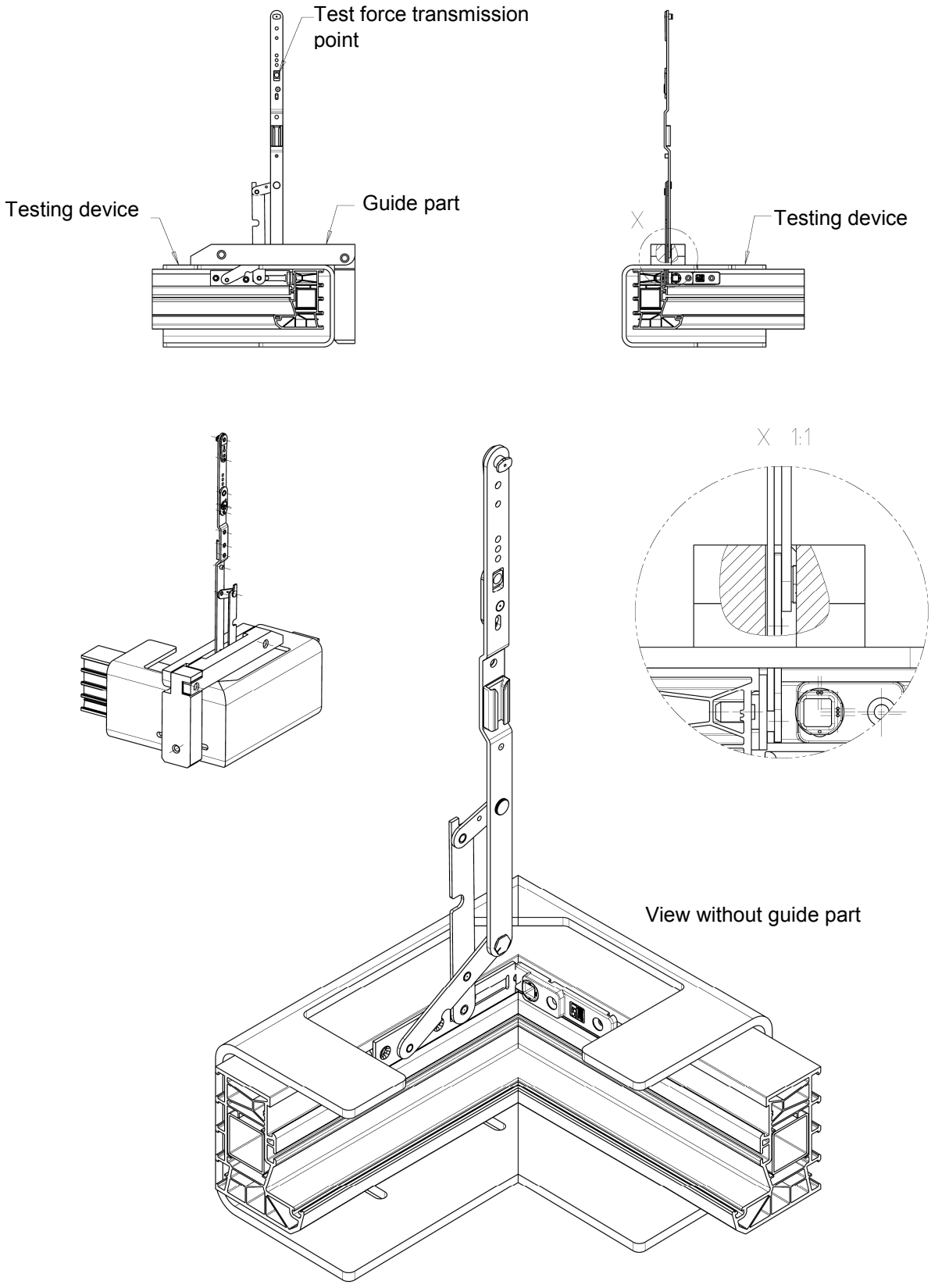


Figure 4: *Testing on a frame corner*



8 Index of literature

ift guideline	*Creation of application diagrams for turn-only and tilt&turn fittings*
QM328	*ift certification programme for turn-only and tilt&turn fittings*
RAL-GZ 607/3	*Property and test requirements for turning and tilt&turn fittings*
HO.06-1	*Fact sheet of VFF (Verband Fenster + Fassade Frankfurt – Association of Window and Façade Manufacturers of Frankfurt)* *Wood types for window construction - properties, table of wood types*
HO.06-2/A1	*Fact sheet of VFF (Verband Fenster + Fassade Frankfurt – Association of Window and Façade Manufacturers of Frankfurt)* *Wood types for window construction - wood types for use in protected wood constructions*
HO.06-3	*Fact sheet of VFF (Verband Fenster + Fassade Frankfurt – Association of Window and Façade Manufacturers of Frankfurt)* *Wood types for window construction - wood types for interior construction as decorative visible surfaces for laminated window edges*
HO.06-4	*Fact sheet of VFF (Verband Fenster + Fassade Frankfurt – Association of Window and Façade Manufacturers of Frankfurt)* *Wood types for window construction - modified woods*
EN 1191	*Windows and doors – Resistance to repeated opening and closing – test method*
EN 12400	*Windows and pedestrian doors – Mechanical durability – Requirements and classification*
EN 12608	*Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors – Classification, requirements and test methods*
EN 13115	*Windows – Classification of mechanical properties - Racking, torsion and operating forces*
EN 14608	*Windows – Determination of resistance to racking*
EN 14609	Windows – *Determination of the resistance to static torsion*
EN 13126-8	*Building hardware – Requirements and test methods for windows and doors height windows – part 8: Tilt & Turn, Tilt-First and Turn-Only hardware*
EN 14351-1	*Windows and doors – Product standard, performance characteristics – Part 1: Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics*

This directive was developed in cooperation with:

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