

## Design

The following principles should be observed when designing the hinge connection and mounting the multiple-joint hinges. This will help prevent wedging or jamming and ensure a smooth, low-wear movement. The function of the multiple-joint hinge is thus ensured in the long term.

- Multiple-joint hinges are installed at least in pairs.
- Multiple-joint hinges are aligned parallel to each other.
- Multiple-joint hinges are aligned plane-parallel to the door, flap or hatch opening.
- Suitable limiting or stop elements prevent the hinge mechanism from opening beyond the intended opening angle (less than 0° or more than 90°, 120° or 180°).
- All hinges involved in the movement bear roughly the same load (lever, center of gravity, ...).
- The specified load capacity of the multiple-joint hinges is not exceeded.

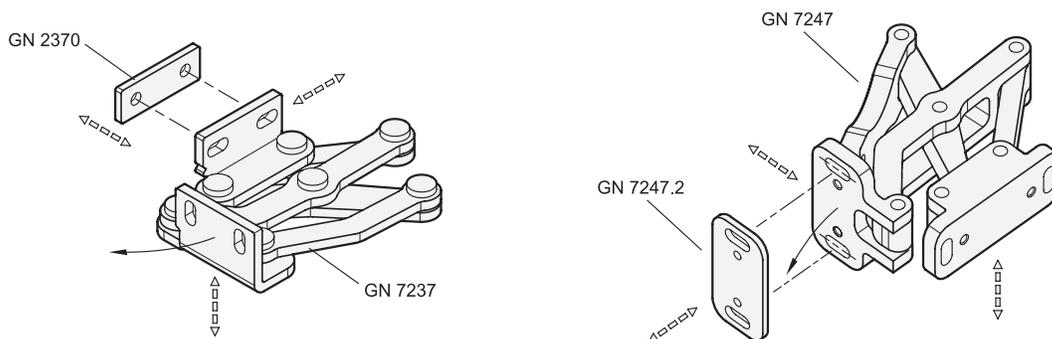
## Installation

In addition to the design precautions to be implemented during installation, a number of additional points must be taken into account.

- The mounting screws correspond to at least property class 8.8 or A2-70 and are tightened with the appropriate torque. Reinforced washers are included with the aluminum hinges. Washers, e.g. as per DIN 125 A or ISO 7089, are used with the stainless steel hinges.
- The multiple-joint hinges must not be installed or aligned using force, e.g. with a pry bar or a hammer.
- If a hinge is stuck or warped, or starts making noises when moved, the cause must be determined and rectified by aligning and adjusting the hinge.

## Adjustment

The slotted holes of the assembly angle brackets or mounting flanges can be used to adjust the hinges in two planes. For the third plane, GN 2370 spacer plates are available as compensation and shimming accessories for the stainless steel multiple-joint hinges, and the GN 7247.2 spacer plates are available for the aluminum multiple-joint hinges.



## Modification

Subsequent modification of the hinges by painting, coating, welding or connecting additional components such as pneumatic springs, indexing elements, etc. can impair the functionality of the hinge or lead to a defect. Modifications should be tested in a test setup first to ensure reliable functioning.

## Safety

When opening and closing the multiple-joint hinges, there is a risk of injury from the hinge mechanism. Fingers can be caught or crushed.



## Load capacity

The maximum load capacity of the multiple-joint hinges depends on the hinge cross-section, the materials of the components and plain bearing bushings as well as the installation situation (flap, hatch or door). For example, the larger cross-section of aluminum multiple-joint hinges makes them better suited for installation in doors compared to the stainless steel version, which offer advantages in other areas. The distribution of the load also plays a major role. In the optimal case, the load should be evenly distributed among all hinges.

The load capacity values of multiple-joint hinges are based on the following sources of information:

- Values from the simulation software
- Calculation based on material data
- Tensile and compression tests
- Endurance tests and empirical values

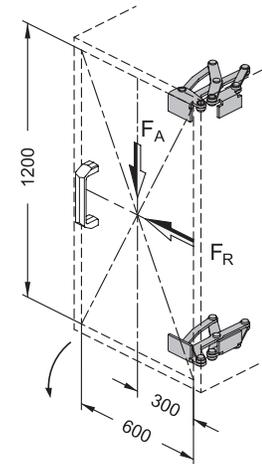
The endurance tests of the hinges in door installations were carried out under the following conditions:

- Hinge arrangement as a pair
- Adherence to the mounting information
- Warp-resistant test setup
- Standard door (flap or hatch) with overall dimensions 1200 x 600 mm
- Even distribution of the load  $F_A$  over the entire area (center of gravity)
- At least 15,000 test cycles (opening and closing once = one cycle)
- Gradual increase of the load

The wear, the movement characteristics and the elastic deformation were evaluated after every phase of the endurance test.

If more than two hinges are installed, the permissible loads are correspondingly higher. The load capacity increases linearly as long as the load is evenly distributed between the hinges. If this is not the case, a corresponding safety factor must be taken into account. Alternatively, it is recommended to test the function in a test setup.

Standard door for endurance test



## Deformation

If the maximum load is applied to the hinges, slight elastic deformation will occur, which will have no effect on the functioning. In the least favorable load scenario (door installation) a deformation or lowering of  $\approx 1-1.5$  mm is permissible. If necessary, the hinges can be re-adjusted using the available adjustment options.

## Lubrication and maintenance

The joints of the multiple-joint hinges have high-quality plain bearing bushings with lifetime lubrication. Under normal conditions, no further lubrication of the bearing points is required.

## Operating temperatures

Depending on the hinge type (stainless steel or aluminum), various plain bearing materials are used, which determine the maximum temperature range. The following ranges are permissible:

- Stainless steel multiple-joint hinges: bronze bushings, temperature range +328 °F to +536 °F (-200 °C to +280 °C)
- Aluminum multiple-joint hinges: plastic bushings, temperature range -40 °F to +194 °F, briefly to +302 °F (-40 °C to +90 °C, briefly to +150 °C)