

## Design

The following principles should be observed in mounting the hinge connection and mounting the multiple-joint hinges. This will help prevent wedging or clamping and ensure even, low-wear movement. The multiple-joint hinge will remain in operation for a long time as a result.

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

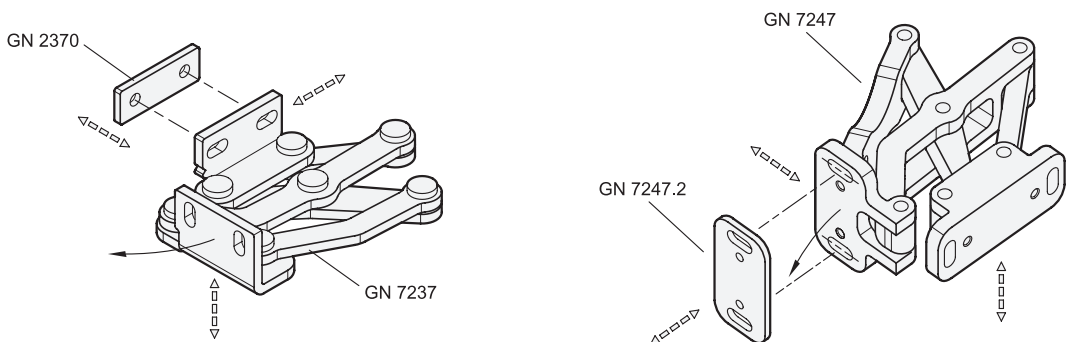
## Mounting

In addition to the precautions to be taken during mounting, a number of additional points must be noted.

- The fixing screws must have at least strength class 8.8 or A2-70 and must be tightened with the specified 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 may not be installed or aligned using force, such as with a hammer or pry bar.
- If a hinge is stuck or warped, or starts making noise when moved, the cause must be determined and rectified by aligning and adjusting the hinge.

## Adjustment

The slotted holes of the fixing angle pieces or fastening flanges can be used to adjust the hinges in two planes. For the third plane, the spacer plates GN 2370 are available as compensation and shimming accessories for the Stainless Steel Multiple-joint hinges, and the spacer plates GN 7247.2 are available for aluminum multiple-joint hinges.



## Modification

Subsequent modification of the hinges by polishing, coating, welding or connecting additional components such as pneumatic springs, latching elements, etc. can impair the functionality of the hinge or lead to a defect. Changes 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 individual parts and plain bearing bush 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 than the stainless steel versions, which offer advantages in other areas. Distribution of the load also plays an important role. In the optimal case, the load should be evenly distributed among all hinges.

The load capacity values given for the 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 testing of the hinges in door installations was carried out under the following conditions:

- Hinge arrangement as a pair
- Adherence to the mounting information
- Warp-resistant test set-up
- 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)
- Staged increasing 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 that the function be tested in a test setup.

## Deformation

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

## Lubrication and maintenance

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

## Operational temperatures

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

- Stainless Steel-Multiple-joint hinges: Bronze bushings, temperature range  $-200\text{ }^{\circ}\text{C}$  to  $280\text{ }^{\circ}\text{C}$
- Aluminum multiple-joint hinges: Plastic bushings, temperature range  $-40\text{ }^{\circ}\text{C}$  to  $90\text{ }^{\circ}\text{C}$  (briefly to  $150\text{ }^{\circ}\text{C}$ )

Standard door for endurance test

