Test Specification

MGD Hangers
Periodic Testing and Inspection

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Symbolic representation

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1. Scope

This test specification contains complementary information for the operation and service manual regarding the non-destructive testing of **hot-dip galvanized hanger arms** and **hot-dip galvanized four-point frames** that must be performed following regular intervals (e.g. according to the operation and service manual, regulations, etc.).

The tests and inspections required for the cabins are listed in the operation and service manual of the cabin manufacturer.

This test specification also applies to duplex-coated components.
(duplex = hot-dip galvanizing + organic coating)

Magnetic particle testing of the hot-dip galvanized components does not yield sound results without careful removal (grinding) of the zinc coat. As grinding comprises the risk of weakening the base material to an impermissible extent, in particular in the area of the weld seams, this specification dispenses with a mandatory magnetic particle testing. Many years of experience with hot-dip galvanized components subjected to stresses caused by vibrations have shown that cracks resulting from operation ('fatigue cracks') on galvanized components can be detected by means of careful visual inspection of the **uncleaned** components due to the rust mark that is forming.
Therefore, according to this specification non-destructive testing of hot-dip galvanized components is only required if the presence of cracks is suspected (e.g. if a rust mark is visible). In such cases the zinc layer must be removed carefully according to inspection specification PSMT0100.

2. Applicable Standards and Documents

PSVT0100 Visual Inspection – Periodic Testing and Inspection

PSMT0100 Magnetic Particle Testing – Periodic Testing and Inspection

Installation-specific operation and maintenance manual

Bulletins specific to the individual installation

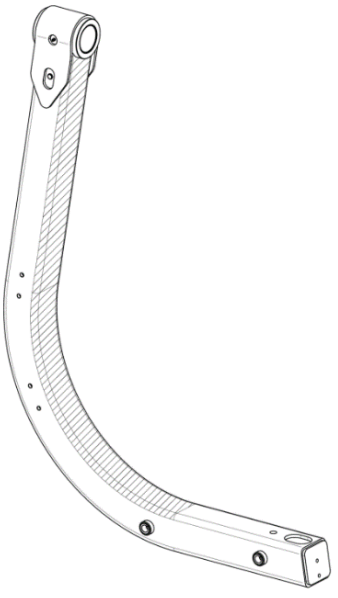
3. Testing and Inspection: Hanger Arm, Four-Point Frame and Suspension Links (depending on the model, where applicable)

3.1 Visual Inspection

Areas to be submitted to visual inspection

All components must be subjected entirely to a **detailed inspection** prior to and following cleaning.

During the visual inspection of the **hanger arms**, special attention shall be paid to the **zone subject to tensile forces** (inner side of the hanger arm – see shaded area in the sketch).



Acceptance criteria for visual inspection:

	Acceptance level	Further measures
Crack-like, rusty indications	impermissible	Impermissible indications: - MT testing according to item 3.2
Notches and score marks at right angles to tube axis	impermissible	Indication depth ≥ 0.2 mm: - Replace Indication depth < 0.2 mm: - Repair according to item 3.3
Notches and score marks	0.5 mm	Impermissible indications: - MT testing according to item 3.2
Rusty, two-dimensional indications	0.5 mm	Impermissible indications: - MT testing according to item 3.2



Notches and **score marks** (provided that they are not at right angles to the tube axis) as well as **rusty, two-dimensional indications** found during a sampling inspection do not require an expansion of the test scope to 100%.

The test scope only needs to be expanded to 100% if an indication of the same type is found on several components.



Missing weld seam ends are permissible if there are no rusty indications visible in this area.

3.2 Magnetic Particle Testing

Areas to be submitted to magnetic particle testing

All indications which must be subjected to magnetic particle testing (MT) according to item 3.1 .

Acceptance criteria for the magnetic particle testing of the base material

	Acceptance level	Further measures
Crack-like indications in the zone subject to tensile forces (inner side of the hanger arm)	impermissible	Impermissible indications: Repair according to item 3.3
Crack-like indications at right angles to tube axis (with the exception of the inner side of the hanger arm)	1 mm	Impermissible indications: Repair according to item 3.3
Crack-like indications parallel to the tube axis	3 mm	Impermissible indications: Repair according to item 3.3
Hanger head tube front	impermissible	Impermissible indications: Repair according to item 3.3
Hanger head (with the exception of the hanger head tube front)	1 mm	Impermissible indications: Repair according to item 3.3

Acceptance criteria for the magnetic particle testing of the weld seams

	Acceptance level	Further measures
Crack-like indications on the hanger head	impermissible	Impermissible indications: Repair according to item 3.3
Crack-like indications (with the exception of the weld seam on the hanger head)	3 mm	Impermissible indications: Repair according to item 3.3



Exception:

Crack-like indications found during MT testing are permissible on condition that:

- there were **no rusty indications** visible in this area during visual inspection,
- the indications run parallel to the weld seam,
- the indications do not go into the base material,
- the total length of all indications in a weld seam is less than 10% of the weld seam length.

3.3 Repair (Grinding)

	Max. grinding depth	Execution
Weld seams	0.5 mm	- Smooth down (surface quality N6 to DIN ISO 1302) - Hardenings and hardening cracks caused by overheating are not permissible!
Base material	0.5 mm	- Smooth down (surface quality N6 to DIN ISO 1302) - The width of the repaired area must not exceed 15% of the length. - Hardenings and hardening cracks caused by overheating are not permissible!

Upon repair, flawlessness must be verified by magnetic particle testing (MT)!

Any component which **cannot be repaired** according to the above listed conditions **must be replaced**. Replaced components shall be sent to Doppelmayr for examination upon request.

4. Testing and Inspection: Axles and Bolts in the Connection Between Hanger Arm and Four-Point Frame

4.1 Visual Inspection

Areas to be submitted to visual inspection

All of the axles and/or **bolts** must be subjected **entirely** to a **detailed inspection** prior to and following cleaning.

Acceptance criteria for visual inspection:

	Acceptance level	Further measures
Crack-like, rusty indications	impermissible	Impermissible indications: - MT testing according to item 4.3
Notches and score marks	depth < 0.2 mm	Indication depth ≥ 0.2 mm: - Replace Indication depth < 0.2 mm: - Axles: Repair according to item 4.3 - Bolts: Replace
Rusty, two-dimensional indications	depth < 0.2 mm	Indication depth ≥ 0.2 mm: - Replace Indication depth < 0.2 mm: - Axles: Repair according to item 4.3 - Bolts: Replace

4.2 Magnetic Particle Testing

Areas to be submitted to magnetic particle testing

With regard to the **axles**, the **entire axle length** of all axles must be tested for cracks by magnetic particle testing.

Acceptance criteria for magnetic particle testing

	Acceptance level	Further measures
Crack-like indications	1 mm	Impermissible indications: Repair according to item 4.3
Crack-like indications on edges, radii, transitions	impermissible	Impermissible indications: Repair according to item 4.3

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Exception:

Crack-like indications found during MT testing are permissible on condition that:

- they are not rusty indications, run exactly parallel to the axis of the component, and
- dye penetrant testing (according to PSPT0100) does not show any indications (i.e. the indications found during MT testing are slag lines).

4.3 Repair (Grinding)

	Max. grinding depth	Execution
Base material	0.2 mm (only locally permitted)	- Smooth down (surface quality N6 to DIN ISO 1302) - The length of the repaired area is at least 25 times its depth. - The width of the repaired area must not exceed 15% of the length. - Hardenings and hardening cracks caused by overheating are not permissible!

Upon repair, flawlessness must be verified by magnetic particle testing (MT)!

Any component which **cannot be repaired** according to the above listed conditions **must be replaced**. Replaced components shall be sent to Doppelmayr for examination upon request.

5. Inspection: 4 Pcs. of Suspension Bolts and Cross Bolts for Cabins (depending on the model, where applicable)

5.1 Visual Inspection

Areas to be submitted to visual inspection



Important:

This test specification only applies to **suspension bolts** and **cross bolts** which are **not** integrated **in the cabin roof**!

Suspension bolts which are integrated in the cabin roof must be tested and inspected according to the operation and service manual of the cabin manufacturer!

All 4 pieces of **suspension bolts** and of **cross bolts** must be subjected **entirely** to a **detailed inspection** prior to and following cleaning.

The suspension brackets/suspension bolts on the cabins must be tested and inspected according to the operation and service manual of the cabin manufacturer.

5.1.1 Acceptance criteria for visual inspection

	Acceptance level	Execution
Crack-like, rusty indications	impermissible	Impermissible indications: - Replace
Notches and score marks Rusty, two-dimensional indications	impermissible	Impermissible indications: - Replace
Wear, deformation and damage	impermissible	Impermissible indications: - Replace



Important:

In the case of suspension bolts, there must be a minimum radius of 3 mm (transition from round to square area) or the minimum radius indicated in the drawing must be available.

6. Documentation

6.1 Personnel for Non-Destructive Testing of Doppelmayr Seilbahnen GmbH

Testers of Doppelmayr Seilbahnen GmbH document the tests and inspections using template PDFB0104.

6.2 Personnel for Non-Destructive Testing of an Accredited Inspection Authority

The inspection and test records must include the below information:

1. Name, order number and date of start-up of the installation
2. Name and address of the current ropeway operator
3. Name and address of the testing laboratory
4. Name and qualifications of inspection personnel involved in testing (tester and supervisor)
5. Date of testing and inspection
6. Number of operating hours at the point of time of the testing and inspection
7. Test data for magnetic particle testing according to PSMT0100
8. Number of tested components
9. Test results
10. Signature of a tester with the authority to approve reports