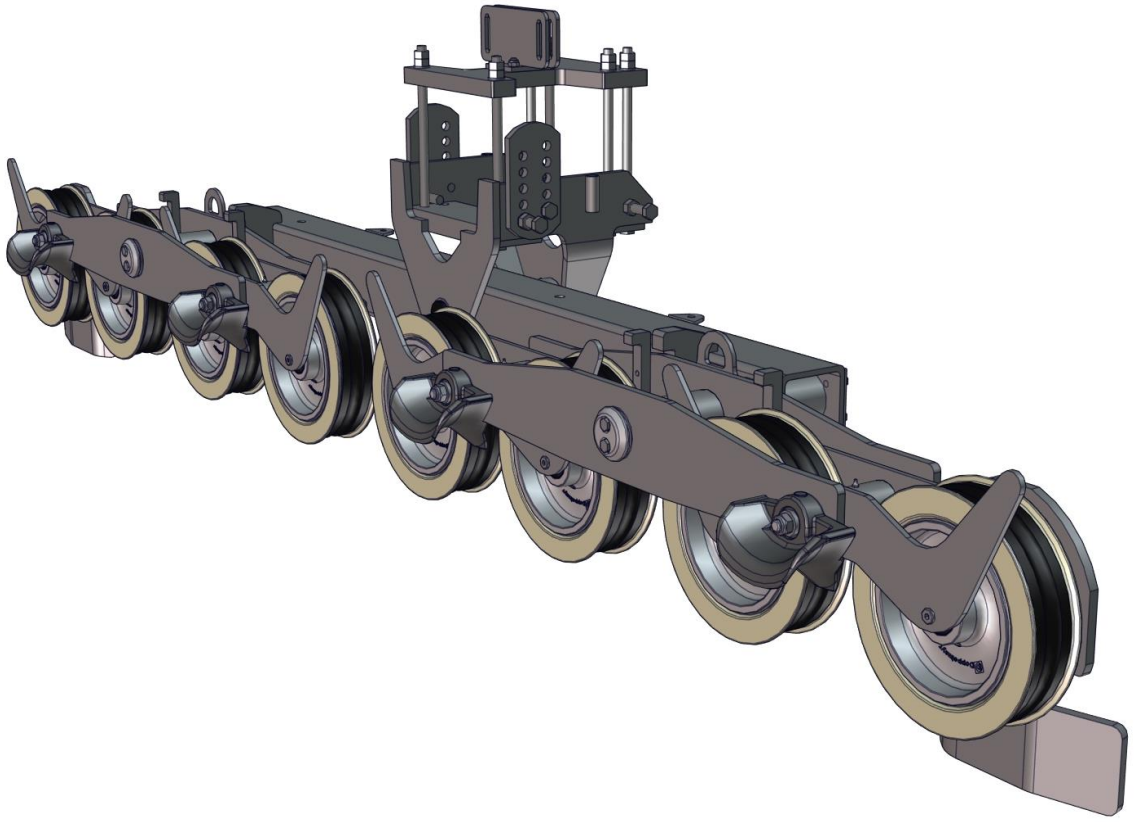
Inspection Specification

Sheave Assembly: Bolts (Axles) and Spacer Sleeves Periodic Testing and Inspection

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1. Scope of Application

This inspection specification contains complementary information for the operation and service manual regarding the non-destructive testing of sheave assembly bolts, axles and spacer sleeves that must be performed following regular intervals (e.g. according to the operation and service manual, etc.).

2. Applicable Standards and Documents

PSVT0100 Visual Inspection – Recurring Testing and Inspection

PSMT0100 Magnetic Particle Testing – Recurring Testing and Inspection

PSPT0100 Penetrant Testing – Recurring Testing and Inspection

Installation-specific operation and maintenance manual

Bulletins specific to the individual installation

3. Inspection: Bolts, Axles and Spacer Sleeves

3.1 Visual Inspection

Areas to Be Subjected to Visual Inspection:

Upon cleaning, all **bolts, axles** and **spacer sleeves** (100 %) of the sheave assemblies must be subjected to a **detail inspection**.

Acceptance Criteria for Visual Inspection:

	Acceptance level	Further measures
Crack-like (rusty) indications	1 mm	<u>Impermissible indications:</u> – MT testing according to item 3.2 or – PT testing according to item 3.3 ('stainless') – Notify the manufacturer
Wear, score marks, scratch marks and rusty patches	See: • Installation-specific operation and maintenance manual • Installation-specific bulletins or: • Annex 1	<u>Impermissible indications:</u> – Replace the components affected <u>Indication depth < acceptance level:</u> – Repair according to item 3.4



If any defects are found during inspection, the scope of testing must be expanded to further and if necessary to all sheave assemblies of the same construction (support, hold-down, combined sheave assembly).

For this expansion, the sheave assemblies must be determined by the testing and inspection authority on a case-by-case basis in due consideration of the results of the inspection and maintenance works carried out by the operator on a regular basis.

3.2 Magnetic Particle Testing (MT)

Areas to Be Subjected to Magnetic Particle Testing

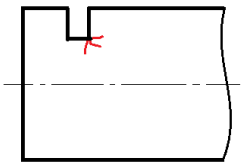
All **bolts** and **axles** (100 %) of the sheave assembly must be subjected to MT testing for cracks.

Furthermore, all indications that are listed as to be examined by means of magnetic particle testing under item 3.1 must be tested.

Exception:

Sheave axles of **CEN-compliant** sheave assemblies and spacer sleeves and sheave axles made of **non-magnetisable steel** ('stainless') do not need to be subjected to MT testing.

Acceptance Criteria for Magnetic Particle Testing

	Acceptance level	Further measures
Crack-like indications that run **more than 45°** to the **component axis** 	2 mm	Impermissible indications: – Replace the components affected
Crack-like indications in the area of the **milled groove** for the axle holder 	5 mm	Impermissible indications: – Replace the components affected Indication length < 5 mm: – Repair according to item 3.4

Crack-like indications in the area of the **milled groove** for the **axle holder** that could be removed in accordance with item 3.4 **do not require an expansion** of the scope of inspection **to 100 %** during a sampling inspection.

3.3 Die Penetrant Testing (PT, Stainless Sheave Axles)

Areas to Be Subjected to Die Penetrant Testing

All sheave axles (100 %) of the sheave assembly made of **non-magnetisable steel** must be subjected to penetrant testing.

Furthermore, all indications that are listed as to be examined by means of die penetrant testing under item 3.1 must be tested.

Acceptance Criteria for Die Penetrant Testing

Quality grade 4 according to EN 10228-2 applies:

	Acceptance level	Further measures
Crack-like, rusty indications	1 mm	Impermissible indications: – Replace the components affected
Maximum permissible length of connected or isolated linear indications [mm]	2 mm	Impermissible indications: – Replace the components affected
Maximum permissible cumulative length of indications [mm] (reference surface: A6 format)	5 mm	Impermissible indications: – Replace the components affected
Maximum permissible length of non-linear indications	3 mm	Impermissible indications: – Replace the components affected
Maximum permissible number of indications in the reference surface	5	Impermissible indications: – Replace the components affected

3.4 Elimination of Defects

	Max. grinding depth	Treatment
Wear, score marks, scratch marks and rusty patches	Acceptance level according to: • Installation-specific operation and maintenance manual • Installation-specific bulletins or: Annex 1	– Any minor score marks and rusty patches **in the support area of the glacier bushings, ball bearings and needle bearings** can be smoothed down with suitable emery paper (coarseness P 320). The surface quality must be N6. – Any minor score marks and rusty patches **in the support area of the frames (links), beams, etc.** can be smoothed down with suitable emery paper (coarseness P320). – **Beyond the support areas** corrosion pits are permissible up to the acceptance level. Corrosion pits and corrosion products must be removed by polishing the surface and the repaired spot must be protected by applying grease or any other corrosion protection agent.
Crack-like indications in the area of the **milled groove** for the axle holder	1.5 mm	– To be removed by grinding (surface quality N6, DIN ISO 1302) – Length of the area of preparation must be at least 25 times the depth – Width of the area of preparation must not exceed 15% of the length – Hardenings and hardening cracks caused by overheating are not permissible!

4. Documentation

4.1 NDT Personnel of Doppelmayr Seilbahnen GmbH

The testers of Doppelmayr Seilbahnen GmbH document the tests and inspections in the template PDRB0106.

4.2 NDT Personnel of an Accredited Inspection Authority

The inspection and test records must include the below information:

1. Name, order number and date of the start-up of the installation
2. Name and address of the current lift operator
3. Name and address of the testing laboratory
4. Name and qualifications of the inspection personnel involved in testing (tester and supervisor)
5. Date of the test
6. Number of operating hours prior to the test (if an operation hour meter is installed)
7. Test data for visual inspection according to PSVT0100
8. Test data for magnetic particle testing according to PSMT0100
9. Test data for magnetic particle testing according to PSPT0100
10. Test results of all tested components
11. For each replaced component
    - the detailed designation or the item number must be recorded
12. For each defective component
    - Description of the defect
    - Decision on how the defective part is to be dealt with
13. Signature of the tester with the authority for approval of reports

5. Annex 1

Acceptance Levels (Wear Criteria) for Sheave Assembly Bolts (Axles) and Spacer Sleeves

Scope of Application:

Replaces or complements the wear criteria indicated in the installation-specific operation and service manuals and bulletins if the specifications vary or nothing is specified, respectively.

Wear criteria for ropeways (except for surface lifts):

Bolt and spacer sleeve diameter [mm]	Permissible wear * [mm]
Ø15 - Ø20	0.2
Ø21 - Ø30	0.3
Ø31 - Ø60	0.4
Ø61 - Ø100 and bigger	0.5

Wear criteria for surface lifts:

Bolt and spacer sleeve diameter [mm]	Permissible wear * [mm]
> Ø15	0.5

***:** 1) Sharp transitions on the bolts and spacer sleeves resulting from wear must be rounded off by grinding (e.g. using a flapwheel or emery paper).

2) Please note that a rough surface and increased bearing play can have a negative influence on the service life of glacier bushings, ball bearings and needle bearings.

3) Wear in the bearing points can sum itself up and lead to a shift (location and position) of the entire sheave assembly as compared with the original condition (new glacier bushings, new bolts).
Furthermore, wear can also lead to increased noise development during operation.

4) If the existing wear is close to the maximum permissible value, it is possible that impermissible deviations can be detected at an earlier stage during regular inspection which require servicing or maintenance.