

Lumbanlano

ABLE
SPACE "Space Roller"
Kiddie

CONSTRUCTION AND OPERATING INSTRUCTIONS FOR THE 'TOPSCAN'



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Construction and operating instructions for the TopScan

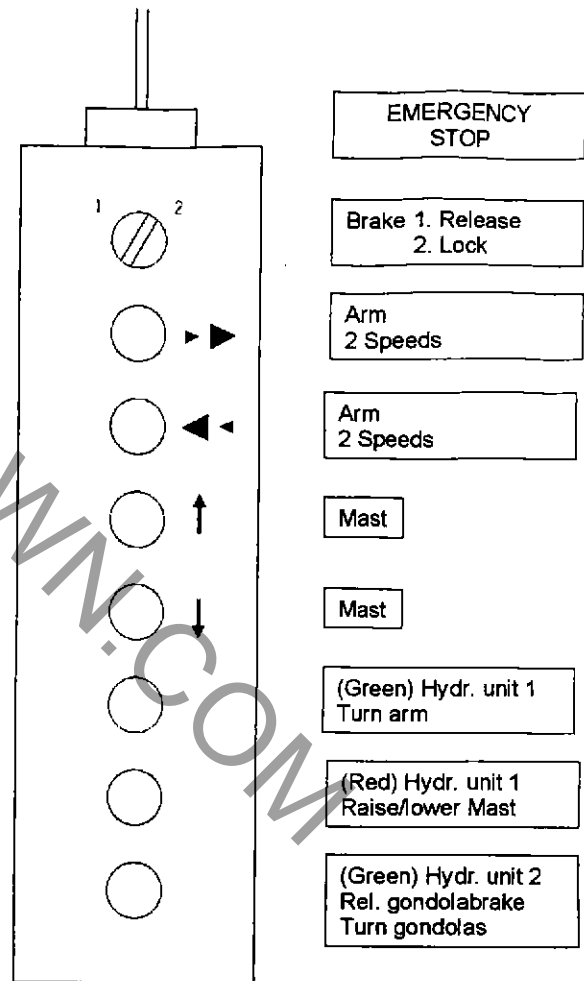
1 CONSTRUCTING THE TOPSCAN

- 1.1 Manoeuvre the middle construction trailer into the correct location. Fit the front and rear supports. Connect the auxiliary unit. Raise the middle construction trailer using the four hydraulic cylinders.

If necessary the tractor unit (truck) can be uncoupled from the middle construction trailer. Place the wooden prop boards and support plates underneath the ends of the supports and adjust to the correct height (see drawing 115-05-276). Now allow the middle construction trailer to lower onto the support plates.

- 1.2 Raise the mast slightly with the remote control, after turning valve no.8 into 'setup' position, using the hydraulic cylinders, so that the working platform can be fitted onto the arm. Now raise the mast fully. The gondola arm is now pulled up slightly using a mobile crane, a steel cable and a snap block (roller), so that the bolt with which the gondola arm is fixed to the mast can be removed. Now pay out the cable until the gondola arm hangs freely. The mast can now be lowered slightly. The steel cable is now pulled in such a way that the flange of the gondola arm is pulled against the flange of the hub. Now place a ladder on the gondola arm and fit at least four bolts on the front in order to couple both flanges together.

- 1.3 By-pass valve no.6 of the hydraulic unit must be open so that the arm can move freely. When turning the arm using the mobile crane the brake must be released. Turn the arm and the hub through 90° using the crane and then lower the mast again. Allow the end of the gondola arm and hub to rest on a frame.



Construction and operating instructions for the TopScan

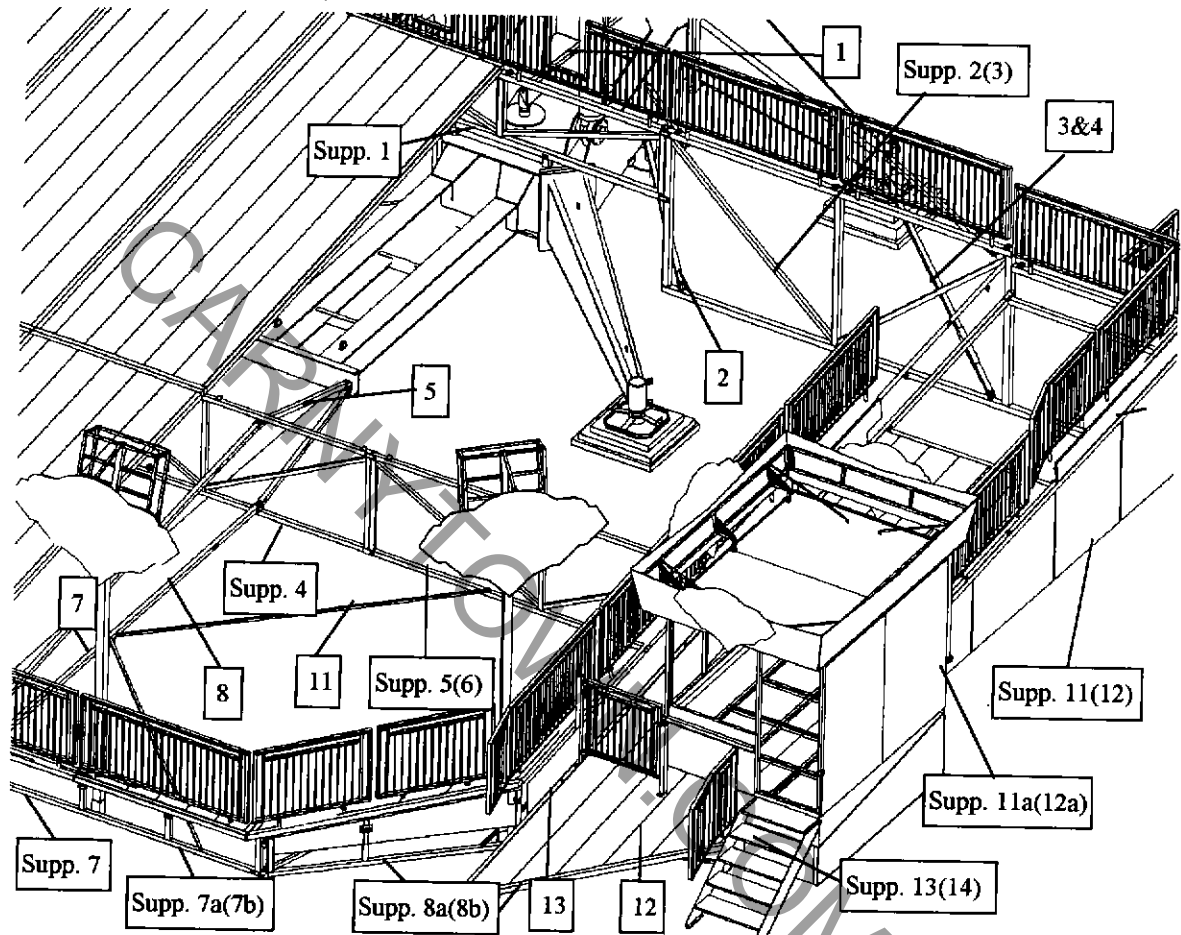
- 1.4 Fit the counter-arm and raise the mast again, after closing bypass valve n°6. The hydraulic lifting cylinders now need to be locked mechanically. Turn the arm with the hub through 90° so that the counter-arm is at the bottom. Fit a 3.8 T counterweight. Turn arm and hub through 180° and fit two gondolas. The further sequence of assembly is 2.5 T counterweight > 2 gondolas > 3.7 T counterweight > 2 gondolas > 2.5 T counterweight.
- 1.5 Put valve N°8 into 'operation' position.

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Construction and operating instructions for the TopScan

2 CONSTRUCTING THE PLATFORM

- 2.1 Place the part of the support, indicated on the drawing by 'Merk 1', which is beside the front-most support legs, on the appropriate stays on the chassis. Lock this part of the support using two 'Merk 1' struts which run towards the chassis.



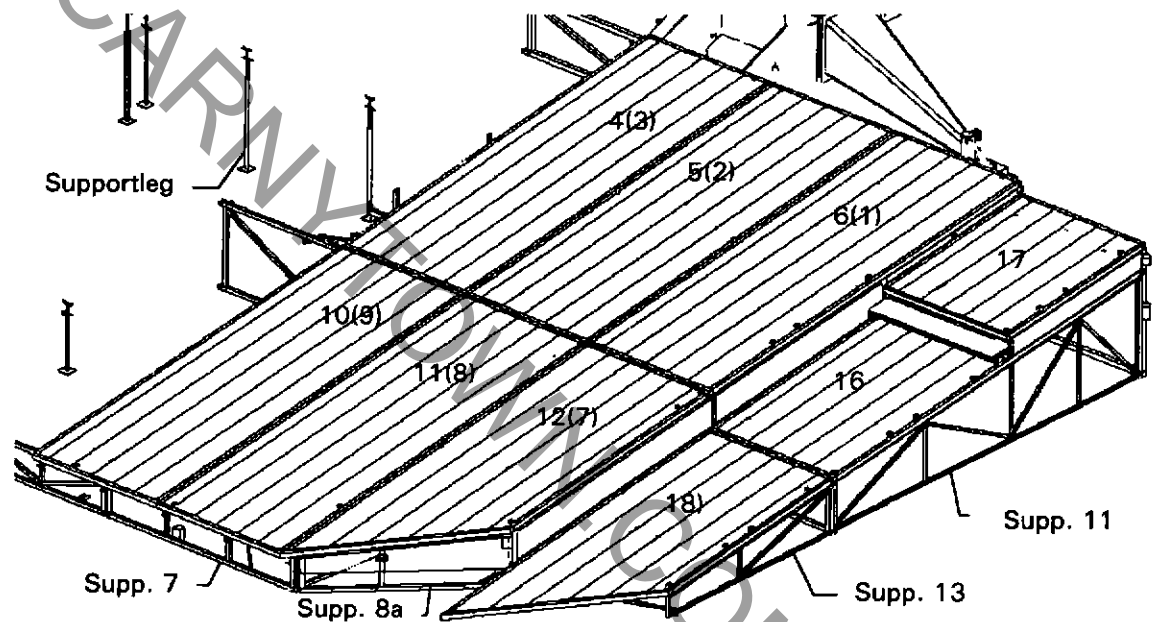
Suspend support parts Merk 2 and 3 on both sides of support part Merk 1 and prop up with wood in such a way that it is precisely horizontal (for propping up see drawing 115-05-276).

Also fit struts Merk 2 as well as Merk 3 and Merk 4 between support part Merk 2/3 and the chassis. Hook in support part Merk 11 and 12 (mirror image) to the frame Merk 2 and 3. Prop these up until they are horizontal.

- 2.2 Fit support part Merk 4 using strut Merk 5 and adjust to the correct height. The underside of the support part is to be at the same height as the underside of support part Merk 2 or 3. Now fit auxiliary strut Merk 10. Suspend support parts Merk 5 and 6 on both sides of the support part 4 and prop them up such that they are precisely horizontal. Fit the auxiliary supports and hook support part Merk 11/12 into support part Merk 5/6. Hook supports part Merk 13 and 14 at 90° into the frame Merk 5/6. Prop them up until they are horizontal.

Construction and operating instructions for the TopScan

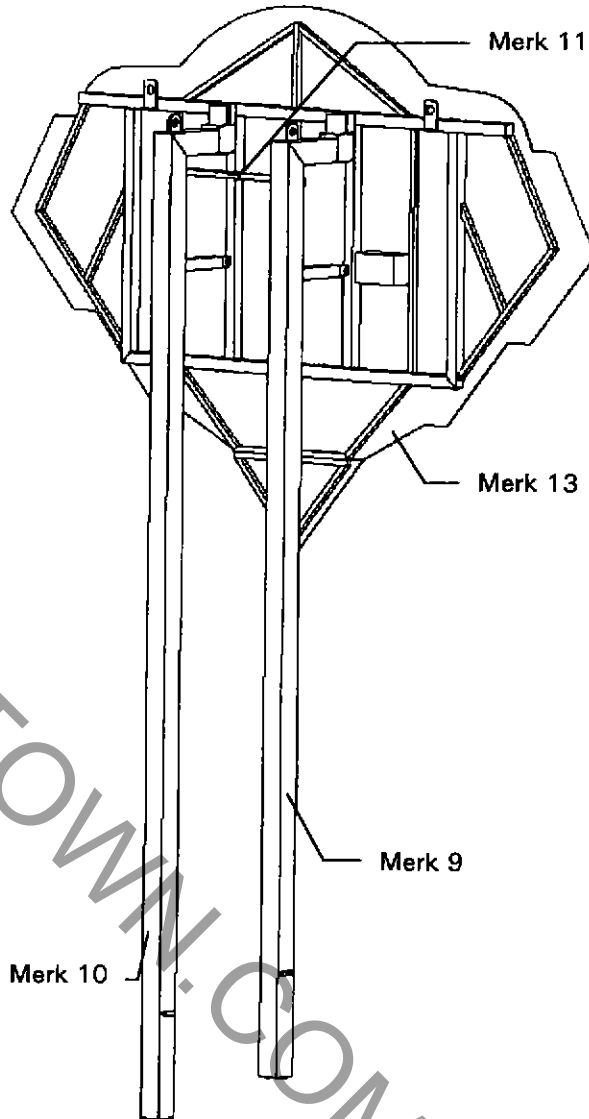
- 2.3 Fit support part Merk 7b using struts Merk 7 and 8 and auxiliary support Merk 11 and adjust to the correct height. The underside must be horizontal and at the same height as support part Merk 4. Fit both support parts Merk 7a on both sides of support part Merk 7b and prop up until they are horizontal. All of this is adjusted using support Merk 11. Support part Merk 8a and 8b can now be fitted and propped up. Using support Merk 12 the support part is moved into the correct position. Support part Merk 13 (14) are secured to support part Merk 8a (8b), into which support Merk 13 is placed.
- 2.4 Place gangboards 13, 1 to 6 and 16 on the back row of supports. The platform steps are placed on top of 13 and 16, and on top of them gangboards 14 and 17. Gangboards 18, 12 to 7 and 15 are then fitted.



- 2.5 Place support legs underneath the platform.
- 2.6 Lay out beams Merk 6-8, fit them together, and fit struts Merk 9 and 10 to support parts Merk 7a or 7b. Prop up the beams so that struts Merk 9 are lying horizontally. Raise frames 1-5 and suspend the end parts Merk 21-29 in between them. The gangboards can now be slid in between them or placed on top of them. These are secured using bolts.
- 2.7 Suspend the front row of platforms no's. 31-34, 36 to Merk 6-8 and prop up on the front. Now the steps Merk 35 can be fitted. Place the cash desk in the desired position and fit the gates which are to be fixed into position using the appropriate bolts. Fit the spotlight frames.
- 2.8 Prop up the entire platform in accordance with drawing 115-05-276. All pins must be locked using sprung locking pins.

Construction and operating instructions for the TopScan

- 3.3 Finally, sign 13 can be fitted. Merk 9 and 10 must be inserted into the open square pipes of the support legs. After this strut 11 can be suspended between Merk 9 and 10. The sign Merk 13 can then be hung up using a mobile crane. The sign Merk 13 must be locked to supports Merk 9 and 10 using pins Merk 70.



Construction and operating instructions for the TopScan

4 ELECTRICAL CONNECTION

- 4.1 The electrical supply is 210 kW. Connection to the public mains may only be carried out by authorised persons.
- 4.2 After connection the earth switch should first be checked for short circuiting and correct operation.
- 4.3 Check that the operating position is receiving power.
- 4.4 Check the direction of rotation of the machine. The direction of rotation is indicated. If the direction of rotation is incorrect, then the electrician will need to change the wires around.

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5 INSPECTION AFTER CONSTRUCTION AND DAILY INSPECTION

- 5.1 Inspect all assembly connections to ensure that they are in the correct position and that they are locked to prevent coming loose.
- 5.2 Inspect the props.
- 5.3 Inspect the restraints.

The inspection must be carried out daily. A damaged component must be replaced immediately.

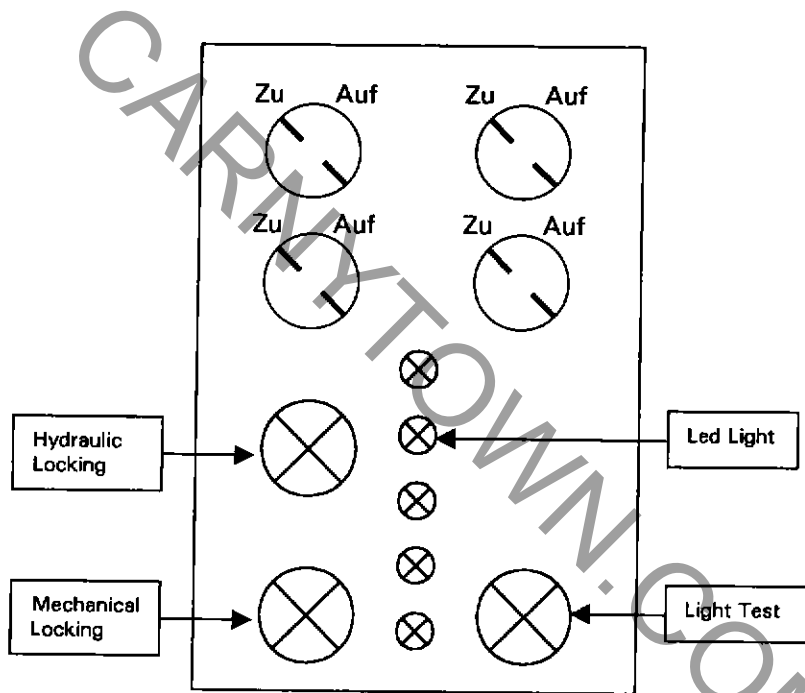
- a. All check lamps on the gondolas must be intact in order to be able to carry out a proper inspection. Therefore a push-button has been fitted for checking the lamps.
- b. All restraints are open - no lamps should be on. If a lamp is on, the restraint or a proximity switch could be broken for example.
- c. By operating knobs 3 and 4 on the gondolas followed immediately by knobs 1 and 2, you should be able to hear a click 8 times (teeth).
- d. On the first click a check lamp comes on (LED). If the lamp only comes on the second click, then a proximity switch could for example be broken or the tooth may be stuck. On every click the check lamp (LED) stays on. If not, then the lock may be broken or the tooth may be stuck.
- e. The restraints are open. When operating knobs 4 and 3 all restraints close. Now turn knob 4 to 'open'. The restraints should now remain hydraulically locked. After three minutes check to see whether a restraint has more than 3 cm of play (has risen). If this is the case then the hydraulic system of these restraints must be bled (see 10.14) using a special hand pump, or a magnetic valve or hydraulic cylinder needs to be replaced.
Weekly inspections must be made of the proximity switch to see whether it has a play of 2 mm in relation to the switch plate when the tooth is locked at the lowest point.

- 5.4 Check the emergency stop switch at low speed.
- 5.5 Hang up any warning signs which are required.
- 5.6 Check the main brake.
The arm must be in the exit position. When pushing the gondola hub with two persons the arm may not move.

Construction and operating instructions for the TopScan

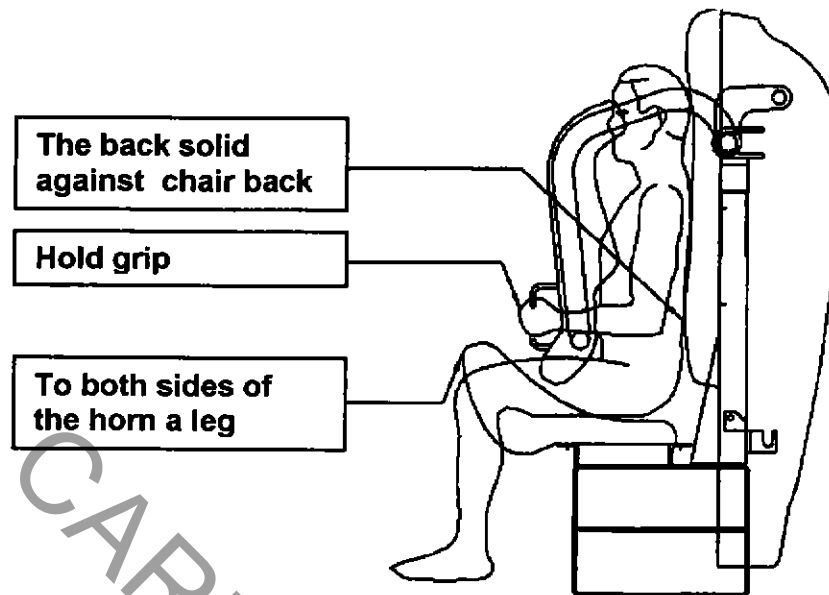
6 OPERATION

- 6.1 Both hydraulic units must be switched on. The arm must be in the zero position. The 'zero position arm' and 'brake system release' lamps on the operating panel must be on. If the mast is in the lowest position, the 'mast down' lamp comes on and the gondolas can be boarded.
- 6.2 The restraints are closed using the knobs which are located on the end of the gondola. The attendance should see to it that all the restraints are all the way to the clients body. The operating sequence is as follows: 4 > 3 > 2 > 1. Readiness is indicated by the lamps.



- 6.3 If this is not the case, then inspection of the lamps will indicate which restraint is not closed properly. By either manually correcting or by repeating the opening and closing sequence the problem should pass. If all of the inspection lamps are on, then all of the ready lamp should also be on.

Construction and operating instructions for the TopScan



After he has closed and locked the restrainbars, the employee of the gondolas is obliged to check if the restrainbar is up to the body. It is prohibited to take bags, loose clothing or other objects into the gondola and to put them in between the body and the restrainbar.

The employee of the gondolas has to check:

1. The back solid against chair back
2. To both sides of the horn a leg
3. No loose objects in between body and restrainbar
4. Hold grip

- 6.4 All gondolas must be closed in this way. Once all 12 ready lamps are on then the ready lamp will also be on at the operating panel in the cash desk. The 'restraint locks open' lamp goes out. The 'restraints locked' lamp comes on.
- 6.5 Press the button 'start raising mast' - the mast will rise up. Once the mast has reached its highest position, the 'mast up' lamp will come on. The 'mast locked' lamp should automatically come on. Now the 'brake system release' button can be operated. The brake button does **not** need to be operated if it is set to 'brake system release' and semi-automatic operation is being used. The arm as well as the gondolas can now be rotated by turning the 'arm joystick arm' or the 'gondola joystick' to the left or right. The gondolas do not have a zero position.

Construction and operating instructions for the TopScan

6.6 Ending of the ride.

Both joysticks must be turned to 0. The arm must be brought to the zero position using the joystick. The brake can be operated when the 'arm zero position' lamp is on. Operation of the brake is not necessary during semi-automatic operation.

By pressing the 'start lowering mast' button, the mast moves to its lowered position. The 'mast down' lamp should come on. The restraints are opened, after the mast is in its lowest position, by pressing the buttons on the gondolas in the following sequence: 1 > 2 > 3 > 4. The movement of the mast can be stopped using the 'stop mast rising/lowering' button.

- 6.7 The 'emergency stop' button may only be used in situations where real danger exists. The function of this button can be tested at low speed operation.

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7 COMPLETE POWER FAILURE

- 7.1 In the case of power failure or drive failure it must be ensured that the passengers are able to leave the gondolas without any danger to them. To this end the following procedures are to be carried out:
- 7.2 Situation in the case of more than 15 persons seated in the gondolas:
- a Turn off main switch.
 - b By-pass valve no.6 beside the main unit must be opened. Valve 7 must be closed.
 - c Pump the brake on the main drive free using the hydraulic hand pump.
 - d The gondolas will automatically turn down. When they are down the brake must be applied again.
 - e To lower the mast the by-pass valve of the hydraulic cylinders must be opened. Therefore valve 9 must be closed and a hydraulic hand pump connected to the matching test nipple. By generating a pressure of at least 30 Bar the mast will lower slowly.
 - f The restraints can be opened using batteries. The cable connection on the batteries and the connection to the gondola is present. The rest of the operation is the same as during normal operation. (There is still sufficient air in the tank).
 - g The batteries must be inspected weekly.
- 7.3 In the case of there being less than 15 persons seated in the gondolas:
- a Turn off main switch.
 - b By-pass valve no. 6 beside the main unit must be opened. Valve 7 must be closed.
 - c The steel cable (which is already fitted between mast head and counter weight) must be lowered at the counterweight. The steel cable must now be fitted to tackle.
 - d This tackle is fitted to the platform depending on where the gondolas are located. The steel cable must now be pulled tight (See image on page 15).
 - e The brake of the main drive must now be pumped free using the hand pump.
 - f The gondolas can now be pulled down using the tackle.
 - g Before the cable is changed from position no. 1 to position no. 2 for example, the brake must first be applied. Now continue from point e) until the gondolas are just above the platform.
 - h Once the gondolas are in the middle above the platform the brake must be applied again. Be sure that the gondolas are in null position.
 - i As described from point 7.2 (e).

Construction and operating instructions for the TopScan

8 NORMAL OPERATION

- 8.1 The maximum turning speeds, acceleration time, braking time, over-pressure valves setting and mechanical pump limiting set during the final inspection may not be changed. The machine has been set up with the following values:

Arm turning speed	8.3 t/min.
Arm acceleration time	8 sec.
Braking time	8 sec.
Arm over-pressure valve	220 bar
Gondola cross turning speed	10 t/min
Gondola cross acceleration	6 sec.
Gondola cross braking time	6 sec.
Gondola cross over-pressure valve	190 bar

- 8.2 During operation the operating position must be constantly manned by a trained person of at least 18 years of age.
- 8.3 During the ride no member of the public or operating personnel may be in the danger zone.
- 8.4 A member of staff must stand beside the boarding and exit platform.
- 8.5 When the passengers take their seats, a member of staff has to check that they have their back solid to the chairback and on both sides of the horn a leg. Furthermore he is obliged to check that, after he has closed and locked the restrainbars, the restrainbar is up to the body. It is prohibited to take bags, loose clothing or other objects into the gondola and to put them in between the body and the restrainbar.
- 8.6 Operating personnel must continually monitor the machine.
- 8.7 Passengers should be spread between gondolas as evenly as possible.
- 8.8 Children under the age of 12 and persons under 1.40 m. may not board the ride.
- 8.9 Persons intoxicated with alcohol may not board the ride.
- 8.10 Loose articles (such as hats, scarves, glasses, etc.) must be handed in to a member of staff before boarding the ride.
- 8.11 Instructions 8, 9 and 10 must be illustrated clearly using signs.

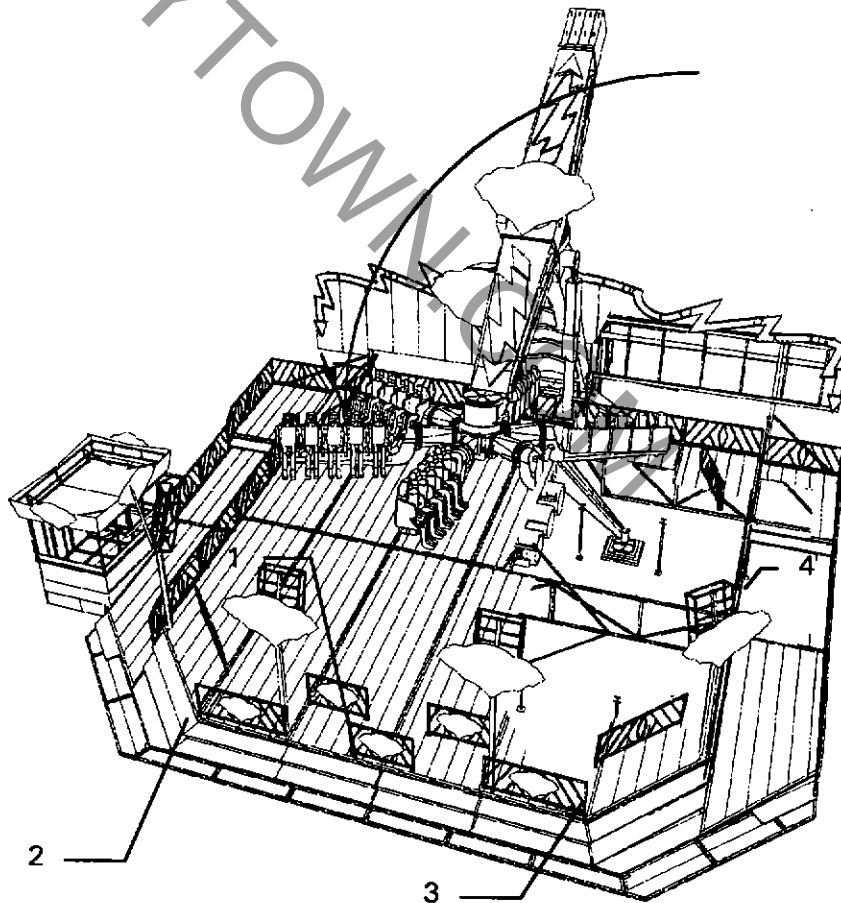
9 FAULTS

9.1 A number of fault lamps are located on every switch box:

- control pressure too low
- oil temperature too high
- oil level too low
- power fault
- direction of rotation check
- cooling motor fault

If one of these lamps is on then the fault must be resolved first before the machine may be started again. If a fault can not be resolved then the supplier must be consulted.

9.2 Emergency recovery system



Construction and operating instructions for the TopScan

The possibility of bringing the arm above the platform in the event of a fault:

- a See point 7.2.
- b Mechanically.
Using the Tirdford tackle to pull the arm down (see description 7.3).
- c Hydraulically.
 1. Close valve no. 1 + 2
 2. Open valve no. 3 + 4
 3. Open valve no. 5
 - . Switch on auxiliary hydraulic unit, open the valve on the outside of the container and the arm will begin to move.
 5. Check oil level in the oil tank after using this pump. If the level is too low, then open valve no. 0 and fill the oil tank.
 6. After all passengers have alighted, turn all valves back to their original positions.

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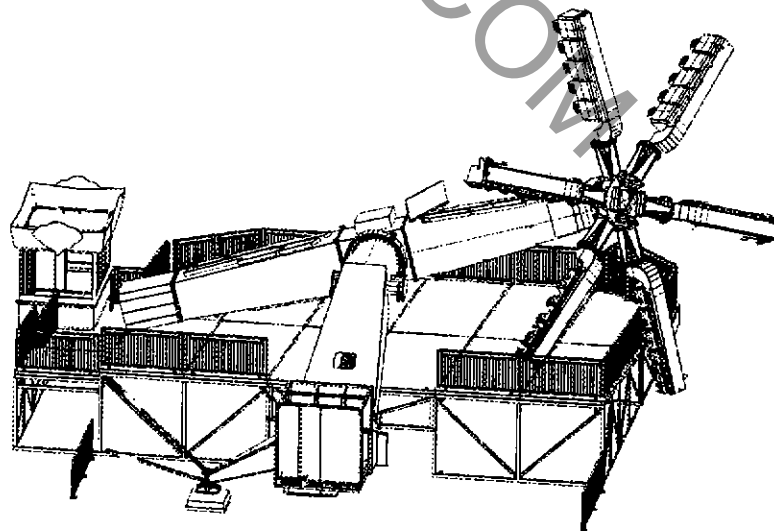
10 MAINTENANCE AND LUBRICATION

- 10.1 All bolt connections must be inspected for tension after every 50 operating hours or at least every week.
- 10.2 Main rotary ring, gondola cross rotary ring and gondola rotary rings must be lubricated every 50 hours or 1 x week. They are lubricated with ESSO Beacon 2 prior to delivery.
- 10.3 Gearbox of the arm drive. Capacity approximately 36 litres of SHELL Omala EP150. Check the oil level approximately every 200 operating hours.
- 10.4 Gearbox of the gondola drive. Capacity approximately 8 litres of SHELL Omala EP150. Check the oil level approximately every 200 operating hours.
- 10.5 Changing the oil in the gearbox of the arm drive

The first oil change must be carried out after 200 operating hours, and then after 400 operating hours, though at least 3 times a year.

Instructions for changing the oil in the gearbox of the arm drive.

- 1. Move the safetyfences 8 at the back and fences 2 at the right of the main platform.
- 2. Turn the gondola-arm and contra-weight-arm to horizontal position.

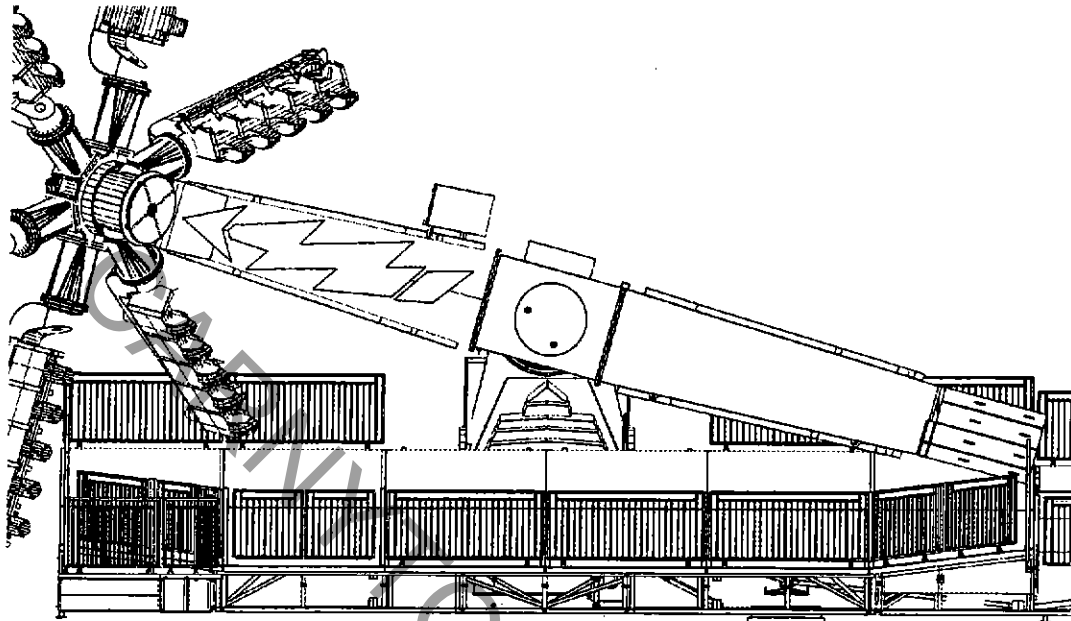


- 3. Lower the mast until the centre-shaft of the gearbox is in horizontal position.
- 4. Rotate now the gondola-arm and contra-weight-arm counterclockwise

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until the contraweights almost touch the platform at the right.

5. The oil changepoints are know in right position. To accelerate the oilchange, open the uppermost changepoint after the undermost.



- 10.6 Hydraulic unit of the main drive.

Capacity approximately 600 litres of SHELL Tellus T46. Also see instructions from Mannesmann Rexroth.

- 10.7 Hydraulic unit of gondola drive.

Capacity approximately 100 litres of SHELL Tellus T46. Also see instructions from Mannesmann Rexroth.

- 10.8 Main lubricating point on the mast: to be inspected 1 x year by the manufacturer.

- 10.9 Air installation

Pneumatic. The compressor is oil free. The water in the tank must be drained weekly.

- 10.10 All parts of the passenger locking system (restraint locking, pneumatic and hydraulic) and the frames of the seats must be inspected at least once per week for correct operation. The polyester covers on the backs of the seats will have to be removed for this. Hydraulic locking: if the

Construction and operating instructions for the TopScan

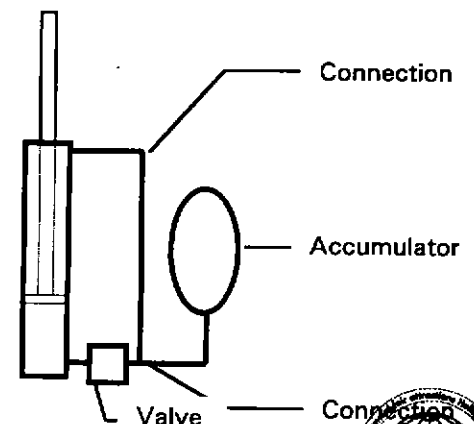
restraints do not close quickly enough, the hydraulic cylinders must be topped up with oil (SHELL Tellus 22T). The pre-tension (when the restraints are closed) is at least 8 bar. The maximum pre-tension is 10 bar. Note: check for air in the hydraulic system, if present, then vent. See 10.14.

- 10.11 The battery of the PLC must be changed every year (if present).
- 10.12 The most important parts of the ride (gondolas, arm and mast) must be checked regularly for crack formation.
- 10.13 Inspection of the hydraulic locking system. See 5.3 (e).
- 10.14 Venting of the hydraulic locking system. Restraints must all be open. Knob 3 to "open". Check oil level in the hand pump (SHELL Tellus 22T).

Connect the hand pump as described below:

- the valve on the pump must be closed;
- connect the transparent hose to the top connection;
- connect the black hose to the bottom connection;
- pump slowly using the hand pump until all the "air" is out of the system. Fit the transparent hose;
- open and close the restraints a few times. Fit the transparent hose once again and resume pumping with the hand pump until all of the air has been removed;
- remove the transparent hose;
- with the restraints open, slowly pump to approximately 16 bar (with accumulator of 4 bar);
- continue inspection of the hydraulic locking system. See 5.3 (e).

- => if the restraint closes too slowly - then the pressure is too low therefore increase the pressure
- => if the restraint closes too quickly - then the pressure is too high therefore reduce the pressure
- => if the restraint closes the same as all the other restraints - then the everything is in order
- => if the restraint does not close at all - the accumulator is broken or empty.



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**CENTRAL DEPARTMENT FOR CABLE CARS - SUSPENDED STRUCTURES
TESTING DEPARTMENT FOR CONSTRUCTION STATICS FOR SUSPENDED
STRUCTURES**

Munich, 21.7.97
BT BY-BSF/SW
TOPA8301.SW1
Order no. 24033632

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Acceptance report

Test number: 2403 3632

1. Regarding:

Installation: 'Space Roller' travel system
(TOPSCAN VIII)
Ref. 48.6.8

Manufacturer and
construction: MONDIAL FAIR ATTRACTION B.V.
Aengwirderweg 57
NL-8441 PN Heerenveen
Netherlands

Static calculation: Dr.-Ing. H. Kollmeier
Düsseldorfer Platz 2
40878 Ratingen

Owner: Fritz Kinzler
Kappenbergstr. 62
70327 Stuttgart

We ran a series of acceptance trials on the newly built travel system at the manufacturer's factory on 3rd and 4th July 1997. Please find attached a summary of the findings of the acceptance trials:

Electric installations

The electric wiring plans were inspected by the Construction and Operation Control Section of the Technical Board of Control (TÜV Bau- und Betriebstechnik GmbH), Dept. BT ESL 1. The findings of this have been compiled in a report. The acceptance trials were conducted on the electrical equipment by Construction and Operation

Control Section of the Technical Board of Control, Dept. BT ESL 1.
A separate report has been written on this.

Welding acceptance trial

The manufacturer does not hold the 'Major Suitability Certificate', specified by DIN 18800 part 7, with an addendum in accordance with DIN 4112 for components which are subjected to dynamic stress.

The welding work was tested instead. A separate report has been written on this.

Pressurised containers

There are 4 pressurised containers built into the travel system, each with a capacity of 20 litres and a working pressure of 10 bar.

No further checks need to be conducted for these (group 1).

Materials certificates

Materials certificates and internal test documents have been submitted. The inspection of the certificates essentially revealed that there were no problems.

Technical construction and safety problems

The installation was essentially erected ready for service. It was checked in order to ensure that it reflected the plans and was properly constructed, insofar as was possible without having to dismantle into its individual component parts. If there were a number of identical parts, we occasionally only checked that only one of these had been built in accordance with the plans. The key dimensions of the supporting components and their connections tallied fully with the dimensions shown on the plans.

A trial run was performed during the acceptance test. The system was operated with the gondolas empty and then full ($6 \times 5 \times 75 = 2250$ kg), as well as with 1/6 and 5/6 loads. The longitudinal, transverse and vertical accelerations occurring in the gondolas were measured on the TOPSCAN 1 system which is of an identical design. Given the reduced permissible speeds and the favourable intrinsic weight of the TOPSCAN III, the acceleration values lay within the range which was taken as a basis for the static calculation.

When the emergency OFF button is pressed, the main drive is braked hydraulically; the brake remains released at this time. There is a battery-maintained power circuit which serves to keep the brake locked during a power failure / emergency off situation while the swivel arm is raised or lowered (this stops the swivel arm from rotating out from its home position).

The permissible angles of inclination are adhered to in the 'entry position' both on the surrounding podium and on the entry platforms on the gondolas.

The aluminium walkway planks used are safe to walk on in any direction. In order to ensure that surfaces are adequately safe to walk on, they must be clean, be clear of any dirt and oil and must not have any materials trodden onto them.

The bow-type locking mechanism comprises a toothed rack with two spring-loaded ratchet mechanisms and an independently operating hydraulic cylinder. The positions of the ratchets are also monitored electrically.

Travelling performance

The travelling performance was also tested during the technical check, based on the 'principles for testing suspended structures'. Given the subjective comparison with similar existing designs of carousel, operating restrictions needs to be implemented (condition 21 on the permissible travel time).

Hydraulic drives

1. Raising and lowering

Comparisons with installations previously approved show that the cylinder pressures which arise during the raising and lowering actions are as follows when the system is empty:

Stopping pressure:

cylinder extended: $p = 100 - 110$ bar
cylinder retracted: $p = 150 - 160$ bar

Pressure surges:

Comparisons with installations previously approved show that maximum pressure peaks of up to 200 to 220 bar occur when the gondola cross is raised and lowered.

The following times were recorded:

raising: $t = 12.0$ seconds
lowering: $t = 10.5$ seconds

The stroke measures 66 cm.

2. Main drive

Control pressure: $p = 60$ bar
Feeding pressure: $p = 35$ bar.

There is a stopping brake (static brake) integrated into the gear of the main drive. The main drive cannot be started up when the starting brake is applied. Mechanical limit stops have been used to restrict the maximum speeds of the pump to $n = 90$ rpm.

The speed has been restricted to $n = 8.0$ rpm electrically.

The following times were recorded:

start: $t = 10.0$ seconds
decelerate: $t = 9.0$ seconds

The following pressures have been measured for the entire installation:

start / brake: $p = 225 - 235$ bar
rotate: $p = 30 - 150$ bar.

3. Gondola drive

A mechanical limit stop has been used to restrict the maximum speed of the pump to $n = 10.5$ rpm (clockwise and anticlockwise rotation).

The speed has been restricted to $n = 10.0$ rpm electrically.

The following pressures were measured for the entire installation:

feeding pressure: $p = 30$ bar
start: $p = 200$ bar
 $n = \square 10$ rpm: $p = 50$ to 60 bar.

The start and decelerate time $t_{An} = 5.0$ seconds.

Cylinder calculation

The comparisons with installations previously approved show that pressure peaks of 200 to 220 bar occur. Relative to the maximum static stopping pressure of 175 bar, this means a maximum impact coefficient of 1.26. The cylinders possess the required wall thickness, in accordance with DIN 2413.

The swivel arm can be held in place by one cylinder at its uppermost position (driving position).

A mechanical end stop prevents the gondolas from coming to rest on the podium if the cylinders fail.

Within the scope of the safety concept which has been applied in terms of the layout, maintenance and inspection of the cylinders, the pressure peaks which occur during raising and lowering are to be measured directly on the cylinder during the annual renewal check. These findings must be recorded in the test record (condition 16).

If these pressure peaks exceed the values listed in this report, the hydraulic controller must be recalibrate by the manufacturer.

Marking

The following numbers are imprinted onto the travel system at the points described below:

- a) on gondola 8A, at the side of the flange connection to the hub,
- b) on the separator piece on gondola 8A, at the side of the hub,
- c) on the flanges connecting the driving carriage to the rear tilting extension arm.

Summary

We have no reasons to object to the Space Roller travel system (TOPSCAN VIII) being set into operation, provided the operating firm implements and complies with the conditions laid down in the test report, the reports on the welding and electrical tests and the conditions specified below.

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Conditions

Conditions for manufacture and the acceptance trials

- 1 Any components which are not expressly contained in the static calculations for the installation must be so strongly designed that there is absolutely no danger that the permissible material stresses are exceeded. This also applies to the decorations and electric components which are mounted onto the travel system.
- 2 In order to restrict the maximum lowering speed, there is a throttle installed directly onto each of the cylinder blocks.
The throttle is designed in such a manner as to ensure that, if a line breaks, twice the normal lowering speed is not exceeded.
- 3 The elements in the pneumatic circuit must be left set as follows:

Pressure switch for the bow-type locking mechanism (the bows are unlocked at approx. 1 bar).
- 4 The maximum permissible lowering distance is to be limited by an end stop in either cylinder. These must be adjusted in such a manner as to allow the gondolas to still swing freely.

Conditions for installation and daily checks:

- 5 The system must be installed in such a manner as to ensure that it is as far away as possible from buildings, trees, power lines, etc. (at least 0.5 m) in all operating statuses, thereby ensuring that the passengers are not placed in any undue danger.
- 6 Getting on and off

The automatic adjustment of the zero position of the main arm did not work precisely at the time of the acceptance trial.
This must be adjusted in such a manner that the maximum space between the podium and the seat on all of the gondolas is approx. 75 cm.
- 7 The supporting points on the installation (frontage) must be carefully levelled every time the installation is erected because different support heights would bring about considerable additional strain on bearing parts.
- 8 Barriers must be placed around the carousel in order to ensure that no unauthorised persons can gain access under the podium.
- 9 The maintenance and operating instructions provided by the manufacturers of all of the machine parts built into the installation and of the general carousel itself must be complied with.

The decorations had not been assembled onto the façade as yet. Once they have been affixed, ensure that the carousel still has adequate clearance.

- 10 Supporting parts and machine parts must be checked before they are erected in order

to ensure that they are in perfect working order.

Damaged parts must be replaced by good parts immediately.

Once each of the different parts has been assembled, they must be connected securely, and connection pieces must be securely put in place.

Railings must be secured in order to ensure that they cannot be removed.

- 11 High-grade screw-type connections which need to be tightened to a specific torque must be carefully inspected before assembly. All nuts and bolts used must be in perfect working order, clean and lightly greased.

The screws must be re-tightened at the torque specified on the drawings after 20 hours in service. This will counteract any subsidence. The pre-tension will need to be checked at regular working intervals, initially twice a week. If subsidence is discovered, the checks must be conducted more regularly. If the subsidence is allowed to continue, this may result in damage to the bolts over time.

- 12 All of the parts must be checked every day before work starts to ensure that they are in good working order. If necessary, they must also be checked during breaks. Take particular care to ensure that they are not damaged and that the bow-type bars and bar locking mechanisms (and springs) are working properly.

Lower the bow-type bar slowly in order to check that the teeth catch in place properly.

If any damage / malfunctions are discovered, the seat or installation must be put out of operation until its can be repaired by a specialist firm. All tests must be logged in an work logbook.

The following tests must be performed on the locking mechanism:

- a) Lock the bow-type bars. Set switches 1 to 4 to 'closed'.
- b) Unlock the toothed rack pneumatically (set switches 1 to 2 to 'open').
- c) Open the bow-type bar against the closed hydraulic valve (set switch 4 to 'open').
- d) Raise the bow-type bar manually against the hydraulic valve (or against the hydraulic cylinders).

If the bar can be pushed up or if it gives way slowly, replace the hydraulic cylinder unit (cylinder, valve, accumulator) immediately. The bar may not be operated with a faulty emergency locking device.

The toothed racks on the bar locking mechanism should not be greased, they may only be lightly lubricated with low-viscosity oil. If there is any dirt on them, it must be cleaned off.

- 13 Clearance / barriers:

Barriers must be placed around the carousel, as shown in drawing 115-05-099. No-one may be allowed to stand inside the area which is sealed off while the ride is in operation. (This also applies to operators).

The name plate had not been put up yet. Once it has been assembled, the clearance of the carousel will have to be rechecked.

Conditions for regular checks and the renewal inspection

14 There must be a gap of at least 2 mm between the proximity switch and the switching lug (otherwise, there is a danger that the ratchet will not catch fully).

15 3-year inspection by the manufacturer:

The locking mechanism must be completely dismantled.

a) Bow-type bar and locking mechanism.

a1) Replacing the pressure springs.

a2) Dismantle the locking mechanism and inspect the toothed wheel parts and all of the other supporting components.

a3) Check in the individual functions of the pneumatic valves and of the press switches.

a4) Check that the hydraulic switches are working properly.

b) Ball bearing slewing rims

b1) The bearing clearance of the ball bearing slewing rims must be measured. The manufacturer must set dates for the next inspection / replacement.

A record must be kept of the inspection work, and this must be placed in the test log.

16 Bow-type safety bar:

The bow-type safety bar must be checked every week by the operating firm and during the annual renewal inspection by the consultant engineer in the area marked in green in the plan (115-05-98 / assembly).

17 Checking the locking mechanism and the bar seat bearing:

In order to inspect the locking mechanisms and the bar bearing, the fibreglass covers need to be loosened every week.

18 The pressure peaks which are experienced by the cylinder during raising and lowering must be measured during the annual renewal inspection. These values must be noted in the test record.

Working conditions

19 The gondola may not rotate until the swivel arm has reached its top position.

20 The power regulation settings defined during the acceptance trial must be maintained. The following values will apply to the installation when empty, in particular:

Main drive: speed: $n \leq 8.0$ rpm
starting time: $t \geq 10.0$ seconds
braking time: $t \geq 9.0$ seconds

N.B. Each of these values apply to the carousel when it is empty!

Gondola drive: max. speed: $n \leq 10$ rpm
starting time: $t \geq 5.0$ seconds

The speeds may be varied during the ride.

N.B. Each of these values apply to the carousel when it is empty!

Brakes:

The carousel may only be motor-driven during the ride. The brakes may not be applied.

21 The passengers total ride time of $t = 180$ seconds may not be exceeded.

22 People with the following conditions may not be taken aboard the carousel:

- a) Given the stressful conditions which occur, people who suffer from spinal or vertebral disc problems or high blood pressure, or people currently receiving medical treatment for any of the above, or people with heart conditions or problems with their blood circulation, and pregnant women may not ride on the carousel.
- b) Children under 12 or people measuring less than 1.40 m, as well as people who are unable to hold onto the existing bow-type safety bar safely because of their own physical shape or on account of a physical disability, and people who are too tall (taller than 1.95 m) to be able to maintain a normal sitting posture may not go on the ride.
- c) People who are intoxicated may not be allowed onto the ride and may not be allowed to stand on the podium either.

23 Under no circumstances may any passengers lean out of the gondola, stick out their arms and legs, smoke, or take on animals, umbrellas, walking sticks or any other bulky, sharp or loose objects. Passengers must remain seated and calm during the ride and secure themselves in place using the stop bars provided. They must lean their heads against the backrest or headrest. earrings must be taken off before the ride.

24 The regulations laid down in conditions 22 and 24 must be displayed in a clearly visible place. The operating staff must ensure that they are complied with.

25 The machine operator may not start the ride until:

- a) all of the safety bars in the gondola are securely locked in place;
- b) an attendant has checked that every single passenger is correctly seated and is secured in properly with the safety bars, ie. that the bar is securely positioned against their body, that the securing function is not hampered by any items of clothing protruding out (the machine operator is unable to perform this check adequately because he is sitting too far away from the gondola);
- c) the attendant has checked that the passengers have removed any earrings which may cause injuries, as well as their glasses;

- d) passengers have cleared the podium.
- 26 The operators must ensure that passengers only gain access to the areas between the gondolas and the barriers if the carousel has stopped to let passengers on and off.
- 27 There may not be any more than five people to a gondola. Passengers must be spread out as evenly as possible in each of the gondolas.
- 28 The installation may not be operated in gale force 8 winds (stormy wind, branches broken from trees).

29 Unlocking the bow-type bars:

The hydraulic and pneumatic locking mechanism may only be opened if

- a) the main arm is lowered,
- b) the brake on the main drive is applied, and
- c) if the gondolas are in horizontal position and at rest.

Other conditions:

- 30 A certificate from the hydraulics firm about the scheduled adjustment of the pressure control valves has yet to be presented.
- 31 The relevant regulations contained in the current version of the 'Guidelines for the Construction and Operation of Suspended Structures' must be complied with.
- 32 You must comply with the conditions of the test report on the documentation relating to the electrical installations.
- 33 Automatic programs may only be used following prior consultation with and appraisal by the Bavarian Technical Board of Control.

TÜV Bau- und Betriebstechnik GmbH

Central Department
Cable Cars - Suspended Structures
Testing Department for Construction
Statics for Suspended Structures

Processed by: The Head

Schneider pp. Leutenstorfer

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**CENTRAL DEPARTMENT FOR CABLE CARS - SUSPENDED STRUCTURES
TESTING DEPARTMENT FOR CONSTRUCTION STATICS FOR SUSPENDED
STRUCTURES**

Munich, 21.7.97
BT BY-BSF/SW
TOPA8301.SW1
Order no. 24033632

Page 1/10

Test report

Test number: 2403 3632

1. Regarding:

Installation: 'Space Roller' travel system
(TOPSCAN VIII)
Ref. 48.6.8

Manufacturer and
construction: MONDIAL FAIR ATTRACTION B.V.
Aengwilderweg 57
NL-8441 PN Heerenveen
Netherlands

Static calculation: Dr.-Ing. H. Kollmeier
Düsseldorfer Platz 2
40878 Ratingen

Owner: Fritz Kinzler
Kappenbergstr. 62
70327 Stuttgart

2. Test documents

The following technical documents were presented for inspection.

1. Test log records as listed in annexe 1.
2. Static calculation in accordance with annexes 1 and 2.
3. Other structural and details drawings listed in annexe 2 which were required for the inspection, but which were not affixed to the test log and which remain with in the offices of the authority which conducted the tests.

3. Description of the structure

The calculations and the corresponding drawings contain the verifications for a rotating system with a total of 6 gondolas, each occupied by a maximum of 5 people. This gondolas can rotate freely around their longitudinal axis. They are flange-mounted onto a gondola star which is driven at a top speed of $n = 10$ rpm. The gondola star is located at a wing which rotates at a speed of $n = 8.3$ rpm around an axle which is inclined at an angle of approx. 45° to the vertical.

4. Design loads

The intrinsic weights of the structural parts have been taken into consideration in accordance with DIN 1055, part 1 and according to information supplied by the manufacturer.

Working loads have been taken into consideration in accordance with DIN 4112. The travelling system features 6 gondolas, in particular, each of which can be occupied by up to 5 people.

$$P = 6 \times 5 \times 0.75 \text{ kN} = 22.5 \text{ kN.}$$

Inertia forces result from the following travelling movements, in accordance with the static calculation:

Maximum speed of the gondola cross:	$n = 10$ rpm
Maximum speed of the rotary arm:	$n = 8.3$ rpm

Wind loads have been allowed for in accordance with DIN 4112, para. 4.5.

Snow loads have not been taken into consideration.

5. Construction materials

The following construction materials were essentially used:

RSt 37-2 in accordance with DIN 17100 for welded components,
RSt 52-3 in accordance with DIN 17100 for bolts, connection plates and flanges,

screws of strength classes 8.8 and 10.9.

Please refer to the design drawings for details of the materials.

6. Foundation

The installation is designed as a suspended structure, to be erected and dismantled repeatedly at different fairground sites.

A ground load-bearing capacity in accordance with DIN 4112/6.3 has been assumed (ground must be suitable driving on).

The following permissible ground load-bearing capacities p' apply, depending on the width w of the support piles underneath:

$w = 20 \text{ cm}$: perm. $p = 100 \text{ kN/m}^2$

$w = 30 \text{ cm}$: perm. $p = 150 \text{ kN/m}^2$

$w = 40 \text{ cm}$: perm. $p = 200 \text{ kN/m}^2$

Please refer to condition 2 for details of the size of the support piles underneath.

Greater ground foundations can be used for secured erection sites. Depending on the condition of the ground being used, the following dimensions apply as the minimum sizes of the support piles:

for $p = 150 \text{ kN/m}^2$: min. $w \times w$ [cm]: 15 x 15

for $p = 250 \text{ kN/m}^2$: min. $w \times w$ [cm]: 25 x 25

for $p = 400 \text{ kN/m}^2$: min. $w \times w$ [cm]: 100 x 100.

Permission to apply an increased pressure level must be documented for each erection site.

7. Remarks on the trials and tests

The technical documentation was inspected on 17.9.97 and has now been checked in order to ensure that it correlates with the tested documents.

Assembly states were not checked in accordance with DIN 4112. Errors in calculations, records and transcriptions which have no bearing on the measurements were not corrected in the checks on calculations.

The manufacturer submitted data sheets for the ball bearing slewing rims, including calculations of their working life (cf. condition 7).

We checked the design loads using extensive computerised comparative calculations. This gave rise to the top speeds defined in the acceptance trial.

The tensions deemed permissible in accordance with DIN 15018, part 1 were exceeded by up to 20% in the following welded seams:

1. The welded seams in the curved area of the gondola arm (cf. item 2, drawing no. 115-05-92).
2. The straps connecting the two hydraulic cylinders to the head of the mast (cf. item 5, drawing no. 115-05-92) and the welded seam connection at the head of the mast.
3. The welded seams at the points where the two front tilting extension arms are connected to the driving carriage (item 10, drawing no. 115-05-92).
4. The welded seams at the points where the transverse beam (chassis) is connected to the tilting extension arms (item 1, drawing no. 115-05-92).
5. The welded seams connecting the steel corner plates with the frame of the seat (drawing no. 115-05-92).
6. The welded seam on the hubs on the flange with the separator piece (cf. item 12, drawing no. 115-05-92).
7. The point where the safety bow-type bar is mounted in the arced pipe area (cf. drawing no. 115-05-98).
8. The welded seams in the curved area of the gondola arm (drawing no. 115-05-93).

These areas must be checked regularly for cracks by the operating firm and during the annual inspection by an engineering consultant (cf. condition 3).

8. Findings of the tests

The static calculation and the relevant design drawings conform to DIN 4112 (published in February 1983) and are essentially complete and correct. We have no reason to object to a provisional three-month design permit being issued, provided the operating firm implements and complies with the conditions laid down in the test report, the reports on the welding and electrical tests and the conditions specified below.

Conditions

Conditions for manufacture and the acceptance trials

1. The bolts of dia. 110 mm and 140 mm (bottom and top cylinder bolts) and the bolts used in the embedding of the mast must be marked in order to ensure that they can be re-fitted in the same arrangement every time they have been removed.

Conditions for installation and daily checks:

2. The travel system must be supported underneath, as shown in drawing no. 115-05-184B, every time it is erected.

In particular, the front tilting extension arms (item 10, drawing no. 115-05-92) must be supported underneath with wooden underlay boards measuring at least 110 x 110 cm and the rear tilting extension arms (item 11, drawing no. 115-05-92) must be supported underneath with wooden underlay boards measuring at least 120 x 120 cm.

The following must be complied with, in general:

- avoid supporting the tilting extension arms underneath on different types of ground (eg. tarmac and loamy ground);
- by setting up the equipment, level out the surfaces underneath the supports so that they are perfectly flat by spreading crushed gravel (not round pebbles !), which then needs to be compacted;
- the support points need to be checked each time the carousel is set up and at regular intervals when the ride is in use.

If the points of installation are secured, the points 6 in section 6 apply.

Conditions for regular checks and the renewal inspection

3. The following components must be checked regularly by the operating firm and during annual renewal inspections for cracks in welded seams:
 - a) The welded seams in the curved area of the gondola arm (cf. item 2, drawing no. 115-05-92).
 - b) The straps connecting the two hydraulic cylinders to the head of the mast (cf. item 5, drawing no. 115-05-92) and the welded seam connection at the head of the mast.
 - c) The welded seams at the points where the two front tilting extension arms are connected to the driving carriage (item 10, drawing no. 115-05-92).
 - d) The welded seams at the points where the transverse beam (chassis) is connected to the tilting extension arms (item 1, drawing no. 115-05-92).

- e) The welded seams connecting the steel corner plates with the frame of the seat (drawing no. 115-05-92).
- f) The welded seam on the hubs on the flange with the separator piece (cf. item 12, drawing no. 115-05-92).
- g) The point where the safety bow-type bar is mounted in the arced pipe area (cf. drawing no. 115-05-98).
- h) The welded seams in the curved area of the gondola arm (drawing no. 115-05-93).

Working conditions

- 4. No account has been taken of snow load in the installation calculations. Any snow which falls must, therefore, be cleared away immediately.
- 5. The following values may not be exceeded or fallen below:

Main drive:

max. speed:	$n < 8.3$ rpm
start time:	$t \geq 9.0$ seconds
brake time:	$t \geq 7.0$ seconds (independent of wing position)

Gondola drive:

max. speed:	$n \leq 10.0$ rpm
start time:	$t \geq 5.0$ seconds
brake time:	$t \geq 5.0$ seconds

Other conditions

- 6. The regulations laid down in the manufacturer's operating and maintenance instructions must be complied with or followed.
- 7. Ball bearing slewing rims:
 - a) The ball bearing slewing rim on the main drive (large BBSR) is calculated to have a working life of 850 service days. The ball bearing slewing rim must be replaced after 8 years (or after 850 days in service).
 - b) Calculations are to be submitted on the working life for the slewing rim on the gondola star, taking account of the change in the collective load (cf. fax of 5.3.97).

8. Ensure that no crowds are allowed to form at the podium exits

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Central Department
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Annexes 1-2

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ANNEXE 1**Summary of the technical documents for the test log for the Space Roller carousel (Topscan VIII)****1. Static calculation:**

Pages 0/1 to 0/4, 1/1, 1/2, 2/1 to 2/3, 4/1, 4/2, 5/1, 5/2, 6/1 to 6/3.

2. Technical drawings:

Drawing no.:	Date:	Description:
115-05-278	26.5.97	Topscan (general drawing / clear space)
115-05-292	24.6.97	Assembly of Kinzler Topscan
115-05-276	15.5.97	Under-support plan
115-05-092 vers. 2	20.2.97	Individual parts 1
115-05-093	17.12.97	Gondola
115-05-098	5.2.97	Mounting bow-type safety bar on seat frame
115-05-246	13.3.97	Hydraulics diagram
115-05-247	16.4.97	Hydraulics diagram
115-05-90 C	1.2.97	Pneumatics connection diagram
115-01-100 A	21.2.97	Hydraulics connection diagram for bow-type bar
115-05-26 B	27.12.95	Assembly of rotating points
115-05-05 A	20.12.95	Assembly of gondola drive
115-05-04	□	Assembly of main gears
115-05-02 C	28.12.95	Screw-type connections

ANNEXE 2 (Sheet 1)**Tested static calculation for the Topscan VIII carousel**

Pages 0/1 to 0/4, 1/1, 1/2, 2/1 to 2/6, 3/1 to 3/9, 3/9.1, 3/10 to 3/52, 3/53a to 3/62a, 3/62.1a, 3/63 to 3/122, 3/122.1a, 3/123a, 3/124 to 3/126, 3/127a, 3/128, 3/129a to 3/132a, 3/133 to 3/137, 3/137.1, 3/138 to 3/140, 3/140.1, 3/141 to 3/156, 4/1, 4/2, 4/3a to 4/10a, 4/11, 4/12a, 4/13a, 4/14 to 4/34, 5/1 to 5/115, 6/1 to 6/70, 7/1 to 7/8 and

the calculation of the rear wall (13 pages) and

the calculation of the podium (6 pages).

Drawings presented for inspection relating to the 'Topscan VIII' carousel:

Drawing no.:	Date:	Description:
115-05-02	20.12.95	Screw-type connections
115-05-03	<input type="checkbox"/>	Assembly of main gears
115-05-04	<input type="checkbox"/>	Assembly of main gears (sectional view)
115-05-05	20.12.95	Assembly of gondola drive
115-05-06 B	21.12.95	Assembly of gondola slewing rim
115-05-07	22.5.96	Assembly of gondola
115-05-08 A	18.12.95	Trailer
115-05-09 C	12.12.95	Individual parts of trailer
115-05-10 E	22.11.95	Welded assembly of chassis
115-05-11 B	17.11.95	Welded assembly of chassis, middle
115-05-12 D	16.11.95	Individual parts of chassis, middle
115-05-13 D	15.11.95	Chassis of semitrailer
115-05-14 D	22.11.95	Chassis, rear
115-05-18 B	15.11.95	Tilting extension arm, rear
115-05-19 B	9.11.95	Tilting extension arm, front
115-05-20 A	7.11.95	Welded assembly of mast
115-05-21 B	3.11.95	Mast head
115-05-22 B	3.11.95	Individual parts of mast
115-05-24 A	28.5.96	RVS individual parts
115-05-25 B	27.11.95	Individual parts of steering joints
115-05-26 A	27.12.95	Assembly of rotating points
115-05-27 C	9.10.95	Hub of gondola arm
115-05-28 C	4.10.95	Reaction arm, gondola hub
115-05-30 B	17.10.95	Hub on main drive
115-05-31	23.10.95	Individual parts of hub on main drive
115-05-32 C	29.11.95	Reaction arm on main gears
115-05-33 B	11.10.95	Counterweight arm
115-05-34	5.10.95	KOP gondola arm
115-05-35 C	30.10.95	Arm on gondola
115-05-36 E	31.10.95	Welded assembly of arm on gondola
115-05-39 E	1.11.95	Separator piece on gondola

ANNEXE 2 (Sheet 2)

115-05-40	4.10.95	Gondola
115-05-41 E	3.10.95	Welded individual parts of gondola
115-05-42 C	5.10.95	Seats on frame
115-05-46 A	12.8.96	Individual parts on cylinder, locking device
115-05-47	□	Hydraulic cylinder for bow-type safety bar
115-05-48 D	3.6.96	Bow-type safety bar
115-05-90 B	1.2.96	Pneumatics connection diagram
115-05-067	21.12.95	Entry and exit podiums
115-05-168	15.1.96	Support for podiums, rear
115-05-289	15.6.97	Assembly of rear wall
115-05-285 B	6.5.97	Name plate
115-05-263 C	23.11.95	Rear wall structure

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