CYPRESS GARDENS

Cypress Gardens

FLYING IS **"Flying Island"**

Non-Kiddie

I. General Requirements

For best performance and safety, and long life of the equipment, a reliable preventive maintenance program must be carried out based on the maintenance guidelines.

The manufacturer and seller of this ride disclaim all liability for personal injury or property damage caused by the failure of the equipment owner to follow the instructions contained in the operation manuals or by modifying, altering or changing any of the systems.

For all work which hereafter is mentioned to require a "responsible person", the management must designate a technically competent and qualified person who performs or supervises the required tasks, observing all guidelines and regulations as described.

Normal and convention technical maintenance items are not listed in details here, but must be carried out to keep the ride in proper working order and as contribution to the safety of the whole installation.

Before start-up of daily operation, the ride must be checked and inspected by the designated responsible person for proper and safe functioning of every part.

Deficiencies occuring during operation must be rectified immediately. The operation must be shut down for the duration of this repair work.

The necessary barriers are to be mounted completely and are to be secured against undesired removal.

Unless the whole ride area, with the exception of loading and unloading platforms, is fenced off against public entry, special protective barriers must be provided. These barriers must be installed in places where any moving parts would come within reach of visitors.

During any maintenance, repair or inspection work on any part of the installation, the power supply must be shut off and locked off reliably. Steps must be taken to prevent anyone from energizing any part of the equipment while work is carried out or personnel may be endangered.

Electric power may be reapplied only after the persons working on the ride have completed their task, are clear of moving parts, have reinstated the ride into a safe operating condition and have personally reported the ride clear and safe for energizing.

If testing with power is required involving moving parts, the following precaution must be observed.

a) The entire testing operation must be supervised and closely controlled by the designated "responsible person" who has been trained and is familiar with the portions tested and their possible behavior, side effects or dangers.

b) During live and moving tests, the "responsible person" must be certain that everyone is out of range of the moving parts and that noone can enter this area unexpectedly.

c) "All persons involved with the testing of the ride and its components must be instructed by the designated "responsible person" of the manner in which the ride and its parts move about while testing is conducted.

The safety keys of the key switches must be kept by a responsible person.

For installation of the main power supply service, utmost care must be taken that all local safety precautions are considered.

All work performed on the installation is to be ordered and supervised by the responsible person.

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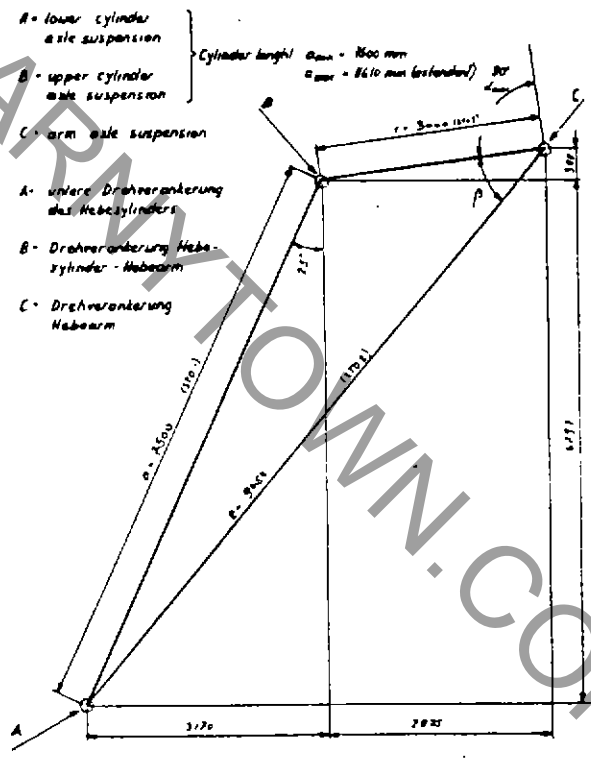
F L Y I N G I S L A N D

I. Essay on the speed-course during raising and lowering the island

1. Steady cylinder within the scope of run-out rapidity

- If the run-out rapidity of the lifting cylinders is **steady** the arm's angular frequency depends on momentary run-out distance of the cylinders. Thus the angular frequency is changing.



- Graph A in diagram 2 shows the arm's changing of angle to the run-out length of the lifting cylinder pair.

  At the bottom of this graph A are all calculation-rules:

  a) Calculation of angle for inoperative-position of the arm (island is down at the bottom, put on buffers)

$$\beta = \arccos \frac{r^2 + z^2 - a^2}{2\,r\,z}$$

  So, angle in inoperative position is 42,03°.

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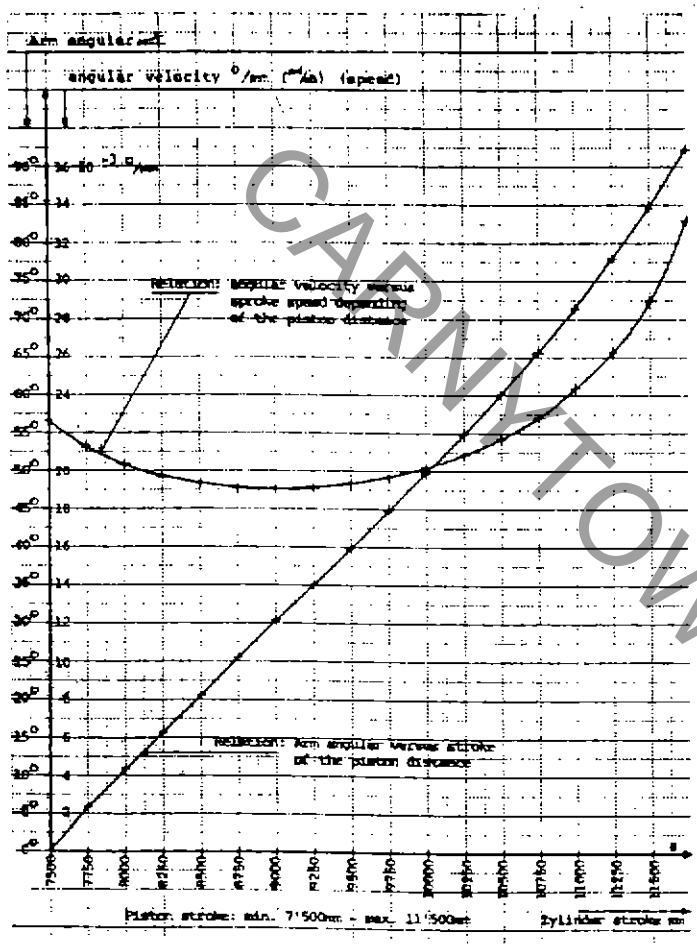
b) Calculation of swing-angle in dependency of cylinder's run-out length

$$\alpha = \arccos \frac{r^2 + z^2 - a^2}{2\,r\,z} - 42{,}03^\circ$$



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Piston stroke of cylinder	Arm angular	Piston stroke velocity of cylinder
7'500 mm	0.00°	22.63 10^{-3} °/mm
7'750 mm	5.47°	21.23 10^{-3} °/mm
8'000 mm	10.66°	20.32 10^{-3} °/mm
8'250 mm	15.66°	19.72 10^{-3} °/mm
8'500 mm	20.53°	19.35 10^{-3} °/mm
8'750 mm	25.34°	19.15 10^{-3} °/mm
9'000 mm	30.12°	19.10 10^{-3} °/mm
9'250 mm	34.90°	19.18 10^{-3} °/mm
9'500 mm	39.72°	19.39 10^{-3} °/mm
9'750 mm	44.61°	19.73 10^{-3} °/mm
10'000 mm	49.60°	20.21 10^{-3} °/mm
10'250 mm	54.73°	20.85 10^{-3} °/mm
10'500 mm	60.04°	21.69 10^{-3} °/mm
10'750 mm	65.60°	22.79 10^{-3} °/mm
11'000 mm	71.46°	24.23 10^{-3} °/mm
11'250 mm	77.75°	26.18 10^{-3} °/mm
11'500 mm	84.62°	28.96 10^{-3} °/mm
11'750 mm	92.35°	33.21 10^{-3} °/mm

- Graph B in diagram 2 shows the relation of angle-rapidity to cylinder-rapidity depending on cylinder run-out length.

The following calculation is at the bottom of this graph B: A factor which defines this relation is searched.

Factor's unit: $\frac{\text{degree / sec.}}{\text{mm / sec.}}$ or $\frac{\text{degree}}{\text{mm}}$

This factor 'X' is obtained by differentiate the equation.

$$\frac{\alpha\ (a)}{a} \Longrightarrow X = \frac{\Delta\alpha\ (a)}{\Delta\ a}$$

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- The values of the swing-angle in dependency of the cylinder run-out length results from the formula:

$$\alpha\,(a) = \arccos \frac{r^2 + z^2 - a^2}{2\,r\,z} - 42{,}03^\circ$$

- Conclusion:

At the raising-procedure the angular frequency changes from an angle of 30° with regard to the inoperative-position, increasingly from 1,624 degrees/sec. to 2,736 degrees/sec.
The maximum angular frequency is reached at an angle of 90,72°; that corresponds to the cylinder-run-out length of 11700 mm. Thus the speed increase is 68 % theoretical.

2. Acceleration and deceleration of raising- and lowering speed

- During the acceleration- and deceleration-procedure an angle of 9,3° is covered. The deceleration in upper position starts at an angle of 72,3°. The deceleration in lower position starts at an angle of 9,3°.

- So, the increase of angular-frequency becomes reduced (if cylinder's run-out rapidity is steady). Thus the change of angular-frequency is about 30 % between 9,3° and 72,3°.

- The acceleration- as well as the deceleration-time is adjustable. The deceleration time of 1,624 degrees/sec. to a minimum of creep speed comes to about 11,4 sec.

II. Measuring- and control-system

- The arm's swing-angle is measured by means of a shaft encoder. The impulses become led to a counter device. The impulses are added during the raising-procedure and subtracted during the lowering-procedure. An impulse (positive side to an impulse to a positive side to an impulse) corresponds to a swing-angle of the arm of 0,024°.

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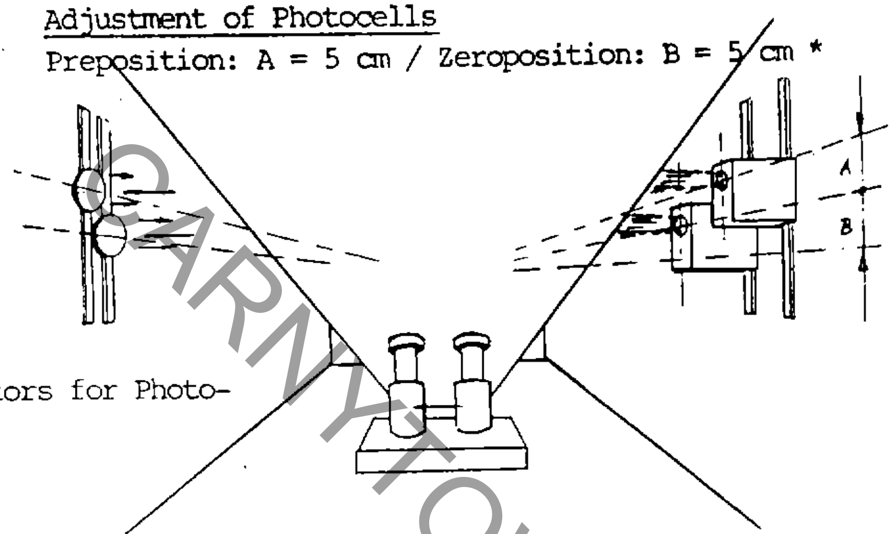
- At zero-position of the arm the counter device becomes reseted to zero on each cycle ⟶ 'Masterreset'. The masterreset is produced by two photocells that means if the arm is in zero-position, the light beams become interrupted and this information is led to the PC which leads it further to the counter device

Adjustment of Photocells

Preposition: A = 5 cm / Zeroposition: B = 5 cm *



* The surface of B is the arm's Zero-Position that means, the Island leans on the buffers.

- By leaving the pre-position the masterreset becomes disconnected. From now on, the counter device counts and switchs the corresponding desired-values on the pre-programmed points. The stored desired-values are shown in the program schedule for the counter device.

Description		Distance or Angle	Counter position		Relays	
			[illegible]	[illegible]	[illegible]	[illegible]
Island on the move (not in down position)	off	- 0,024°	- 1	0001	7	5
Island on the move (not in down position)	on	0°	0	0000	7	6
Down high speed disable	on	+ 0,024°	+ 1	0001	3	6
Speed check during Ramp (down)	ext	3,6°	+ 104	[illegible]	A	4
Speed check enable	on		+ 109	[illegible]	[illegible]	[illegible]
Speed check enable	off		+ 110	[illegible]	[illegible]	[illegible]
Speed check enable + counter compare	on	+ 7,25°	+ 303	[illegible]	[illegible]	D
Speed check enable + counter compare	off		+ 303	[illegible]	[illegible]	[illegible]
Down high speed disable	on	+ 9,784°	+ 387	[illegible]	1	D
Down high speed disable	off		+ 388	[illegible]	1	[illegible]
Enable turntable turning	off	- 9,96°	+ 435	[illegible]	4	5
Enable turntable turning	on		+ 436	[illegible]	4	[illegible]
Valve b 2A/t	off	+49,6°	+ 2066	[illegible]	[illegible]	5
Valve b 2A/t	on		+ 2067	[illegible]	[illegible]	[illegible]
Ramp 2	off	+55,0°	+ 2291	[illegible]	C	[illegible]
Ramp 2	on		+ 2292	[illegible]	C	[illegible]
Up - highspeed disable	off	+72,53°	+ 3022	[illegible]	1	5
Up - highspeed disable	on		+ 3023	[illegible]	1	[illegible]
Speed check enable + counter compare	off	+77,33°	+ 3224	[illegible]	[illegible]	5
Speed check enable + counter compare	on		+ 3225	[illegible]	[illegible]	[illegible]
Speed check enable	off	+82,0°	+ 3417	[illegible]	[illegible]	[illegible]
Speed check enable	on		+ 3418	[illegible]	[illegible]	[illegible]
Speed check during Ramp (Up)	ext		+ 3419	[illegible]	[illegible]	2
Up - disable	off	+82,3°	+ 3430	[illegible]	3	[illegible]
Up - disable	on		+ 3431	[illegible]	3	[illegible]

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- By means of relay-boards, all the informations from the counter device are given to the programmable controller; called PC.

  - Decel.-/Accel. ramp
  - UP high speed disable (= UP high speed enable)
  - UP disable (= UP enable)
  - DOWN high speed disable (= DOWN enable)
  - Speed measuring arm movement V = 0
  - Valve 28 b/b enable
  - etc. (see PC-list IN 81 - IN 96)

- The chained and processed signals come back from PC and arrive at analog-board over the optocoupler board. In this way the following signals become actuated at the analog-print:

  - Speedreference 1 THRESHOLD (no arm movement)
  - Speedreference 2 UP
  - Speedreference 3 DOWN
  - Speedreference 4 CREEPING
  - Accel.-/Decel. ramp BOTTOM
  - Accel.-/Decel. ramp TOP
  - etc. (see PC-list OUT 49 - OUT 64)

- In series to the out-put of the analog-amplifier which now is supplying the proportional-valve, an other relay point is switched for safety. (On optocoupler board P 6: IN-put 8 ⟶ Enable). This contact prevents an erreneously supplying of the proportional-valve in case of a failure on the analog-board.

- The maximum current (100 %) of the analog-board to supply the proportional-valve is 50 mA.

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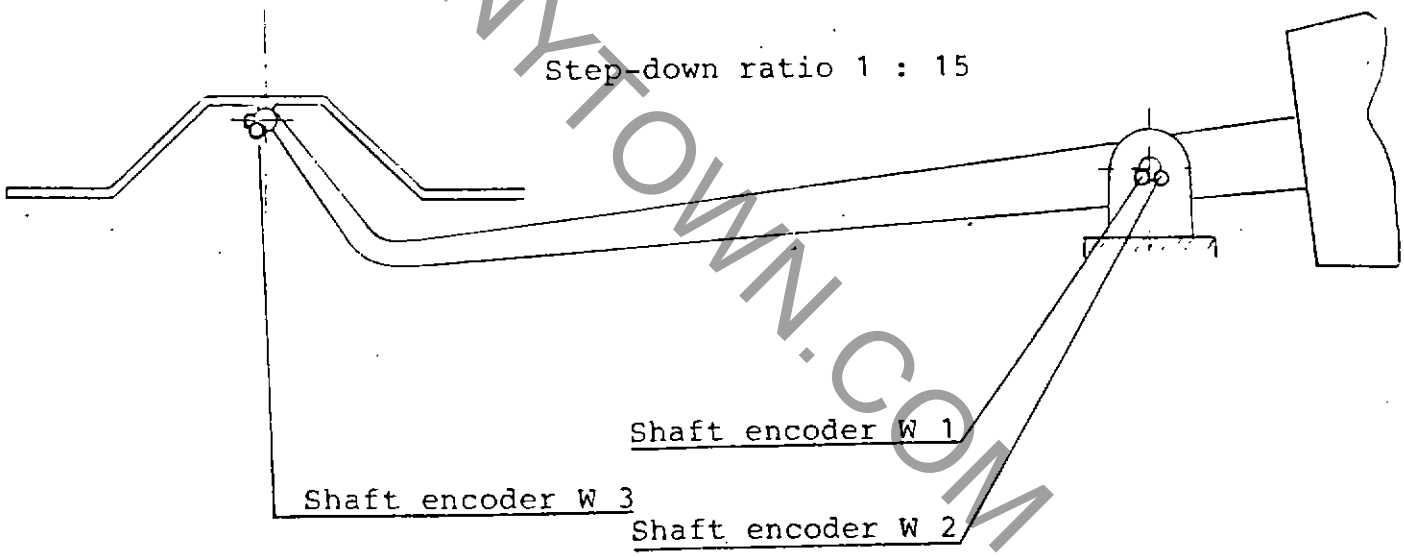
III. Horizontal-position of the island

- The zero position of the arm is also reference point for the island's horizontal-position. An other shaft encoder, working in the same way like the ones on the arm's pivot bearing is installed under the island. If the arm is raised, the impulses coming from the shaft encoders on the arm's pivot bearing become counted in the counter device as described before. At the same time the impulses coming from the shaft encoder under the island are always kept on the same count of the counter by supplying the equalizer. Before it is possible to supply the equalizer, a small counter-difference has to be detected.



- So, the horizontal-position of the island is arranged with an electrical difference-potentiometer which works up impulses depending on the arm's angle as well as on the angle between arm and platform.

- The horizontal position of the island is further controlled by a pendulum which is mounted on the platform. Is the platform moved out from a certain tolerance zone, +/- 11° (that means allowed slope-position) for any reason, the checking circuit switchs off the adjustment of the equalizer. Also an imergency stop of the arm's movement is set up. The platform keeps itself more or less horizontal on account of its own physical conditioning but, each weight transfer on the platform will

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change this position because of the hydraulic system which is on free running.

Final observation:

The ride has to be turned off if there is a wind velocity of 90 km/h (60 mi/h).

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F L Y I N G I S L A N D Nr.: 83-345

A) General electrical data drives

1. Mainpumpmotor P1 and P2 (11a and 11b)

Brand, Type	Reliance, Frame 405 TC, Type P
Indentification	Nr. 1MQF 9591-GI-PJ
Power	125 HP (92 kW), 1770 rpm
Supply	3 x 460 V, 148 A, 60 Hz
S.F. 1.1	max. 40°C
Isolation class	B

2. Controlpumpmotor P3 (52)

Brand, Type	SEW-USA, DFT 9094
S.Q.	85000 3067.3.01.85.001
Power	1,5 HP (1,1 kW), 1700 rpm
Supply	3 x 460 V, 2,32 A, 60 Hz
or	3 x 230 V, 4,75 A, 60 Hz
S.F. 1.1	max 40°C
Duty	continue
Protection norm	IP 55

3. Equalizerpumpmotor P4 (11)

Brand, Type	SEW-USA, DF 160 M4
S.Q.	85000 3066,3.01.85.001
Power	15 HP (11 kW), 1750 rpm
Supply	3 x 460 V, 19,7 A, 60 Hz
or	3 x 230 V, 39,5 A, 60 Hz
S.F. 1.1	max. 40°C
Duty	continue

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4. Ventilatormotor V1 and V2 (Oilcooling mainsystem)

Brand, Type	General electric, Frame 56
Model-Nr.	5K 49 MG 2067 EX
Power	0,5 HP (360 W), 1140 rpm
Supply	3 x 460 V, 1,3 A, 60 Hz
or	3 x 230 V, 2,6 A, 60 Hz
Code L	max. 40°C
Duty	continue
Isolation class	A

5. Ventilatormotor V3 (Oilcooling Equalizer system)

Brand, Type	Generalelectric, Frame 48
Model-Nr.	5K 32 EG 293
Power	0,25 HP (180 W), 1725 rpm
Supply	3 x 460 V, 0,7 A, 60 Hz
or	3 x 230 V, 1,4 A, 60 Hz
Code M	max. 40°C
Duty	continue S.F. 1.0

6.1 DC-drives motor for turntable (2 pieces)

Brand, Type	SEW-USA, R 100 GN 112 M BG G2
Indentification Nr.	0404908 and 0806019
Power	4 HP (3 kW), 2160 rpm
Armature	260 V, 15,2 A (1,26 ohm / 6,6 mH)
Field	340 V, 0,45 A
Protection norm	IP 55
Mounting	on gear

6.2 DC-drive gear

Brand	SEW
Reduction	i = 163,5 max. 13,2 rpm
Torque	2170 Nm
Mounting	Foot V6
Shaft	ø 70 mm x 140 mm

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6.3 DC-drive brake

Brand	SEW
Supply	380 V, 60 Hz
Torque	30 Nm
Mounting	on dc-drive motor

6.4 DC-drive tachogenerator

Brand, Type	SEW, G2
Output	20 V / 1000 rpm
AGMA-norm	classification II

B) General electrical data valves and hydraulic-switches

1. Valves 28a and 28b

Brand	Parker (Hydrell)
Model-Nr.	D-1V-W-4-C-JJ-18 BR
Coil-Type	DC 702138/3
Supply	24 VDC, 1,36 A
Duty	100 % ED
Date	1/83

2. Valves 54a and 54b

Brand	Parker (Hydrell)
Model-Nr.	D-1V-W-2-C-JJ-18 CR
Coil-Type	DC 702138
Supply	24 VDC, 1,36 A
Duty	100 % ED
Date	1/83

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3. Proportional Valves V5a and V5b

Brand	Moog (D-7030 Böblingen)
Model-Nr.	D 062-562 D, Nr. D345
Supply	24 VDC, max. 50 mA
Coil	2 x 28 ohm (serie)

(detailed information see specification sheet)

4. Pressure-switches 12a and 12b

Brand	Delaval Turbine GmbH
Model-Nr.	9675-2
Adjust.range	2 - 7 bar, max. 480 bar
approx.	6,86 - 103 bar

5. Pressure-switches 32a, 32b, 32c and 32d

Brand	Barksdale Delaval
Switch-Nr.	9048-2
Adjust.range	3,45 - 34,5 bar (50 - 500 PSI)
Proof. pressure	414 bar (6000 PSI)

6. Pressure-switches 54a, 54b, 54c and 54d

Brand	Delaval Turbine GmbH
Model-Nr.	9675-2
Adjust range	2 - 7 bar, max. 480 bar
approx.	6,86 - 103 bar

7. Thermostat-switches 20

Brand	Sauter T80
Type	TSCC 111 RW Nr. 1303
TR / TW	35979
Sonde	A = 1, L = 50

8. Oillevel-switch 21

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C) General data electrical devices

1. Pendulum for horizontal level control turntable

Brand	Moog (D-7030 Böblingen)
Model	86 D - 121 1
Supply	24 VDC (10 Vmin. - 30 Vmax.)

(detailed information see specification sheet)

2. Shaftendcoders for arm- and turntable shaft

3. Photoeyes with reflectors for arm zero position

Brand	Electronics corp. of america Photo switch divison
Type	42 MRL, Serie 5000

(detailed information see specification sheet)

4. Proximity-switches for turntable positioning

Brand	Pepperl + Fuchs (Denison)
Type	NJ 40-FP-E2 (Nr. 07327)
Supply / signal	24 VDC (3 wire), (pnp / n.o.)

5. Proximity-switches for zero position

Brand	Pepperl + Fuchs (Denison)
Type	NJ 4-12 GK-E2 (Nr. 01650) pnp
Supply / signal	24 VDC (3 wire), (pnp / n.o.)

6. Limit-switch for arm in upper position

Brand	Telemecanique