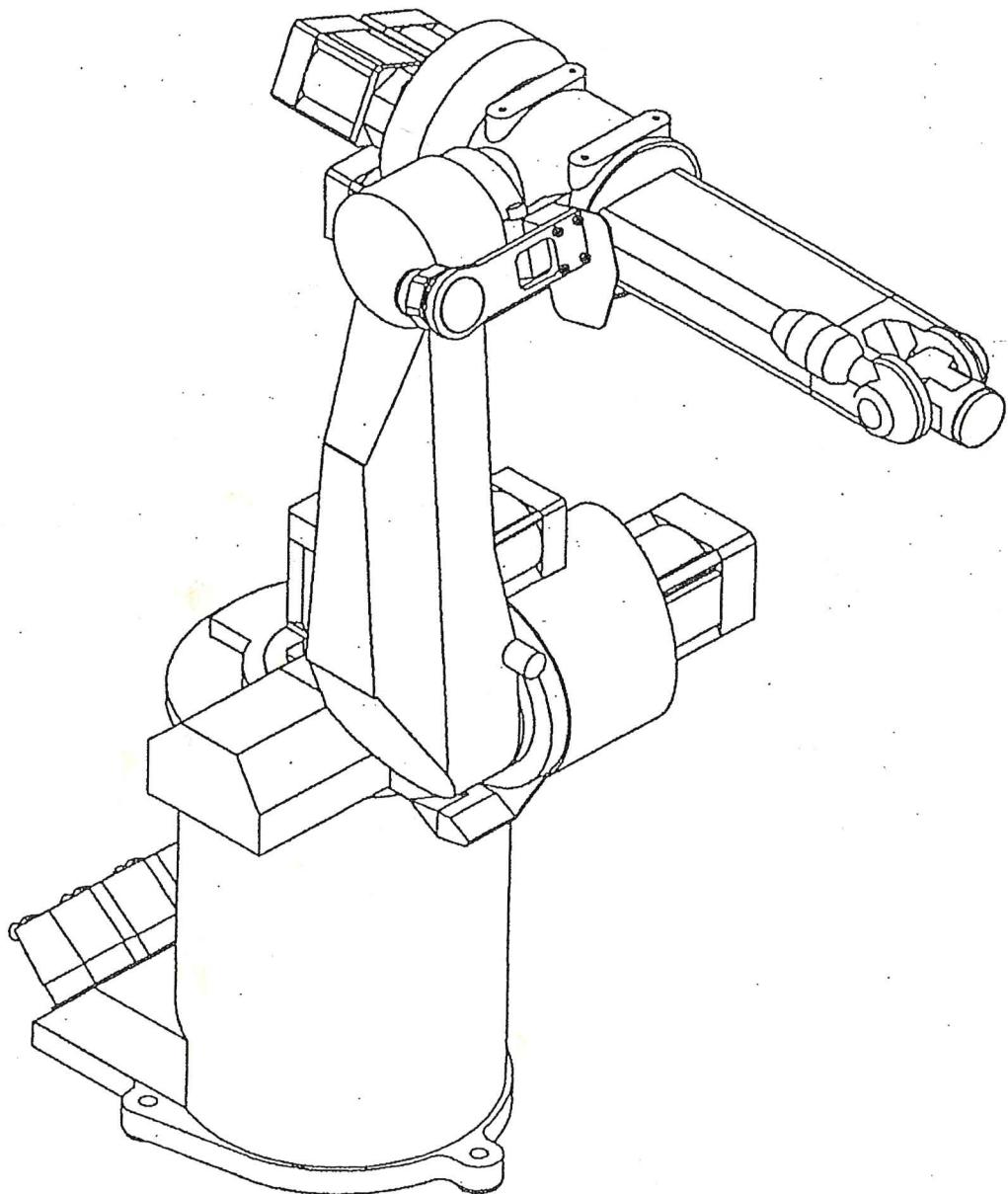


r e i s

TECHNICAL MANUAL

REIS ROBOT RV6/RV6L/RV16



reis

RV6/RV16

TECHNICAL MANUAL

TABLE OF CONTENTS

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UTILIZATION

The Reis Robots RV6/RV16 are 6-axes industrial robot.

Due to rotation axis 2 being displaced to the front the robot has a very large work envelope with a reach of 1525 mm for the RV6 and a reach of 1535 for the RV16. With regard to the arm length and the swivel angles the kinematics were optimized in such a way that both, upright and suspended arrangement of the robot is possible.

The compact design, good movability and the high axes' speeds, especially in the wrist make the robot suitable also for utilization in very small operation areas.

Various application possibilities in fully or semi-automated production installations are e.g.

- Path welding
- Coating
- Assembly
- Handling
- Machining

Solid sealings protect the drive elements from dirt and moisture from outside in case of extreme environmental conditions.

For utilization of the machine the max. loads indicated in chapter "Technical Data" have to be taken into consideration, in order to avoid damage at the unit resp. injuries of persons.

Observe safety instructions mentioned in chapter 2 !

ATTENTION!



DESIGN OF THE MACHINE

The Robot is designed as vertical articulated arm robot equipped with six freely programmable axes.

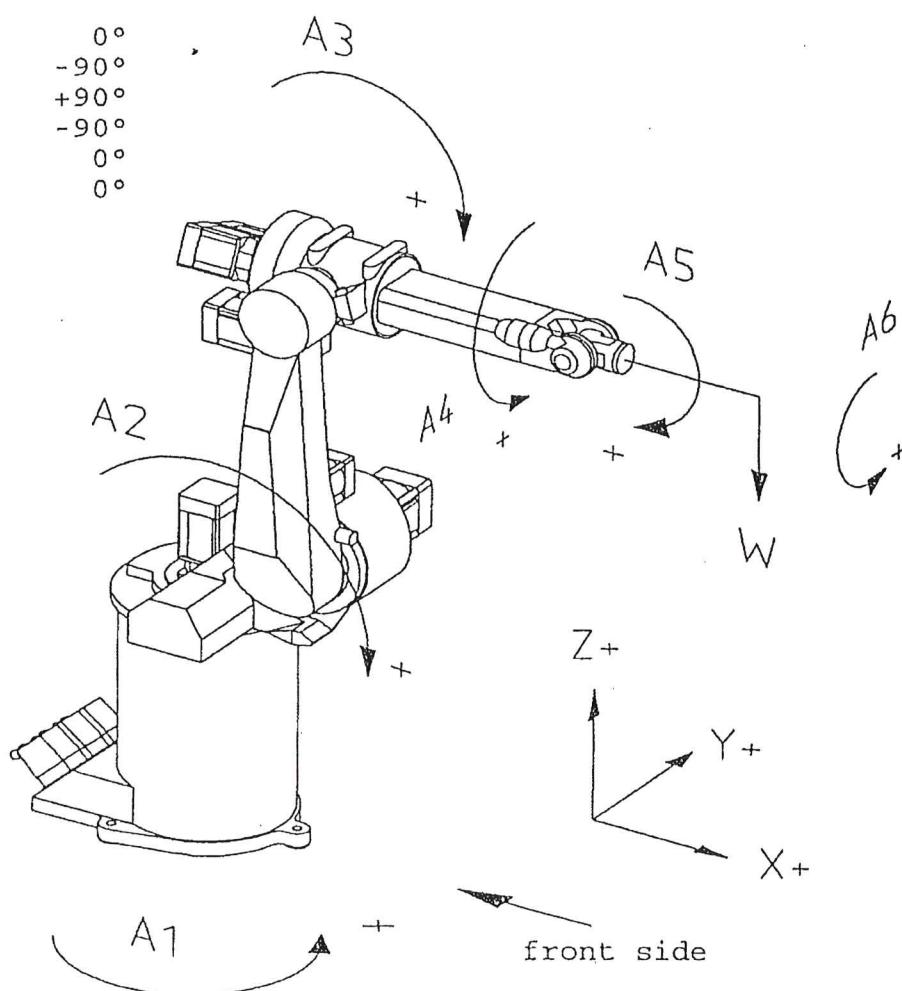
All axes are driven by brushless AC servo-motors equipped with an absolute path measuring system transmitting electric pulses to the control.

All motors are additionally equipped with a brake in order to keep the axes in position in case of standstill or power failure.

The gear units of the corresponding axes are directly installed at the driven end of shaft. Thus, the RV6/RV16 disposes of highly dynamic and rigid drive systems.

The illustration of the robot in the measurement position corresponds to the axes positions:

A1	0°
A2	-90°
A3	+90°
A4	-90°
A5	0°
A6	0°



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robot

SAFETY INSTRUCTIONS - 2

TERMS

User

User is the entrepreneur who uses the installations for production purposes, or the person appointed by the company to be vicariously responsible for the machine, e.g. head of a department or foreman.

Insured

Person employed at the machine.

ATTENTION !

Special remarks concerning regulations, correct sequence of works etc... In case this will not be observed, damage and destruction of the machine and/or other equipment of the installation might be possible.



Warning: Zone of danger.

Remark for danger to life and limb.

INSTRUCTIONS CONCERNING SAFETY REGULATIONS

Maintenance

- (1) The user has to see to it that in case of irregularities in operation of the machine it will be checked if there is any defect. The operation of the machine must be stopped until the detected defect has been eliminated.
- (2) Insured who are employed at the machine have to inform the superior immediately of any irregularities in machine operation.
- (3) Insured must switch off the drive and actuate the switch-off device during maintenance, inspection and repair.

Instructions of the manufacturer:

- (1) Insured who are occupied with assembly, operating, servicing and repair of the machine in the company of the user, must have read and understood the operating manual, particularly chapter "Safety instructions".
The user is recommended to have this confirmed in each case by written evidence.
- (2) The machine may be run by trained and authorized insured only. Competences for operating the machine must be clearly fixed and kept so that no unclear competences occur with regard to safety.
- (3) In case of inappropriate use or use not according to the application of the machine, or operation by unskilled personnel, the following can impend:

- danger to life and limb
- danger for the machine and other property assets of the user
- danger for the efficient work of the machine

Besides this, it has to be stressed that in case of inappropriate use there might occur faults in functioning or the original quality of the machine might be reduced.

INSTRUCTIONS CONCERNING SAFETY REGULATIONS

(4) The safety regulations indicated in the operating manual must be observed at all works concerning assembly, operation, rearrangement, adaptation, maintenance and repair.



Generally the following safety instructions are valid for insured who are employed at the machine:

- The insured also must take care that no unauthorized person works at the machine.

- Any method of working impairing particularly the safety of

- the mechanics
- the hydraulics
- the electrics

of the machine must be omitted.

- The insured is obliged to inform the user immediately of changes occurred which impair safety.

- As a matter of principle, no safety devices must be removed or put out of service.

- When the safety devices at the machine in the production cycle are disengaged, no sufficient protection of the insured or of third persons is guaranteed. In this case, considerable dangers threaten the insured or third persons, in the extreme case danger to life!



The main switch must always be switched off during works at the machine and be secured against unauthorized switch on !

- The machine must always be switched off if safety devices are removed during repair or maintenance.
The safety devices must be remounted immediately after completion of the repair or maintenance works, i.e. before starting up the machine again.
- Works at the electric unit may only be executed by skilled personnel with regard to the UVV 7.0 regulation (German accident prevention regulation) or with regard to similar prescriptions in the user's country.
- If hydraulic medium escapes under pressure, injury hazard threatens, when operating the machine close to open fire, explosion hazard and danger of fire threaten !

INSTRUCTIONS CONCERNING SAFETY REGULATIONS

- Prior to works at hydraulic and pneumatic components (especially cylinders, pressure reservoirs) it has to be ensured that those are pressureless.
- All drives or controls have to be switched off prior to maintenance or repair works.

Special safety instructions for the user:



- The user must bind himself always to run the machine in faultless condition only.
- Running of the installation in automatic mode presumes an installed, closed, and controlled protecting installation, also around the individual machines and equipments of this production unit, if necessary.
No person must stay within this protecting installation during operation !
- If a complete screening of the machine with regard to the safety regulations is not part of the delivery of Messrs. Reis, the user must ensure that the working range of the machine is screened by appropriate measures, based on the safety regulations valid in the user's country.
- As far as required, the user must oblige the insured to wear protecting clothes etc.
- The user must guarantee cleanliness and clearness of the workshop place in the machine area by means of corresponding instructions and controls.

(5) Any arbitrary conversion, repair and modification at the machine effected by the user, by the insured or by third persons is prohibited for reasons concerning safety regulations.

(6) According to regulations of the Federal Republic of Germany, the user has to set up a written operating- and working instruction. This has to be done in the language of the insured. This operating manual can partly be taken for formulation.

reis

robot

SAFETY INSTRUCTIONS - 2

INSTRUCTIONS CONCERNING SAFETY REGULATIONS

The robot may only be operated by personnel that is trained or instructed accordingly:

personnel	minimum qualification	allowed operating modes
Operators	Instruction by trained programming or service personnel or instruction by service personnel of Messrs. Reis or participation in an operator training at Messrs. Reis	Operation only from outside the safety grid During operation safety devices have to be inactive, i.e. safety doors have to be closed. Staying inside the safety grid only when drives are switched off.
Programmers	Participation in an operating and programming training at Messrs. Reis	All operating modes as per VDI 2853 as described in the operating manual ROBOTstar.
Servicing staff	Participation in an operating and servicing training at Messrs. Reis	All operating modes as per VDI 2853 as described in the operating manual ROBOTstar.

Safety Datasheet according to 91/155/EEC

Optimol LONGTIME PD 1/Art.-No. 08224

Date printed: 19.07.95

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1. Designation of substance/preparation and manufacturing company

1.1 Designation of substance or preparation
Commercial name: LONGTIME PD 1

1.2 Designation of company

Manufacturer/Supplier: Optimol Ölwerke Industrie GmbH
Street/Post Office Box: Friedenstraße 10
Country code/Zip code/locality: D-81671 München
Telephone: 089/4183-0
Telefax: 089/4183-200
Department providing information: Laboratory/UMW
Telephone: 089/4183-116
Emergency information (poisoning): Giftnotruf München
Emergency telephone: 089/41402211

2. Composition/Ingredients

2.1 Chemical characteristics (individual substance)

CAS No.	Designation acc. to EEC Directive see 2.2 (preparations)	Code letter	Risk phrases
	<u>Identification number:</u> none		
	<u>Other remarks:</u> none		

2.2 Chemical characteristics (preparations) Description:
Lubricating grease based on mineral oil and lithium-12-hydroxystearate

Hazardous ingredients:

CAS No.	Designation acc. to EEC Directive not applicable	Contents % by wt	Code letter	Risk phrases

Other remarks: Identification according to GefStoffV (German Hazardous Goods Regulation) not necessary.

3. Possible hazards

3.1 Designation of risk

none

3.2 Special risks for people and environment

none

4. First aid measures

4.1 General remarks

Immediately remove contaminated and impregnated clothing.

4.2 Inhalation

not applicable

4.3 Skin contact

Clean well with soap and water, then use

4.4 Eye contact

Flush thoroughly with water for several minutes, if necessary call for medical attention.

4.5 Ingestion

Do not induce vomiting, call for medical attention.

4.6 Medical information

5. Fire fighting measures

5.1 Suitable extinguishing media

Foam, dry chemicals, CO₂

5.2 Extinguishing media unsuitable for safety reasons

Water

5.3 Special risks inherent in the substance, its combustion products or resulting gases

During combustion unhealthy vapours may form (see 10).

5.4 Special protection equipment

not necessary

6. Measures to be taken in case material is released or spilled

6.1 Personal precautions

not necessary

6.2 Measures to protect the environment

Contain polluted water/extinguishing water.
Avoid entry into sewers and waterways.

6.3 Measures of purification/absorption

Remove with a suitable absorbent and dispose of in compliance with applicable legal regulations.

6.4 Other remarks

none

7. Handling and Storage

7.1 Handling

Information for safe storage

See 7.2 with regard to storage together with other materials!

Information concerning protection against fire and explosion

No special measures required if product is handled in conformity with applicable legal regulations.

7.2 Storage

Requirements concerning storage room and containers

Storage in closed containers at room temperature. Avoid pollution and entry of humidity to maintain existing quality standards.

Storage together with other materials

Do not store together with strong oxidizing chemicals.

Other information regarding storage conditions

Total storage period under the above conditions is approx. 20 months.

Storage class not applicable

8. Limitation of exposure and protective equipment

8.1 Other information regarding design of technical plants and equipment

none

8.2 Ingredients for which limit values have to be monitored in relation to the workplace

CAS No.	Designation acc. to EEC Directive	Type	Value	Unity
not applicable				

The above values have been taken from the lists valid at the time of preparation (e.g. TRGS 900 for Germany).

Other remarks none

8.3 Personal protective equipment

General measures of protection and hygiene

The precautions usual in handling lubricants have to be observed.

Do not eat, drink, smoke, take snuff during work.

Remove contaminated work clothes.

Clean and care skin after work.

Protection against inhalation

not necessary

Hand protection

Protective gloves made of chemical resistant material, e.g. Neoprene.

Eye protection

not necessary

Body protection

not necessary

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9. Physical and chemical properties

<u>Form</u>	pasty	<u>Colour</u>	brown
<u>Odour</u>		<u>Value/Range</u>	<u>Unity</u>
<u>Change of physical state</u>			<u>Method</u>
Kind of ... (1) Point/Range of fusion		°C	not applicable
Kind of ... (2) Point/Range of boiling		°C	not applicable
Kind of ... (3) Dropping Point	> 260 °C	°C	ISO 2176
<u>Flashpoint</u> (base oil)	approx. 200 °C	°C	ISO 2592
<u>Inflammability (solid, gaseous)</u>			not applicable
<u>Ignition temperature</u>		°C	not applicable
<u>Self-ignition</u>			not applicable
<u>Explosion hazards</u>			not applicable
<u>Limits of explosion</u>	UEG	Vol-%	not applicable
	OEG	Vol-%	not applicable
<u>Vapour pressure</u>	at T= 20°C	hPa	not applicable
	at T= 50°C	hPa	
<u>Density</u>	at T= 20°C	kg/m³	100,887 DIN 51757
<u>Solubility</u>	at T= °C	mg/l	insoluble in H₂O
<u>pH</u>	at T= °C		not applicable
<u>Coefficient of distribution</u>	Comp. :	logPOW	not applicable
<u>Viscosity</u>	at T= °C	mm²/s	not applicable
	at T= °C	mm²/s	
<u>Separation of solvents test</u>		%	not applicable
<u>Solvents content</u>		%	not applicable
<u>Other data</u>	none		

10. Stability and Reactivity

Conditions to avoid

The product is stable

Material to avoid

Strong acids and oxidizing chemicals

Hazardous decomposition products

Depending on conditions of decomposition: Oxides of C, S, N, P

Other information

Decomposition temperature > 350°C

11. Toxicological information

11.1 Acute toxicity Information regarding ingredients:

LD/LC₅₀ Values determining classification: not defined

Manner:	Value/Range of values	Species	Method
oral	mg/kg		
dermal	mg/kg		
inhalative	mg/l/4h		

<u>Specific symptoms in experiments on animals</u>	not defined			
<u>Primary irritation effect</u>				
<u>Effect</u>	<u>Species</u>	<u>Method</u>		
on skin				
on eye				
<u>Sensibilisation</u>	not defined			
<u>Other information</u> (relating to experimental toxicology)				
11.2 Subacute to chronic toxicity				
<u>Tests</u>	not defined			
<u>Species</u>	Maximum dosis:	mg/kg		
<u>Results</u>	Method			
11.3 Experiments on human beings				
not defined				
11.4 Other toxicological information (particularly with regard to preparations) Avoid prolonged and repeated skin contact, slight irritations being possible. Eye contact may lead to slight irritation of the conjunctiva.				

12. Ecological information

12.1 Information relating to disposal of waste (persistence and degradation)			
not determined			
<u>Procedure</u>			<u>Method of analysis</u>
<u>Degree of elimination</u>			<u>Classification</u>
<u>Evaluation text</u>			
<u>Other information</u>			Avoid entry into the soil, waterways and sewers.
12.2 Behaviour in different ecological compartments			
<u>Ingredient</u>			
<u>Mobility and bioaccumulating potential</u>	not defined		
<u>Other information</u>	none		
12.3 Ecotoxicological effects			
<u>Aquatic toxicity</u>	not defined		
<u>Sort of test</u>	<u>Active concentration</u>	<u>Method</u>	<u>Evaluation</u>
<u>Remark</u>	none		
<u>Behaviour in sewage treatment plants</u>	not defined		
<u>Sort of test</u>	<u>Active concentration</u>	<u>Method</u>	<u>Evaluation</u>
<u>Remark</u>	none		
Restricted aeration of activated sludge EC 20 =	mg/l acc. to ISO 8192 B		
<u>Other information</u>	none		

Safety Datasheet according to 91/155/EEC

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12.4 Other ecological information

<u>AOX information</u>	<u>Remark:</u>	not defined
<u>CSB value</u> mg/g	<u>Remark:</u>	not defined
<u>BSB₅ value</u> mg/g	<u>Remark:</u>	not defined

The formulation contains heavy metals and compounds as per EEC Directive No. 76/464 mentioned hereunder:

The preparation contains the heavy metals molybdenum and zinc.

General remarks: none

13. Information regarding waste disposal

13.1 Product

Recommendation: Disposal in accordance with technical instructions for the disposal of hazardous waste

<u>Waste Code No.</u>	<u>Designation of waste</u>	<u>Proof to be furnished</u>
54202	Waste of greases	yes

13.2 Contaminated packaging

Recommendation: Contaminated packaging to be emptied at best; it may be reconditioned after proper cleaning.

Recommended means of cleaning:

Cleaning to be effected only by an authorized company.

14. Transport regulations

14.1 Land transport ADR/RID and GGVS/GGVE (crossborder/inland)

<u>ADR/RID-GGVS/E class</u> ---	<u>Figure/Letter</u> ---
Warning board: <u>No. of risk:</u> ---	<u>No. of substance:</u> ---
<u>Designation of product:</u> ---	
<u>Remarks:</u> see 14.5	

14.2 Inland water transport ADN/ADR

<u>ADN/R class</u> ---	<u>Figure/Letter</u> ---	<u>Category</u>
<u>Designation of product:</u> ---		
<u>Remarks:</u> see 14.5		

14.3 Sea transport IMDG/GGVSee

<u>IMDG/GGVSee class:</u> ---	<u>UN-No.:</u> ---	<u>PG.:</u> ---
<u>EMS-No.:</u> ---	<u>MFAG:</u> ---	
Marine pollutant: no		
Correct technical designation:	---	
<u>Remarks:</u> see 14.5		

14.4 Air transport ICAO-TI and IATA-DGR

<u>ICAO/IATA class:</u> ---	<u>UN-ID-Nr.:</u> ---	<u>PG.:</u> ---
<u>Correct technical designation:</u> ---		
<u>Remarks:</u> see 14.5		

14.5 Transport/other information

No hazardous goods within the meaning of applicable transport identification rules!

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15. Regulations

15.1 Identification according to EEC Directive

Letter of identification and designation of risk inherent in the product:
(according to Annex I of the Directive 88/379/EEC relating to preparations)
No identification required.

Component(s) determining the risk(s) to be specified in labelling:
contains: not applicable

Risk phrases:
none

Safety phrases:
none

Special identification of certain preparations:
(according to Annex II of the Directive 88/379/EEC)
not applicable

15.2 National Regulations

Additional classification according to GefStoffV (German Hazardous Goods Regulation) Annex II No.:
(only in case of deviation from EEC-classification)
No classification required.

Information relating to employment restrictions:
none known

Decree about emergencies: not applicable

Classification according to VbF: not applicable

Technical instructions on air quality control: not applicable
Class: --- Figure: --- Content m%: --- (for liquids)

Class of hazard for water: 2 (self-classification)

Other regulations, limitations and interdictions:

[for example principles of industrial medicine and regulations relating to industrial safety (VBG, ZH-1/...instruction leaflets among others)]
none

16. Other information

The information contained herein is based on our present knowledge and experience and cannot in any case be relied upon as complete.

Department preparing safety datasheets: Laboratory/UMW

Persons to be contacted: B. Helbig

DIN safety data sheet

Date: 19.07.1993

Company Harmonic Drive Antriebstechnik GmbH, D-65555 Limburg F.R.G Commercial product name Harmonic Drive Grease SK -1A				
1.1 Chemical characterization: Composition of paraffinic, naphthenic and aromatic hydrocarbons with lithium - 12 - hydroxystearate - thickener and "EP" - additives				
1.2 Form: pasty		1.3 Colour: yellow(mustard-like)	1.4 Odour: petroleum-like	
2 Physical data and safety data Tested in accordance with:				
2.1 Change in physical state				
Dropping point		197 °C	DIN ISO 2176	
Pourpoint		-25 °C	DIN ISO 3016	
2.2 Density Bulk density		(°C) inapplicable	0.93 g/cm³ kg/m³	DIN 51757
2.3 Vapour pressure		(°C) (°C)	negligible mbar mbar	DIN 51562
2.4 Viscosity (basic oil) Consistency No. Worked penetration		(40 °C)	37 mm²/s 2 (NLGI) 290 0.1 mm	DIN 51 818 DIN ISO 2137
2.5 Solubility in water			insoluble	
2.6 pH value (at g/l H ₂ O) (°C)			inapplicable	
2.7 Flash point		170 °C	(base oil) ASTM D 92 (C.O.C.)	
2.8 Ignition temperature		Not determined	°C	
2.9 Explosion limits		Lower: not determined	Upper: not determined	
2.10 Thermal decomposition at 197 °C the grease becomes liquid				
2.11 Hazardous decomposition products will not occur if application is not contrary to rule; oxides of carbon at combustion temperatures possible				
2.12 Hazardous reactions will not occur whilst storage and handling according to regulations				
2.13 Further information				
3 Transport GGVSee/IMDG code: GGVE/GGVS:		UN No.: RID/ADR:	ICAO/IATA-DGR: ADNR:	
Other information: no dangerous good				
4 Regulations				
4.1 No duty to any designation according to the decree for dangerous goods from August 26, 1986 (version of April 23, 1990)				
4.2 "MAK"-value (max.all. concentration at working place): not specified				
4.3 "Vbf"-value: not classified				
4.4 Pay attention to the recommendations of the employer's liability insurance associations concerning industrial medical check-ups.				
4.5 "TA Luft": not applicable				
4.6 Pay attention to the "Wasserhaushaltsgesetz" (water resources law) and decrees about devices for storage, rack-off and transfer				

Commercial product name		
5 Protective measures, storage and handling		
5.1 Technical protective measures Sealings should be able to protect against penetration of lubricant		
5.2 Personal protective equipment Respiratory protection: not necessary Eye protection: avoid contact with eyes Hand protection: only recommended in case of prolonged skin contact		
5.3 Industrial hygiene avoid contact with eyes and prolonged or repeated skin contact; rubber or plastic gloves and aprons could be worn, if required. Before starting to work, lay a protection cream on the skin. After handling wash well hands and moistened skin with soap and (warm) water. After having cleaned the skin use a skin care cream. Neither wear nor take with you clothes impregnated by lubricating grease.		
5.4 Protection against fire and explosion Fire classification "B" according to DIN EN 2 Don't smoke and do not handle or store near open flame.		
5.5 Disposal Avoid heating above flash point. According to the valid law for waste disposal (waste code : 54202)		
6 Measures in case of accidents and fires		
6.1 After spillage / leakage / gas leakage Scrape up with spatula or scoop and place in container		
6.2 Extinguishing media Suitable: Foam, dry chemical, carbon dioxide Not to be used: water		
6.3 First aid skin contact: remove lubricating grease from skin with dry cloth or towel, wash with soap and (warm) water Eyes contact: Wash thoroughly 10 min. with (warm) water and call a physician Ingestion: Call a physician Further information		
7 Information on toxicity		
7.1 Lubricating grease is not suitable for ingestion. 7.2 Till now not any effects detrimental to health are known if the application is under the regulations for working hygiene and protection of labour. 7.3 Occuring of allergic diseases: no experience		
8 Information on ecological effects		
The lubricating grease endangers the water according to the water resources law ("Wasserhaushaltsgesetz"); class (Wassergefährdungsklasse") 2. Follow exactly the regulations for disposal of waste oil.		
9 Further Information		



SAFETY DATA SHEET

Shell Alvania EP (LF) 1

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1. Identification of Substance/Preparation and Company

Product name:
Shell Alvania EP (LF) 1

Supplier:
Deutsche Shell Aktiengesellschaft

Address:
Überseering 35
22297 Hamburg

Contact numbers:
HSE informations: (040) 6324-6255

Emergency telephone number:
(040) 6324-5110

2. Composition/Information on Ingredients

Preparation Description:

A lubricating grease containing highly refined mineral oils and additives.

Dangerous components:
On the basis of available information, the components of this preparation are not expected to impart hazardous properties to this product.

3. Hazards Identification

Human Health Hazards:

Prolonged or repeated exposure may give rise to dermatitis.
No specific hazards under normal use conditions

Safety hazards:

Contains mineral oil for which an exposure limit for oil mist applies.

Environmental hazards:

Avoid spillage.
Not readily biodegradable.

4. First Aid Measures

Other information:

First aid - inhalation

Inhalation of any vapours from this product is not likely to present an acute hazard.
Remove to fresh air.

First aid - skin:

Remove contaminated clothing and wash affected skin with soap and water.
If high pressure injection injuries occur, obtain medical attention immediately.

First aid - eye:

Rinse immediately with plenty of water for at least 10 minutes and



seek medical advice.

First aid - ingestion:

Do not induce vomiting
If rapid recovery does not occur, obtain medical attention

Advice to physicians:

Treat symptomatically

5. Fire Fighting Measures

Extinguishing media:

Foam, Dry chemical powder, carbon dioxide, sand or earth.

Unsuitable extinguishing media:

Do not use water in a jet

Specific hazards:

Combustion is likely to give rise to a complex mixture of gases and airborne particulates, including carbon monoxide, oxides of sulphur, and unidentified organic and inorganic compounds.

6. Accidental Release Measures

Personal precautions:

Ventilate contaminated area thoroughly
Minimise contact with skin.

Environmental precautions:

Prevent further leakage or spillage and prevent from entering drains
Prevent from spreading or entering into drains, ditches or rivers by using sand, earth, or other appropriate barriers.

Clean-up methods:

Shovel into a suitable, clearly marked container for disposal or reclamation in accordance with local regulations.

Other information:

7. Handling and Storage

Handling:

When using do not eat or drink.
When handling product in drums, safety footwear should be worn and proper handling equipment should be used.
Prevent spillages.

Storage:

Avoid direct sunlight, heat sources, and strong oxidising agents.

Recommended materials:

mild steel
high density polyethylene
for containers or container linings.



8. Exposure Controls/Personal Protection

Engineering control measures:

Occupational exposure standards:

Component name	Limit type	Value/Unit	Other Information
Oil mist	8-h TWA	5 mg/m ³	ACGIH
15-min STEL	10 mg/m ³		ACGIH

Other information:

Respiratory protection:
Not normally required.

Hand protection:
PVC or nitril rubber gloves if splashes are likely to occur and if applicable.

Eye-Protection:
Safety spectacles

Body Protection:
Minimise all forms of skin contact.

Hygiene measures:
Don't keep oily rags in your pockets.
Wash hands before eating and drinking.

9. Physical and Chemical Properties

Physical state:

Form....: Semi-solid at ambient temperature

Colour...: brown

Safety relevant data:

Change of physical state:

Dropping point:

(-) 180 °C

Flashpoint (Base Oil): > 250 °C
(DIN ISO 2592)

Solubility in water (°C): Negligible

n-octanol/water partition coefficient: Not applicable

10. Stability/Reactivity

Stability:

Stable under normal use conditions

Materials to avoid:

Strong oxidising agents



Hazardous decomposition products:

Hazardous decomposition products are not expected to form during normal storage.

Other information:

11. Toxicological Information

Toxicological Data:

LD 50 expected to be > 2000 mg/kg.

Specific symptomatic results:
Not available

Skin irritation:
Expected to be slightly irritant

Skin sensitisation:
Not expected to be a skin sensitisier

Prolonged and/or repeated contact:
Prolonged/repeated contact may cause defatting of the skin which can lead to dermatitis and may make the skin more susceptible to irritation and penetration by other materials.

Carcinogenicity:
Product is based on mineral oils of types shown to be non-carcinogenic in animal skin-painting studies.
Other components are not known to be associated with carcinogenic effects.

Human effects:

Other information:

Information given is based on a knowledge of the toxicology of similar products.

12. Ecological information

Persistence/degradability:

Information given is based on data on the components and the ecotoxicology of similar products.

Not readily biodegradable.

Mobility:

Floats on water.
Semi-solid under most environmental conditions.
If it enters soil, it will adsorb to soil particles and will not be mobile.
Product has the potential to bioaccumulate.

Ecotoxicity:

Product is expected to be practically non-toxic to aquatic organisms, LC/EC50 >100mg/L.

Other Information:

13. Disposal Considerations



Product:

Precautions:
Dispose to licensed disposal contractor

Waste disposal No. (EU) :
12 01 12

Container disposal:

Drain container thoroughly
Dispose to licensed disposal contractor

Recomanded cleaning procedure:
Cleaning by disposal contractor

14. Transport Information

Not dangerous for conveyance under UN, IMO, ADR/RID and IATA/ICAO codes.

15. Regulatory Information

EC Classification:

Not classified as dangerous under EC criteria
(incl. directive 98/98/EC (25. ATP)).

National Regulations:

16. Other Information

Additional informations:

Concawe Report 5/87 Health Aspects of Lubricants.

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

TRANSPORT

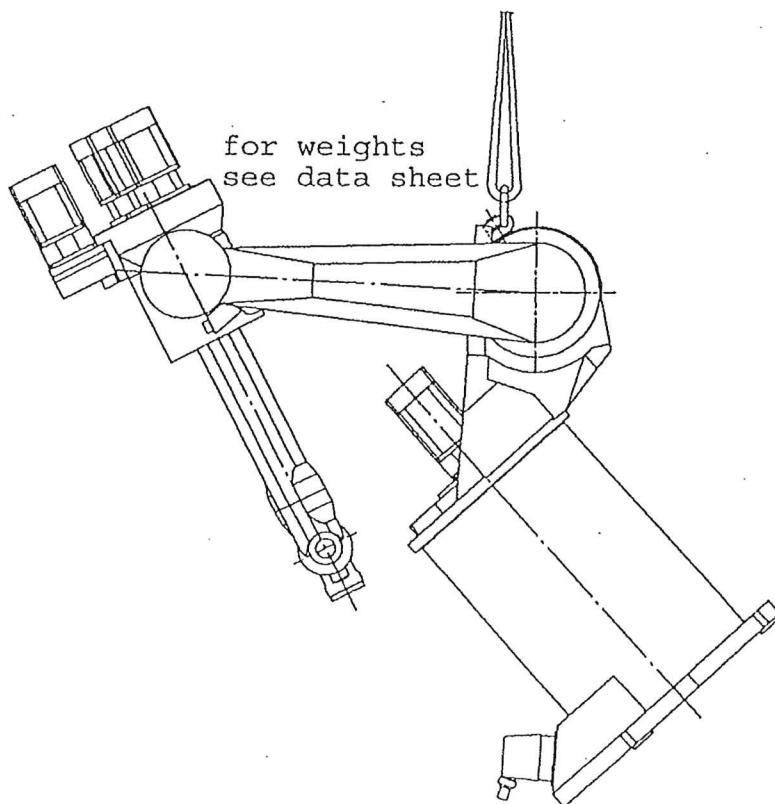
Shocks and vibrations affect the precision of any machine. Therefore special care should be applied during transport, and especially during loading and unloading of the machine.

Transport instructions according to UVV regulation 18.4 "Lastaufnahmeeinrichtungen im Hebezeugbetrieb" (Load lifting devices) have to be observed under any circumstances ! (Prescriptions in the user's country have to be observed). ATTENTION

Upright Robot (without base frame)

For lifting of the robot a thread M10 is located at the upper side of the rotary tower of axis 1. A rope with load key is suspended to this thread for transport of the robot.

When using base frames or foundation plates the transportation suspension must not be executed with the robot ! ATTENTION



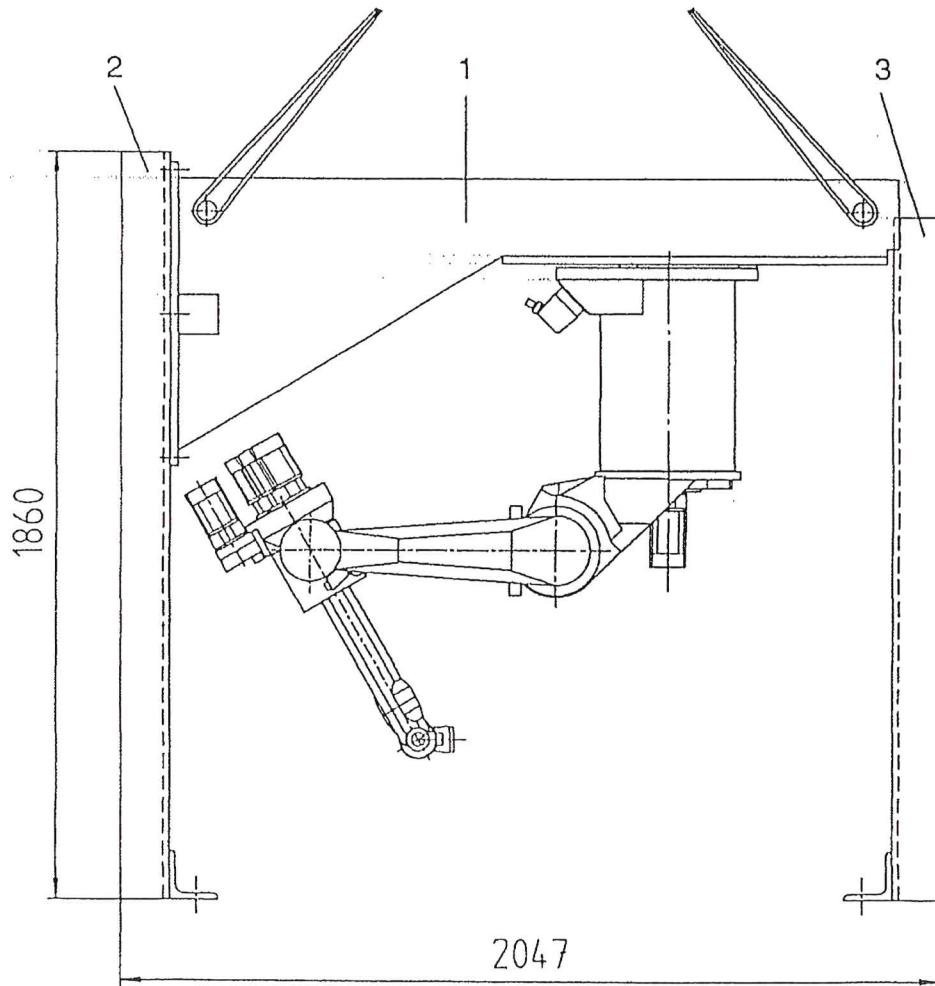
TRANSPORT

Suspended Robot

When being mounted to a support column the robot will be transported together with the supporting arm (1). For this purpose two transportation frames (2,3) are mounted to the supporting arm.

The transportation ropes must not be fixed at the two swivel arms !

ATTENTION



ARRIVAL

Immediately after arrival of the machine you have to check whether:

- a) any transport damage has occurred
- b) the standard accessories and possibly special accessories are complete

Transport damage or missing accessories have to be reported to the forwarding agent and to the manufacturer immediately.

If the installation has to be intermediately stored, this has to be effected in a dry, frost-free room.

Max. ambient temperatures for transport and storage:

-40°C (233 K) up to +60°C (333 K)

The manufacturer is not liable for damage due to or in expert storing.

ASSEMBLY / ALIGNMENT

For space requirements and design of the machine foundation please refer to machine foundation drawing. Foundation has to be prepared accordingly.

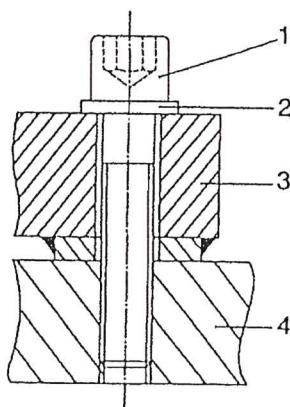
The robots RV6/RV16 may either be directly fixed on the foundation or with foundation plates (4). The occurring foundation loads are indicated on the illustration above.

The occurring foundation loads are indicated in the data sheets in chapter "TECHNICAL DATA".

Fixture is ensured via 3 screws M16 (1) and disks (2) resp. the corresponding heavy load anchor.

In any case it has to be observed that the base plate (3) of the robot will not be distorted.

Pinning with the foundation plate (4) is impossible. In order to ensure a long-time accuracy it is very useful in many cases to have fixed the robot on a common steel plate together with all peripheral components.



INSTALLATION OF THE CONTROL CABINET

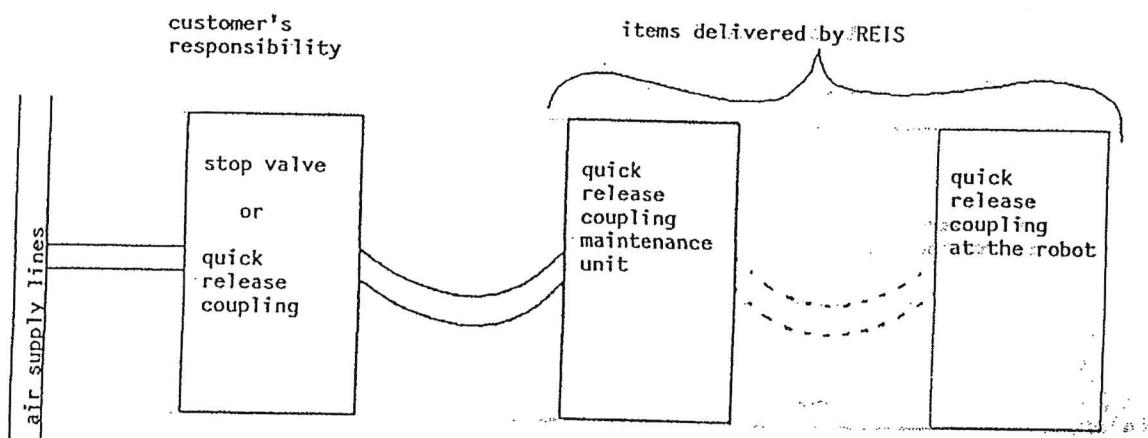
For installation of the control cabinet the following has to be observed:

- install control cabinet close to the robot
- foundation must have sufficient bearing capacity and must be free from vibrations.
- exterior door of the cabinet must open by at least 90° and be freely accessible for operation, maintenance and repair.
- ambient temperatures between 0°C up to 45°C (273 K to 318 K) have to be kept if standard control cabinet with filter fan is used.
- for higher temperatures up to $+55^\circ\text{C}$ (328 K) a cooling unit is required. Correct flow-off of the condensing water has to be considered.
- the maximum hygroscopic moisture must not exceed 75 %

PNEUMATICS

OPTION

For machine-specific connection data please see installation drawing and circuit diagram.

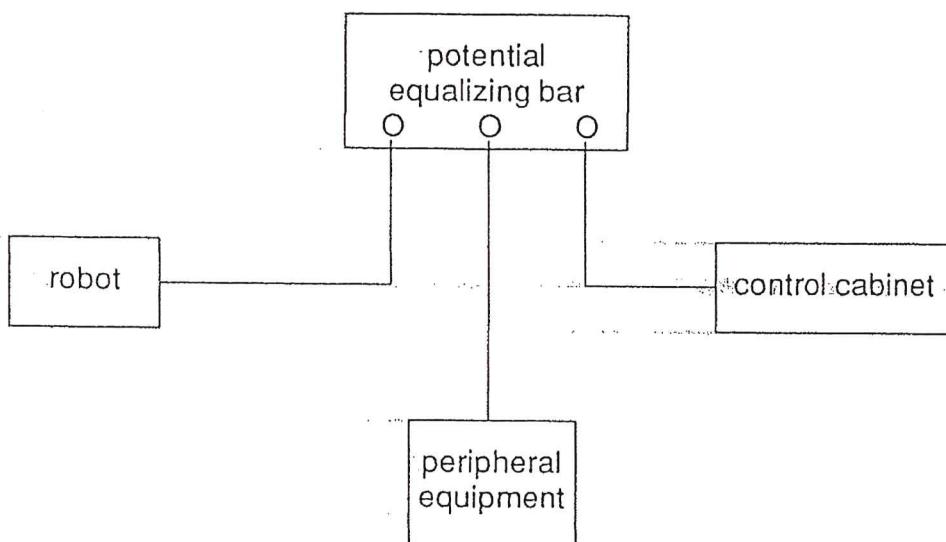


For compensation of minor vibrations during machine operation the maintenance unit and the connection to the robot have to be connected to the air supply lines with a hose line having a length of at least 30 cm.

ELECTRICS

For machine-related connection data please see installation drawing and circuit diagram.

In order to ensure a high electro-magnetic freedom from interference of the total unit, all components of a robot cell have to be radially led to a potential equalizing bar outside the control cabinet.



The potential equalizing bar has to be connected to a foundation earth wire. A flexible wire with min. cross section of 10 mm² has to be provided for this purpose.

SWITCH-ON

After having switched on the supply voltage, the robot is synchronous in general. If, however, the supply voltage was disconnected with drives being switched on or in case of a power failure, the robot has to be synchronized. In the status line of the display the following message is indicated:

ASYNCH

Synchronization of the Robot

1. Set the axes to their markings at the housing via operating mode HAND/AXIS
2. Select program ADPROG
3. Enter the number 163 into the date "SYNCHRO" (step 25) via the function "edit" (for installations without additional axes).
4. Select the function "HOME_POS" from the operating mode "SPEC_MODE" and acknowledge with key "ENTER".
5. Operate the "START" key (drives are switched off and the display indicates the message "Robot synchronous").
6. Check the home position (switch on drives, repeat step 4 and 5, drives remain switched on). The axes have to be on their markings.
7. If the markings of the axes are not correct, the procedure has to be repeated as described above.

The positions of the axes towards their markings may be checked in the operating mode "HOME_POS" any time (see 4.). If the "START" key is operated, the axes directly approach their home position in dead man operation. Danger of collision !

ATTENTION !

Remark concerning item 3:

The following numbers have to be entered for installations with additional axes:

1 additional axis:	127	2 additional axes:	255
3 additional axes:	511	4 additional axes:	1023
5 additional axes:	2047	6 additional axes:	4095

AXIS 1

The rotary column (3) of axis 1 mounted on the robot base (10) is guided via a preclamped cross roller bearing (5). External installation of the drive to ensure ease of assembly and maintenance.

The drive system consists of a maintenance-free, brushless AC servomotor (2) equipped with an absolute path measuring system (1). The motor equipped with a brake is directly coupled to the gear kit (4). The sealing (6) protects the drive elements against contamination and moisture from outside.

The electric supply lines from the control cabinet are connected in the robot base with multipolar plugs (11). The electric supply lines and the connected pneumatics are fastened as spiral cables (8) to the cable clamps (7) in the robot base. These clamps are easily accessible behind the sheet casing (9).

The cables are guided via a bolting with sealing kit (13) in the swivel arm at the rotary tower.

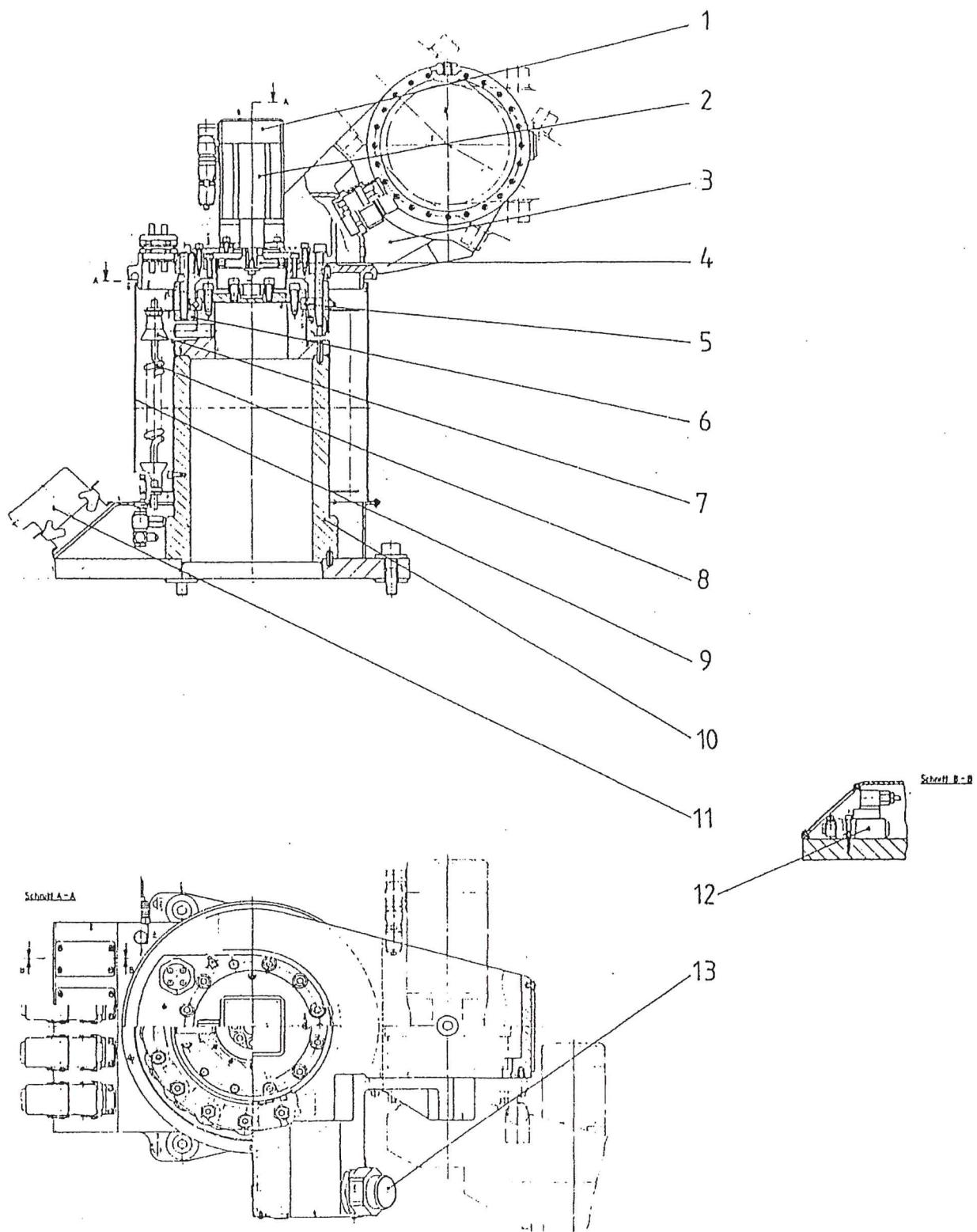
The pressure switch (12) for the pneumatics (option) is mounted close to the plugs (11) under a covering plate.

r e i s

RV6/RV16

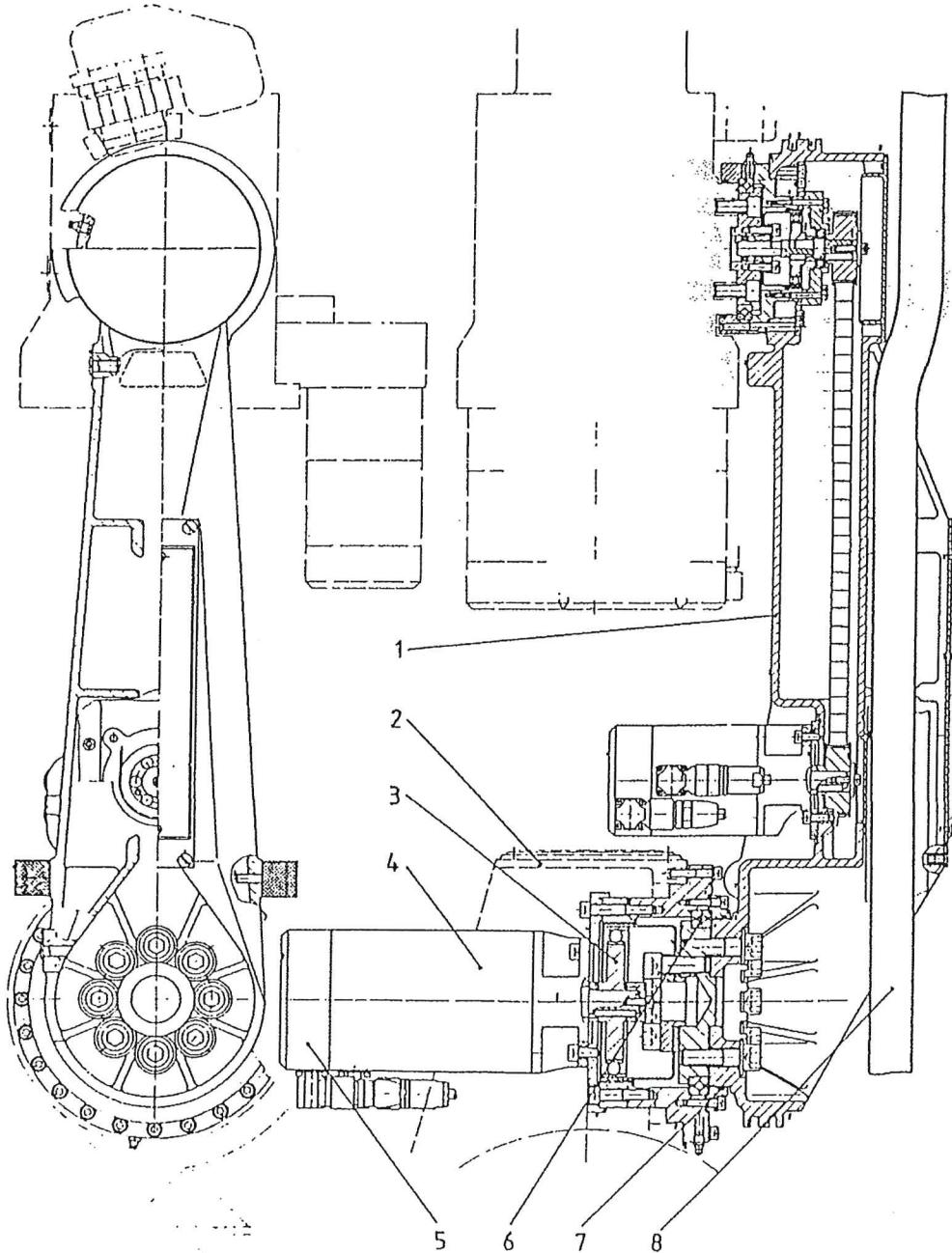
DESCRIPTION OF ASSEMBLIES - 5

AXIS 1



AXIS 2

The swivel arm (1) of axis 2 is guided in the rotary tower (2) of axis 1 via a preclamped cross roller bearing (6). The rotation movement of the motor (4) equipped with a brake is transferred to the swivel arm via the directly coupled gear kit (3). The sealing (7) protects the drive elements against dirt and moisture. Path measurement is ensured via an absolute measuring system (5). The supply lines are guided to the swivel arm in a protective hose (8).



AXIS 3

Axis 3 (8) is guided at the front end of the swivel arm (6) of axis 2 via a preclamped cross roller bearing (5).

Drive of the rotation axis is ensured via a play-free and preclamped belt drive (7) located in the swivel arm of axis 2.

The belt transfers the rotation movement to a highly reducing gear kit (3) directly installed at the driven end of axis 3.

The absolute path measuring system (12) is integrated in the AC servomotor (11) equipped with brake.

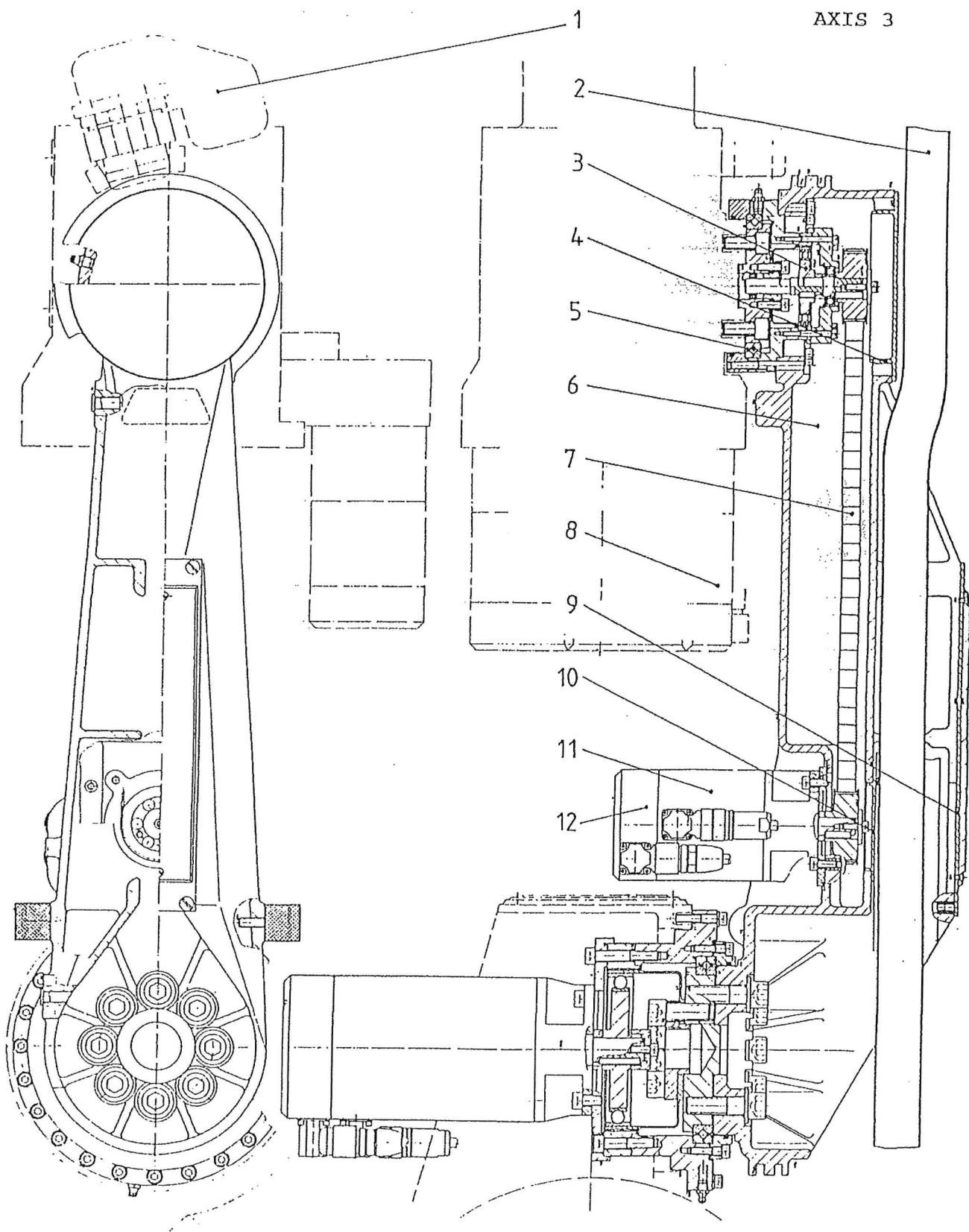
Good accessibility of the total drive system is ensured due to openings for mounting (4,9,10).

The supply lines are guided to the cable fixture of axis 4 (1) in the protective hose (2).

re i s

RV6/RV16

DESCRIPTION OF ASSEMBLIES - 5



AXIS 4

Via play-free adjusted gear drive (1) flanged to the housing of axis 4 (2) the rotation movement of the AC servomotor (3) equipped with brake is transferred to the rotary flange (4) of axis 4.

The absolute measuring system is integrated in the brushless drive motor.

On the housing of axis 4 there is provided an assembly surface for mounting of customer-specific devices, e.g. pneumatic valves, wire feed unit for welding, up to a weight of 10 kg (see illus. on page 7-5).

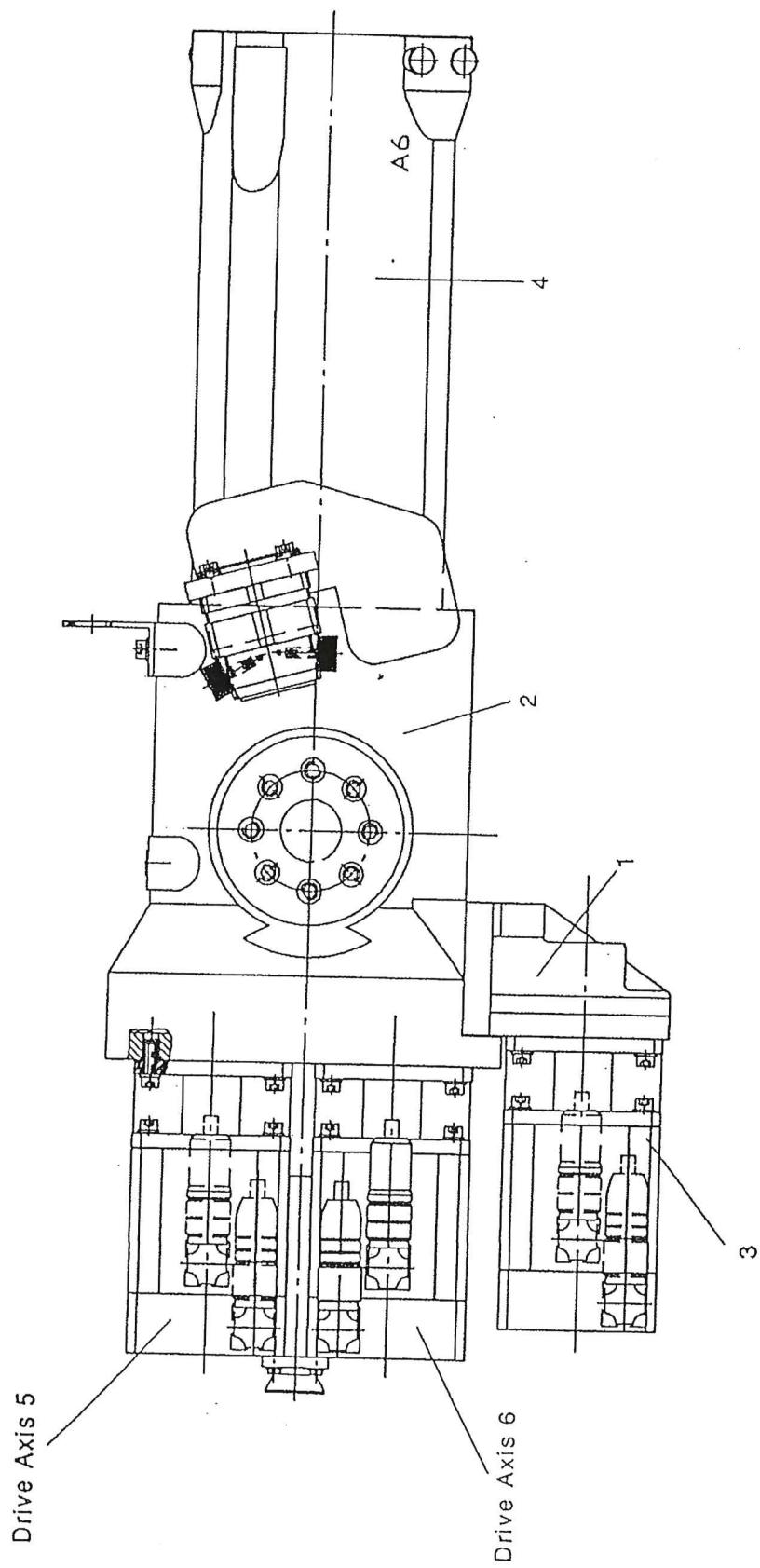
Connection of these devices is ensured via plug connectors.

r e i s

RV6/RV16

DESCRIPTION OF ASSEMBLIES - 5

AXIS 4

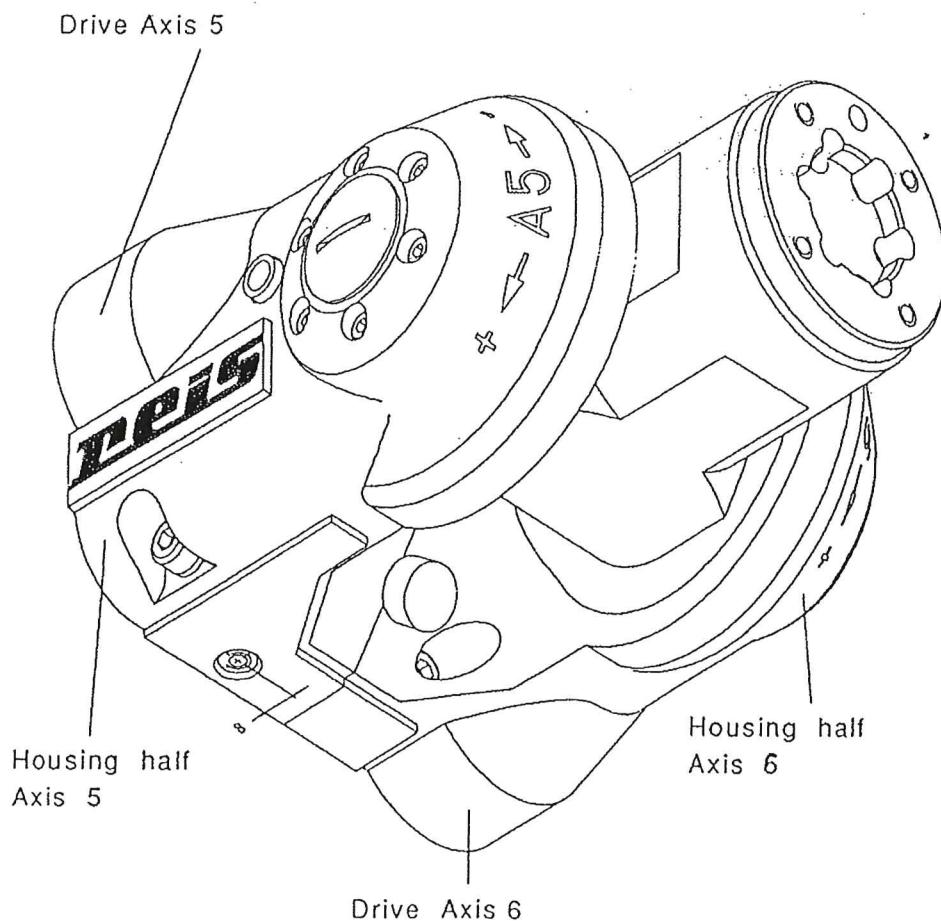


AXES 5 and 6

The AC servomotors (5,6) equipped with brake of the two axes are installed at the rotary flange (4) of axis 4 (see illus. on page 5-7).

The absolute path measuring system is integrated in the motor.

Via clutch shafts in the rotary flange of axis 4 the rotation movement of the drive motors is transferred to the modular adapted head axis (see illus.).



MAINTENANCE INSTRUCTIONS

In order to achieve a long durability of the machine, regular attendance and maintenance works are indispensable.

Switch off the complete unit for all works at the machine or at the peripheral equipment in order to avoid any danger for both man and machine.



All safety sheets and covers may only be removed for maintenance purposes and have to be mounted correctly and completely prior to new start-up.

ATTENTION

Warning and indication plates as well as coloured markings of danger areas must be clearly visible and have to be cleaned or replaced if necessary !

Warranty becomes void if the items mentioned in this chapter are not observed.

Observe safety instructions mentioned in chapter 2 !



PNEUMATICS

Filter and water separator of the maintenance unit

We recommend a weekly check of the air filter and draining of the water separator. The filter element should be exchanged every 6 months (for 2-shift operation).

For draining of the water separator the drain screw at the filter cup has to be untightened. The condensate is blown off under pressure. **ATTENTION!**

If the filter element is to be changed, the air pressure has to be switched off. Then, the filter cup can be taken off downwards.

Cleaning of the filter element is not recommended. Cleaning of the filter cup however, must be made with water only. **ATTENTION!**

Oiler of the maintenance unit:

The oil level has to be checked weekly. If oil level is at minimum, air pressure has to be switched off, unit has to be evacuated and oil has to be filled up.

For cleaning of the oiler cup water must be used only. **ATTENTION!**

Adjustment of the drop quantity

The drop quantity is regulated at the setscrew and can be seen at the drop sight glass. The dropper should be adjusted so that in automatic operation approx. 1 drop per minute can be seen.

We recommend the following oil brands as lubricants:

Avia Avilub RSL 10
BP Energol HLP 10
Esso Spinozzo 10
Shell Tellus Oil C 10
Mobil DTE 21

Sound absorbers at pneumatic valves

Contaminated pores of the sound absorbers reduce the operating speed of the valves.

In this case, the sound absorbers have to be exchanged. Cleaning is not recommended.

Dirt in the control cabinet affects the durability of the electric components and jeopardizes the operating safety. The max. hygroscopic moisture must not exceed 75 %. Always keep closed control cabinet and distribution boxes.

Control cabinet with filter fan (basic design)

Admissible ambient temperature: 0°C up to +45°C. Regular cleaning of the filter mats is required resp. replacement in case of heavy contamination. In case of extremely fine dust below 10 micrometer a fine filter mat has to be used.

Control cabinet with heat exchanger

Admissible ambient temperature: 0°C up to +45°C. The heat exchanger is almost maintenance-free. The components of the exterior air circulation can be cleaned with compressed air from time to time, depending on the degree of contamination.

Prior to maintenance works the heat exchanger has to be disconnected from the mains supply so that voltage is off. Observe the protective conductor connection !

Control cabinet with cooling unit

Admissible ambient temperature: 0°C up to +55°C. The cooling unit works with freezing mixture free from CFC and is almost maintenance-free.

Detailed information concerning a.m. components:
For documentation of the manufacturer of the components please see control cabinet !

r e i s

RV6/RV16

MAINTENANCE - 6

LUBRICATION INSTRUCTIONS

For arrangement of lube points please see page 6-6.

ADDITIONAL REMARKS

Axes 1, 2 and 3

Axis bearing: see lube points 1, 2 and 3
The gear units of the axes are greased for life.

Axis 3 - toothed belt

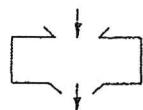
With regard to damage or wear the condition of the toothed belt has to be checked every 2000 service hours when checking the belt tension.

Axes 5 and 6

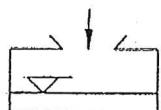
Spindle bearing of the head axes: see lube points 4 and 5.
The gear unit of the axes 5 and 6 is lubricated with the bearing grease.

LUBRICATION INSTRUCTIONS

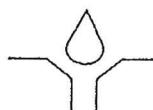
Explication of symbols



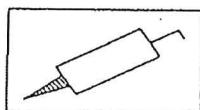
oil change



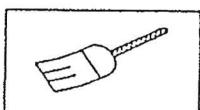
check and fillup if required



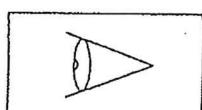
oiling



regreasing with grease gun



apply lubricant with brush



visual check

(2)

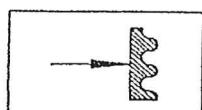
lube point (e.g. No. 2)



visible lube point

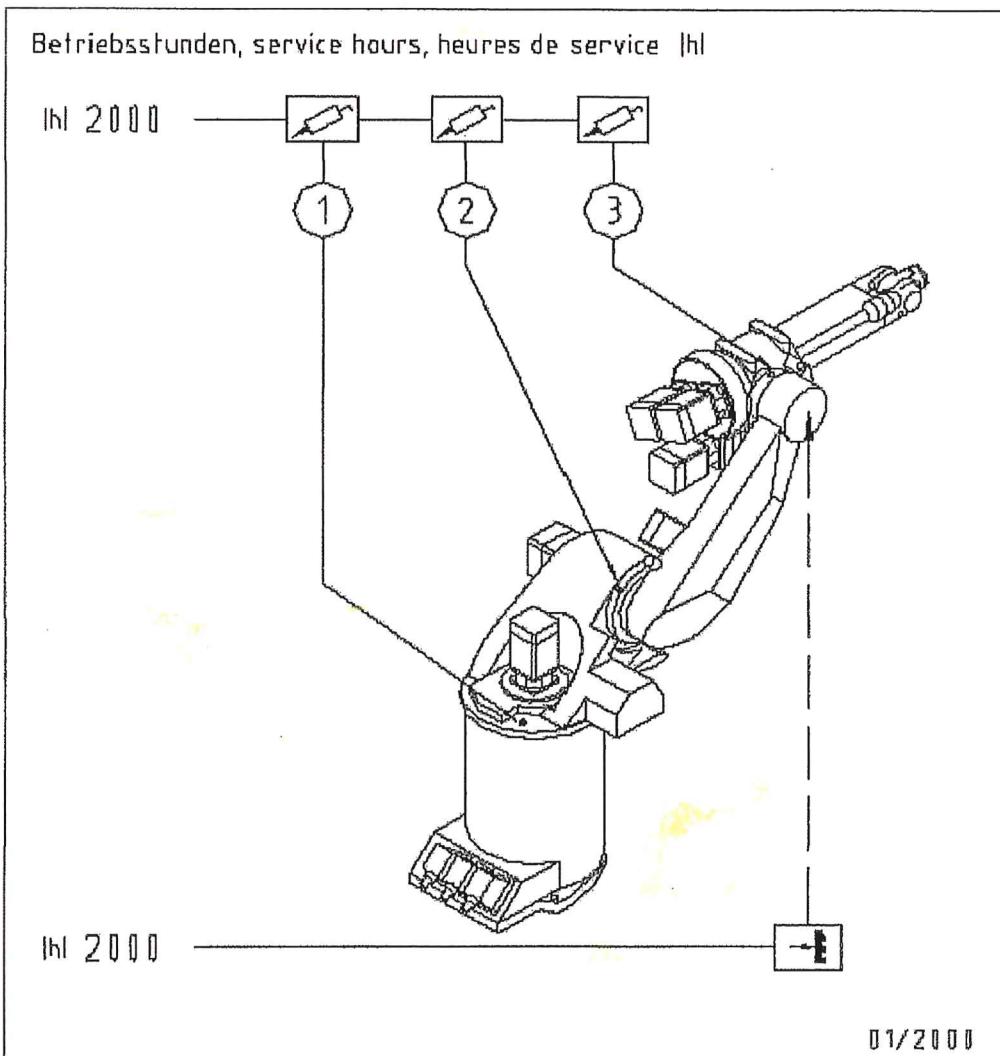


covered lube point



check belt tension and retighten if necessary

LUBRICATION INSTRUCTIONS



SRAM BUFFERING

Battery exchange - intervals and procedure

Valid for ROBOTstar II/III/IV

The SRAMs are buffered by means of a lithium battery which is installed in a battery holder at the VME rack.

Data of the lithium battery:

Manufacturer:	Sonnenschein
Type:	SL-780
Capacity:	13.5 Ah
Nominal voltage:	3.6 V
Duration:	10 a

Table: Current consumption and buffering time

VME board Type	function	current consumption typical	min.	buffering time days	years
CPU23 XS/XB	CPU RSIV	0.06 mA	0.3 mA	1875 d	5 a
SRAM 7	MEM RSIV	0.01 mA	0.15 mA	-	10 a
ELTEC SAC	CPU RSII/III	0.02 mA	0.3 mA	1875 d	5 a
RARO	MEM RSII/III	0.02 mA	0.3 mA	1875 d	5 a

Robots	Axis	Components	Relubrica tion point	Relubricatio n quantity	Lubrication interval	Lubricant Id.No.	First lubrication quantity	Remarks
RV6	1	Gear unit	none	none	Durability	Harmonic Drive SK1A 1868018	300 cm ³	Fill toothing of the gear unit and the grooved ball bearing of the Wave Generator. grease cable in cable duct with Shell Retinax LX2 Id.No. 2454058
		bearing	①	10 cm ³	2000 h	Harmonic Drive SK1A 1868018	30 cm ³	turn A1 slowly during greasing
RV16	2	Gear unit	none	none	Durability	Harmonic Drive SK1A 1868018	350 cm ³	Fill toothing of the gear unit and the grooved ball bearing of the Wave Generator.
		Bearing	②	10 cm ³	2000 h	Harmonic Drive SK1A 1868018	25 cm ³	turn A2 slowly during greasing
	3	Gear unit	none	none	Durability	Harmonic Drive SK1A 1868018	170 cm ³	Fill toothing of the gear unit and the grooved ball bearing of the Wave Generator.
		Bearing	③	10 cm ³	2000 h	Harmonic Drive SK1A 1868018	20 cm ³	turn A3 slowly during greasing
	4	gear unit and bearing	none	none	Durability	Shell Alvania EP1 1512715	290 cm ³	grease cable in cable duct with Shell Retinax LX2 Id.No. 2454058
	5	gear unit and bearing	none	none	Durability	Shell Alvania EP1 1512715	RV6: 130 cm ³ RV16: 260+20 = 280 cm ³	RV16: observe the gear stage in the motor flange
	6	gear unit and bearing	none	none	Durability	Shell Alvania EP1 1512715	RV6: 130 cm ³ RV16: 260+20 = 280 cm ³	RV16: observe the gear stage in the motor flange

Attention: Clean all lube points prior to lubrication!

It is strictly forbidden to use molybdenum disulfide (MoS₂) as lubricant

Absolutely observe the instructions in the safety data sheet

all lubricants can be purchased from Reis Robotics under the indicated Id. No.

SRAM BUFFERING

Calculation of the recommended battery exchange interval

$$\text{buffering time/ interval [days]} = \frac{13500 \text{ [mA]}}{\text{Imax [mA]} * 24}$$

Imax: addition of the max. current consumption according to
the above table for each board used in the VME rack.
unit: [mA] - [milliampere]

Procedure for battery exchange

1. Switch on the control at the main switch
2. Back-up the data and programs
- on disk or via DNC interface
3. Keep switched on the supply voltage of the control during
battery exchange !

Remove the old battery from the battery holder and insert a new one.

CLEANING

For cleaning of the installation do not use any compressed air or high-pressure /steam jet cleaning apparatus and avoid penetration of washing agents into the bearings, sealings, motors, and other electric components. Dirt or detergents may impair the functioning of the machine or cause damage of the components concerned.

Clean lines, tubes, and plastic parts with solvent-free detergents only.

For cleaning use a rag soaked with detergent and observe the instructions given by the detergent manufacturer.

Choose the cleaning intervals adapted to the ambient conditions of the installation site.

GENERAL REMARKS

Technical data and dimensions mentioned in this chapter are standard dimensions only. Customer-specific adaptations of the machine have not been taken into consideration.

The data and dimensions of the delivered machine are indicated on the installation plan and the machine card.

Max. ambient temperatures of the machine
(without control cabinet):

In operation: 0°C (273 K) up to +45°C (318 K)

For transport
and storage: -40°C (233 K) up to +60°C (333 K)

Utilization in other temperature ranges on request.

Max. ambient temperatures of the control cabinet:

See operating manual of the robot, chapter "Maintenance".

NOISE EMISSION

Kind: Robot

Noise measurements
acc. to DIN 45635 part 1

Uncertainty in measurement 3 dB

Emission value at the
workshop LpA < 70 dB(A)
(without accessory)

Used measuring unit: sound level meter
Brüel & Kjaer
Type 2231
class of accuracy 1