

General installation and operating instruction

- Planetary gears
- Hydraulic motors and hydraulic gear motors
- Locking brakes and return stops
- Add-on components

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Contract Nr. MB-06.1310

Applied directives:
2006/42/EC „Machinery“

Applied standards:
EN 62079:2001 – Preparation of instructions
EN 12100-1:2004 and EN 12100-2:2004 – Safety of machinery

In case of conflict, the german original of this instruction is prevailing

SAFETY INSTRUCTIONS

This installation instruction contains hints for your personal safety and useful tips to avoid damages, which you have to follow up. These hints are marked by warning triangles and represent the following grades of hazard:



DANGER!
 Serious injuries and death and considerable damages **will occur** in case the corresponding precautions are not met.



WARNING!
 Serious injuries and death and considerable damages **can occur** in case the corresponding precautions are not met.



CAUTION!
 Smaller injuries or damages can occur in case the corresponding precautions are not met.



HINT!
 This sign draws your attention to important information about the product, its handling or to a particular section of the documentation.

Qualified personnel

Only qualified personnel are authorized to install the equipment. Qualified personnel - with regard to the safety instructions of this document - are persons, which are educated and trained in the use of the system.

To be observed:

The manufacturer cannot be claimed guilty in case of accidents or damages because of disregard of safety instructions, of improper actions or a use, which is not according to the regulations.



WARNING!
 Partly completed machineries must only be used for the provided scopes as defined in the technical description and only in combination with the Rollstar authorized resp. recommended components or foreign equipment.

 A satisfactory and safe operation of the product presupposes an appropriate transport, storage, setup and installation.

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Passing on to others or copying of this document or using or transmission of its content is not permitted if not explicitly admitted. Contraventions are liable for indemnification.

Nonliability

We have audited the content of this document regarding the correspondence with the described hardware. However deviations cannot be excluded. For a full agreement we do at assume responsibility. All information in this document are checked regularly, necessary corrections are incorporated in the following issues.
 We express our gratitude for suggestions for improvements.

Rollstar AG
 CH-5704 Egliwil

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PREFACE / IMPORTANT HINTS

Scope of this installation instruction This instruction is to support you during the installation of partly completed machineries of ROLLSTAR AG.

Selection of aggregate and construction Design, installation and startup of ROLLSTAR – aggregates demand total dediction of trained experts.

Readership This installation instruction is directed to project managers, engineers and mechanics, wich are entrusted with the planning, execution and installation of partly completed machineries within the scope of complete machines.

Obligation to inform The installation and maintenance personnel must keep this installation instruction and the applicable regulation in a place that is easily accesible.



HINT!
In addition to the installation instruction, the general and obliging accident prevention regulations must be observed and assigned.

Extent of validity of this instruction This installation instruction applies to all gears, hydraulic motors, hydraulic gear motors, locking brakes and return stops and also to further add-om components according to the type-key in chapter 2.



HINT!
In case of change of function of the equipment without approval by ROLLSTAR AG, guarantee and liability expire.

Obligation of the operator The operator is obliged, to run the partly completed machinery in perfect operating condition. Areas of hazard, existing between ROLLSTAR AG partly completed machineries and the operator must protect customer provided installations.

This installation instruction must be read carefully until its end. In case of vagueness, please contact us immediately. Do not start operation of the equipment as long as vaguenesses exists. Starting up the equipment means, that you have read and understood this instruction manual.

DANGER!
If the partly completed machine is improper operated or used in incorrect condition, accidents can occur.

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1 Introduction

This installation instruction is issued for a reliable installation of the ROLLSTAR products. If you observe the following hints, the equipment will operate to your full satisfaction and reach a large service life. ROLLSTAR machines work safe, provided they are correctly selected, installed and maintained. Appropriate safeguards must be provided for all driven machines to ensure safety. Therefore it is absolutely essential that the following list of hazards is read completely, understood and observed.

This installation instruction is specially compiled for those groups of persons, which are assigned to install, dismount, start-up, operate and maintain the equipment. Only by observing the information as given by this instruction, a troublefree operation can be achieved. Ignoring of given instructions, mainly the chapter „safety“, the equipment is a source of danger for operating and maintenance personnel. Also equipment damages can occur and surrounding installations are endangered.

2 Use according to the regulations

The ROLLSTAR machines are to convert electrical, hydraulic or mechanical energy into a rotating motion. The planetary gear is used either to increase or to decrease the torque at the power take-off.

Any other use is not according to the regulations and hence forbidden.



DANGER!

- ROLLSTAR-products must be operated outside of explosion hazard areas!
- The operator must clarify the explosion hazard of the entire installation.



HINT!

In the case of accidents or damages, caused because of ignoring the safety instructions and because of improper actions or because of use not according to the regulations, the manufacturer refuse to accept liability with regard to operational dependability and harms to personnel.

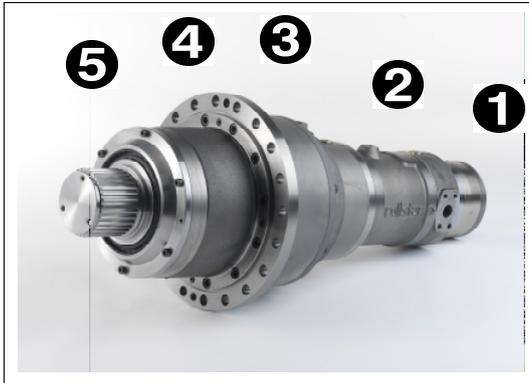
2.1 EC – Conformity of the ROLLSTAR-equipment

The equipment is designed, built and tested according to directive 98/37/EC respectively according to the amendment directive 2006/42/EC “Machinery“

In addition to the aforesaid directives and EN standards, the Swiss Safety and Accident Prevention Regulations were observed. As part of delivery of all ROLLSTAR products, the EC declaration for Installation 2006/42/EC, annex IIB is issued.

2.2 Description of the system components

The system components of the ROLLSTAR equipment are shown in illustration 1. This illustration in its details serves as common information and does not represent a customer made design or execution.



Caption of illustration 1:

Pos.

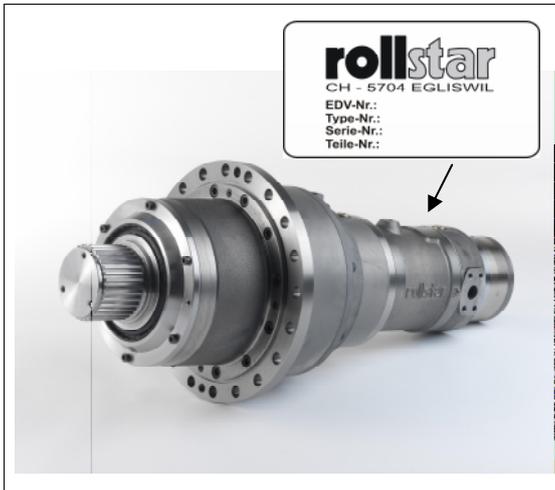
- 1 Locking brake, return stop, speedo, etc.
- 2 Drive (Hydraulic motor, Electric motor, etc.)
- 3 Gear, (Planetary gear, pick-off gear, etc).
- 4 Fixing
- 5 Output (shaft, hub, etc.)

Illustration. 1: System components

2.3 Nameplate

Besides the unmistakable identification of the machine, the nameplate contains, as required by the directives, the year of construction.

It is mounted on an accessible place of the machine. The nameplate does not show the CE mark because the ROLLSTAR equipment is considered as a partly completed machine according to regulation 2006/42/EC annex IIB.



Caption of illustration 2: Nameplate

EDV-Nr.	Rollstar part number
Type-Nr.	Type code according Rollstar product-catalogue
Serie-Nr.	Consecutive number with year of construction

Illustration 2: Nameplate

2.4 Product data

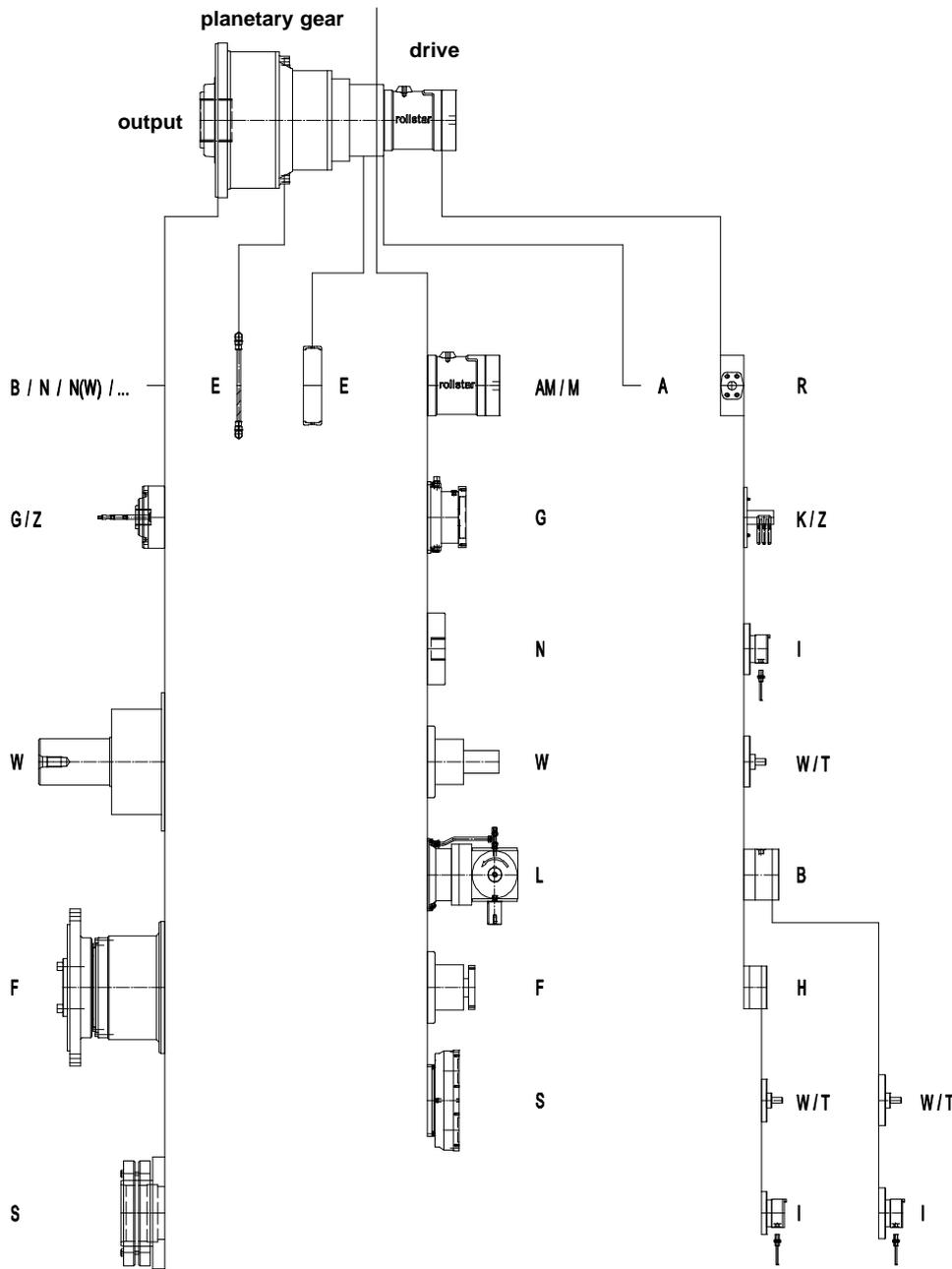
All data with regard to features of performance, capacity, loading capacity as well as special requirements regarding space are given in attached binding dimensional drawing and in our order confirmation.



HINT!

- For maintenance purposes, arrange for sufficient space around the equipment.

2.5 Type designation



	General
A	Sealed between motor and gear
D	Hollow shaft, continuous
E	Special design: E.g. cooling, oil level indicator etc.
F	Flange
FV	Flange, reinforced
W	Shaft
WV	Shaft reinforced
WP	Shaft feather key
WVP	Shaft feather key reinforced
WZ	Shaft toothed
WVZ	Shaft toothed reinforced

	Drive specific
AM / M	Hydraulic motor Rollstar Type AM, Type M
B	Brake
G	Mounting foreign motor
H	Return stop
I	Impulse generator incl. case
K / Z	Manual or hydraulic gear shift
L	Mounting angular gear
N	Hub
NP	Hub feather key
NZ	Hub toothed
R	Oil hook-up radial
	Oil hook-up axial
S	Mounting spur gear / pick-off gear
T	Second shaft end for tachogenerator

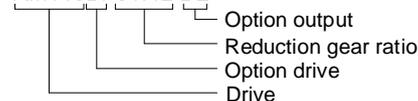
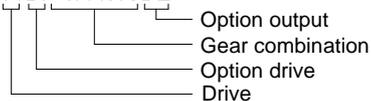
	Output specific
B	Special fastening flange
G / Z	Manual or hydraulic gear shift
N	Hub special design, suitable for shaft fastening
N(W)	Hub special design, suitable for shaft fastening
S	Shrink disc coupling

Coding sample part no.

Coding sample type

11BI34.41.69BE

AM110BI-51.42 BE



Specification according catalogue

2.6 Scope of supply

Before you start unpacking and installing the ROLLSTAR equipment, make sure that the scope of supply coincides with the delivery note.

The most important element of this installation instruction is the dimensional drawing and the order confirmation, which are binding for the equipment to assure a safe operation of the ROLLSTAR equipment and which contain all customer related information with regard to layout, technical data and possible special features.

2.7 Transportation and installation hints

2.7.1 Delivery

Normal transport: The equipment is properly packed according to the instructions of the shipping agent
 Shipment by sea: and complies with the regulations of the country of the consignee.
 Airfreight:

2.7.2 Condition of delivered goods

Prior to shipment ROLLSTAR equipment is tested for tightness. Hydraulic motors are tested under different operation conditions. The test results are recorded. Hence all machines are delivered ready for use, however because of safety reasons without oil filling. Machines are primed (color similar to RAL 6019 green). Internal parts and blank external parts are covered with a conservation agent. If desired, the machines can be preserved for a longer period.

2.7.3 Transport

The shipment of ROLLSTAR – units across long distances has basically to be carried out in horizontal position, independently of the means of transportation! Without consultation with the manufacturer, vibrations, impacts, centrifugal forces and accelerations do not have to overstep ± 2 g. The CTU-packing directives have to be applied. Before transporting the machine, observe the danger signs.



DANGER!
 The driver of the fork list must be authorized to operate the same.
 Before lifting of the good, all persons within the range of the fork list must leave.
 Move the fork between the longitudinal guides of the wooden pallet.



CAUTION!

- Lifting heavy objects can cause muscle stress and backache. Use appropriate appliances and a correct technique when lifting the equipment.
- Heavy loads can drop and cause serious injuries!
- The personnel must wear safety shoes.



HINT!

- Transport the ROLLSTAR equipment carefully and take care of transport fasteners, which can cause surface damages.
- Use appropriate lifting equipment.

2.7.4 Unpacking

- Carefully remove all packing and possible fasteners.
- Inspect equipment for visible damages.



HINT!

- Check the delivery for completeness with the help of the enclosed bill of delivery. (In case of incomplete delivery, please contact our customer service)
- Damages, caused because of inadequate packing or during transportation must be reported without delay to our customer service, to the shipping agent and to the shipping insurance company.



CAUTION!

- Heavy object: can cause muscle stress and backache. Use appropriate appliances and a correct technique when lifting the equipment
- Before installation and after desmounting, store the object in a safe and stable position.

2.7.5 Positioning

Because this partly completed machine cannot be used as it is, a specific working position cannot be assigned.



HINT!

- Fixing sufficient
- Protection guard of revolving parts

2.7.6 Storage

If the equipment is stored for a period over 6 months before installation or startup, you must consult ROLLSTAR regarding special conservation measures. In order to avoid damages, the equipment must be stored in a covered area, protected against atmospheric influences like dirt, dust, humidity, chemical agents and excessive warmup and also against mechanical damages. The relative humidity must not exceed 70%. The admissible storage temperature is between -20°C and $+40^{\circ}\text{C}$. External parts must be treated with a conservation agent. Conservation agents on internal parts must not be removed before startup.

3 Installation

3.1 Installation



DANGER!

- No modifications, additions or alterations are permitted, which can lessen the safety or function of the equipment, otherwise the EC conformity expires.
- It is prohibited to perform any kind of welding to the gear!



HINT!

- Qualified personnel must execute the installation only. Qualified personnel with regard to this instruction and safety advice are persons, which are trained and familiar with the system.
- Before starting with the work, the personnel must have read and understood the installation instruction and the applicable safety measures as well.

If the installation position is not horizontal, it is essential to contact ROLLSTAR for the purpose of suitability, recommendation of installation and oil filling.

3.2 Output

Standard drives and output shafts respectively toothed hubs are only designed to transmit torques. No radial forces are permitted. Drives and output shafts which are mounted into the toothed hub of the hydraulic motor or planetary gear must have an axial clearance of 3 – 5 mm to avoid a possible axial pressure caused during installation or because of inaccuracy during fabrication.

3.3 Fixing

For fixing of Rollstar equipment use bolts of 12.9 quality only and tighten them with the specified torque. At shocklike or reversing operation, the mounting flange must be additionally secured with a pin against the counterpart or close tolerance bolts must be provided.

3.4 Piping, manifolds

The installation of the manifolds must be performed meticulously. Whenever possible bend steel pipes in cold condition. Welded pipes must be cleaned internally, pickled and rinsed afterwards. Size the pipe section adequately to maintain a low flow loss. Special attention must be paid to angular screw fittings.

3.5 Sense of rotation

The sense of rotation of the hydraulic motor and the planetary gear is, as you like. The sense of rotation depends on the oil hook-up of the high-pressure side. See dimensional drawing. The planetary gear does not change the sense of rotation, to say; incoming sense of rotation is equal to outgoing sense of rotation.

4 Operation

4.1 Start-up restriction



HINT!

- The start-up is forbidden until the complete installation including all auxiliaries are installed and connected and tested and until the personnel is instructed and until the safety commissioner has given his authorization.

4.2 Start-up

Before start-up observe the installation and operation instructions. Check the oil filling. After start-up, at first, operate the hydraulic motor, the planetary gear respectively the hydraulic gear motor under idle load and slowly increase the load whilst observing the temperature.



DANGER!

- Do not touch the surfaces of the ROLLSTAR machine during operation. High surface temperatures may occur which lead to burnings.

5 Maintenance / Lubrication / Cleaning



HINT!

- Only such repair und maintenance works are permitted, which are described in this manual. All other works must be authorized by ROLLSTAR.
- See appendix E: Lubrication instructions!

6 Spare parts, customer service

In order to maintain a troublefree function, only original ROLLSTAR spare parts must be used as long as such parts are standard machine parts, which are available in the market.

Our liability expires if foreign, copied or non-authorized parts are used.

Direct your queries and requests / orders for spare parts directly to our customer service department and always mention the contract number, type and ROLLSTAR EDV number. (See nameplate)

<p>Manufacturer's CUSTOMER SERVICE</p>	<p>ROLLSTAR AG Schlattweg 2 CH 5704 Egliswil / Switzerland</p>
	<p>Phone: +41 (0) 62 769 80 40</p>
	<p>Fax.: +41 (0) 62 769 80 41</p>
	<p>e-mail info@rollstar.com</p>

7 Operating instructions

For the operation, maintenance, repairs, lubrication and cleaning we recommend to prepare operating instructions and to enclose them to this installation instruction. These instructions simplify repeated procedures, reduce the risk of operating errors and are valuable instruments for training of new personnel.

8 Waste management



HINT!

- Follow local disposal instructions!
- Prior to disposal, remove hazardous residuals from parts.
- Metal parts are disposed off at metal collection centers
- Plastic parts are disposed off at plastic collection centers.
- Other parts and parts of non-metallic or organic origin must be disposed off at special collection centers. Handle waste disposals carefully or contract a waste disposal company. The disposal of lubricants requires special care.
- When disposing off by yourselves, follow the EC directives as listed hereafter (a selection):

Directive 2000/76/EC	Incineration of waste,
Directive 94/904/EC	List of hazardous waste,
Directive 94/67/EC	Incineration of hazardous waste,
Directive 75/439/EEC	Waste oil elimination.

9 Disturbances, operating problems, error identification and elimination

Disturbances are eliminated by professionals only, which are trained by the manufacturer of the equipment. These professional personnel for ROLLSTAR equipment belong to the inhouse service staff of the plant.

10 Guarantee

Guarantee ends at the date as spelled out in the order confirmation. Replacement of spare and wearparts are excluded from guarantee.

We ensure the availability of identical spare parts over a period of **10 years**, counting from date of delivery.

ROLLSTAR AG assumes guarantee for the suitability of the equipment only, if all technological requirements were disclosed prior to fabrication.

Repair and maintenance works during the guarantee period by our specialists only or upon our written agreement.

APPENDIX A:

Additional requirements for ROLLSTAR - GEARS

1 Introduction

According to the general installation and operation instructions.

2 Use according to the regulations

According to the general installation and operation instructions.

3 Installation

According to the general installation and operation instructions.

4 Operation

Prior to start-up, check operation mode. Open flames and smoking in the surroundings of the planetary gear is prohibited. Possible oil mist or oil leaks can catch fire. Protection devices to avoid accidents must cover accessible rotating parts. All manifolds and fittings must be connected according to the dimensional drawing and must be checked daily for tightness. An oil leak resp. insufficient lubrication of the planetary gear will cause damage to the motor and gear. At larger capacities the oil temperature must be monitored. Exceeding of the max. admissible limits, as laid down in the technical installation data, can lead to serious accidents.

5 Maintenance / Lubrication / Cleaning

Maintenance personnel must wear protection gear; possible occurring oil mist must not be inhaled. Refer to general installation and operating instruction appendix E.

6 Spare parts, Customer service

According to the general installation and operation instructions.

7 Operating instructions

According to the general installation and operation instructions.

8 Waste management

According to the general installation and operation instructions.

9 Disturbances, operating problems, error identification and elimination

According to the general installation and operation instructions.

10 Guarantee

According to the general installation and operation instructions.

APPENDIX B:

Additional requirements for ROLLSTAR – Hydraulic motors and hydraulic gear motors

1 Introduction

According to the general installation and operation instructions.

2 Use according to the regulations

According to the general installation and operation instructions.

3 Installation

The leak-oil hook-up is always at the highest point of the hydraulic motor resp. the hydraulic gear motor to assure a satisfactory lubrication of all moving parts. Prior to start-up, the equipment must be filled with hydraulic oil through the leak-oil connection to prevent a dry run during operation. With regards to a long service life of the shaftseal, the leak-oil must flow back to the oiltank without pressure, to say: the pressure at the leak-oil connection must not exceed 1 bar. When a filter is used in the return manifold, the pipe diameter must be oversized to avoid the build-up of banking-up pressure. Therefore the leak-oil manifolds must not be connected to the return-manifold because pressure peaks in the leak-oil manifolds cannot be controlled then. Avoid a high banking-up pressure at low outside temperatures and also avoid long leak-oil manifolds. If open circuits are used, make sure that there is no motor cavitation at all operating conditions. In this case, the filling pressure of the hydraulic motor must be at least 8 bars. Closed circuits require a flush valve. Our hydraulic motors are not very suitable for an operation in series and we recommend to backcheck with the manufacturer.

4 Operation

According to the general installation and operation instructions.

5 Maintenance / Lubrication / Cleaning

For hydraulic motors and hydraulic gear motors see Annex E.

6 Spare parts, Customer service

According to the general installation and operation instructions.

7 Operating instructions

According to the general installation and operation instructions.

8 Waste management

According to the general installation and operation instructions.

9 Disturbances, operating problems, error identification and elimination

According to the general installation and operation instructions.

10 Guarantee

According to the general installation and operation instructions.

APPENDIX C:

Additional requirements for ROLLSTAR – Locking brakes and return stops

1 Introduction

According to the general installation and operation instructions.

2 Use according to the regulations

Rollstar brakes are designed as brakes to hold during standstill only but not to brake moving masses. To ensure full braking moment you have to assure, that the return flow manifold of the brake is pressureless. Return stops are used to prevent a change of the sense of rotation of the planetary gear.

3 Installation

Because machine elements are used this can accumulate mechanical energies (Pressure springs, hydraulic liquids etc.), make sure, that eventually accumulated energies are not discharged during installation, which could cause accidents.

4 Operation

Prior to startup, check operation mode under idle load condition. Exceeding of the max. admissible limits, as laid down in the technical installation data, can lead to serious accidents.

5 Maintenance / Lubrication / Cleaning

Because safety relevant components are used, their function must be tested under idle load condition weekly. Whenever a defect is detected or wearing is evident, immediately inform the plant operator, clarify whether the installation can remain in operation and contact the manufacturer of the equipment.

6 Spare parts, Customer service

According to the general installation and operation instructions.

7 Operating instructions

According to the general installation and operation instructions.

8 Waste management

According to the general installation and operation instructions.

9 Disturbances, operating problems, error identification and elimination

According to the general installation and operation instructions.

10 Guarantee

According to the general installation and operation instructions.

APPENDIX D:

Additional requirements for ROLLSTAR – Add-on components

1 Introduction

Add-on components are elements, which can be added as an option to Rollstar planetary gears, hydraulic gear motors, hydraulic motors, brakes, return stops etc. Components are added in case an additional function is required.

2 Use according to the regulations**2.1 Water-cooling**

Rollstar water-cooling serves to remove heat from Rollstar planetary gears, which is generated at high capacities.

2.2 Sensor

Sensors are used to control specified components or to meter velocities, e.g. number of revolutions of shafts or status of the brake circuit (open or closed, brake in action or not).

2.3 Cardan joint

Cardan joints are used to transmit a torque from one shaft to an other shaft. With it it is possible to transmit torques angularly.

2.4 Angular gear

Angular gears are used to transmit a torque from one shaft to an other shaft. With it it is possible to transmit torques angularly.

2.5 Oil level indicator

The oil level indicator is used to visualize the oil level of the Rollstar planetary gear or hydrogarmotor. The indicator must not be used as handle or object to step on. It is not designed for this purpose and accidents can be the consequence.

2.6 Shrink disk coupling

Shring disk couplings are used to transmit the torque by positive locking.

3 Installation**3.1 Water-cooling**

Up to now (1-piece): the surface of the gear must be clean and without painting. During installation the gaskets should not be damaged.

New (2-pieces): the surface of the gear must be clean. During installation the gaskets should not be damaged.

Wear adequate protection gear. Dropping parts may cause injuries.

Cooling water inlet and outlet can be connected, as you like.

The temperature and quantity of cooling water depend on the specific type of equipment and is defined on the corresponding dimensional drawing of the gear.

Before start-up of the installation, fill up the cooling circuit and and if the need arises, vent the system.

The admissible water pressure in the cooling jacket is limited to 16 bars.

Carry out a water analysis before using the cooling system. The cooling water must comply with special requirements. It must not cause furring or sedimentation on the cooling surfaces. Its hardness should not exceed 10°dH (german grade). Furring in cooling chambers drastically reduces cooling efficiency. On the other hand, too soft cooling water attacks pipes and cooling surfaces. Cooling water must be free of manganese and iron, which cause clogging-up of pipes. The content of organic matter must be kept low to avoid sludge deposits on the cooling surfaces.

Open cooling circuits are exposed to contamination. Preference is given to closed circuits!

Exceeding the admissible standard values, a treatment of the water is necessary.

Contracting a specialist in water treatment offers the following advantages:

- Reduction of stop periods
- Minimization of energy and water costs
- Optimization of operating safety

Characteristics	Standard values
pH-value	6.5 ... 9
Water hardness [°dH]	<10
Matter in suspension [ppm]	<30
Filter mesh [micrometer]	<100

Remaining specification according to DIN 50930

Relation of matter in suspension to hardness: The smaller the amount of matter in suspension, the higher the hardness grade.

At shut down and standstill of the machine and subsequently no cooling water flow, the content of matter in suspension in the cooling water should be kept very low → Optimum < 10ppm

This is necessary because the suspended matter at standstill reacts with the ions and particles, e.g. calcium carbonate, like an absorbent. Ions and particles settle at the suspended matter, grew in size and can block the flow of the cooling system. Recommended as well is the addition of a corrosion inhibitor to the cooling water.

3.2 Sensor

According to the installation and operation instructions of the relevant supplier.

3.3 Cardan joint

According to the installation and operation instructions of the relevant supplier.

3.4 Angular gear

According to the installation and operation instructions of the relevant supplier.

3.5 Oil level indicator

Do not damage gaskets and hoses during installation.

3.6 Shrink disk coupling

According to the installation and operation instructions of the relevant supplier.

4 Operation

The integration of components e.g. sensors or water-cooling into the process control system is not provided by Rollstar.

4.1 Water cooling

Before start-up check all connections and contact surfaces for tightness and tightening moment. During start-up raise the water pressure slowly up to its operating pressure. (max. admissible 16 bars). Check the water-cooling during operation for tightness every day. A leaking water-cooling can cause water damage with the consequence of an overheating of the components and the installation.

4.2 Sensor

According to the installation and operation instructions of the relevant supplier.

4.3 Cardan joint

According to the installation and operation instructions of the relevant supplier.

4.4 Angular gear

According to the installation and operation instructions of the relevant supplier.

4.5 Oil level indicator

Before start-up check all connections and contact surfaces for tightness and tightening moment because damages during transport and installation cannot be excluded. During operation check the oil level indicator for tightness every day. A leaking oil level indicator can cause damage to the motor and gear. Open flames and smoking close to the oil level indicator are forbidden because oil-mist or oil leaks can catch fire.

4.6 Shrink disk coupling

According to the installation and operation instructions of the relevant supplier.

5 Maintenance / Lubrication / Cleaning

5.1 Water cooling

In order to achieve a constant cooling efficiency at the cooling surfaces, they need to be maintained from time to time

Informative values for a cleaning:

Circuit	Cleaning interval *
Open	>1 year
Closed	>5 years

* These intervals refer to deviations of the admissible limit values of water hardness and suspended matters of the used cooling water and depend on the actual contamination of the cooling chamber and manifolds of the installation.

Indications for inadmissible contamination are: E.g. higher pressure drop and / or warm up at unchanged operating conditions



ATTENTION!

Cleaning agents must not attack the standard material NBR 70 and the installed O-rings.

- Chemical cleaning by authorized and trained personnel only! For protection measures when using such products, consult the corresponding safety data sheets.

Specialists for water treatment

ONDEO Nalco European Operations

2342 BV Oegstgeest

P.O. Box 627, 2300 AP Leiden, The Netherlands

Tel: 31-71-524-1100 • Fax: 31-71-524-1197

In order to ensure a constant cooling capacity of the water-cooling, the surveillance and maintenance of the cooling circuit is indispensable.

The surveillance of the temperature at cooling water inlet as well as the cooling water flow is a key requisit for a troublefree operation.

Of great importance is the surveillance of the temperature of the gear because a malfunction of the water-cooling can be detected and a possible gear damage prevented.

At lower temperatures, mainly at plant standstill, a freeze-up of the water cooling circuit must be avoided.

5.2 Sensor

According to the installation and operation instructions of the relevant supplier.

5.3 Cardan joint

According to the installation and operation instructions of the relevant supplier.

5.4 Angular gear

According to the installation and operation instructions of the relevant supplier.

5.5 Oil level indicator

The oil level indicator is maintenance free if operated according to the instructions. In emergency cases, the oil level indicator can be used to drain the gear but must be cleaned immediately afterwards according chapter 3.5 and remounted.

5.6 Shrink disk coupling

According to the installation and operation instructions of the relevant supplier.

6 Spare parts, Customer service

According to the general installation and operation instructions.

7 Operating instructions

According to the general installation and operation instructions.

8 Waste management

According to the general installation and operation instructions.

9 Disturbances, operating problems, error identification and elimination

According to the general installation and operation instructions.

10 Guarantee

According to the general installation and operation instructions.

APPENDIX E:**Maintenance / Repair / Lubrication / Cleaning****Hydraulic motors and hydraulic gear motors****General maintenance instructions**

All maintenance and repair work must be performed with care and by properly trained personnel only. The safe operation and service life of components are dependent on correct maintenance. The operator is responsible for ensuring that an up-to-date safety data sheet is available for the lubricant used and that the measures specified in are taken. This data sheet does not release the operator from responsibility for checking the conformity and suitability of the lubricant for his particular system. He must ensure that the lubricant selected meets the minimum requirements of all relevant standards throughout its period of use.

1. Wear protection capacity

Wear protection capacity describes the characteristics enabling lubricants to prevent or minimise component wear. The wear protection capacity is described in DIN 51524-2,-3 through the "FZG rig test" procedures (ISO 14635-1).

2. Material compatibility

The lubricant should not have a negative effect on the materials used in the components. Particular attention must be paid to compatibility with linings, gaskets, hoses, metals and plastics. Compatibility with liquid gaskets and adhesives (Loctite) and with paints (Mäder) must also be clarified.

3. Temperatures

The permitted operating temperature of hydraulic motors and gears in continuous operation is between -10 and +80 °C. High fluid temperatures, in excess of 80 °C, lead to a halving of the fluid's service life for each additional 10 °C increase in temperature and should therefore be avoided. Note that the maximum temperature of the lubricating oil of 100°C should not be exceeded.

4. Demulsibility and water solubility

Demulsibility describes the ability of lubricants to separate from water at a set temperature. ISO 6614 describes the demulsifying characteristics of lubricants.

Contamination by water can cause various problems such as additive consumption, oil oxidation, corrosion, cavitation and a reduction in the lubricant film thickness. By monitoring the water content of the oil, costly damage can be avoided and remedial action taken in good time.

5. Filterability

Filterability describes the characteristics by which a lubricant can be separated from its impurities through the use of a filter. The lubricants used must demonstrate good filterability not only when new but also through their period of use.

6. Filling new systems

The cleanliness classes of hydraulic and gear oils in the delivered state generally do not meet the requirements of our components. When filling, lubricants should be filtered using a suitable filter system in order to minimise solid particle contamination and water in the system.

The oil quantity indicated in the dimensional drawings is a guide value only. The oil quantity should be determined by the dip stick or level indicator.

7. Oil change

Oil changes should basically only be performed with the type of oil used previously. Unless otherwise instructed, the deepest possible point should be used for draining/siphoning off the oil. The oil change should be performed as soon as possible after the gears have been switched off, in order to avoid any settling of solid particles. Should this not be possible, they must be operated briefly again before draining the oil. Oil should as far as possible be drained when warm (approximately 50 °C).

8. Changing the lubricating medium

Mixing oils of various kinds or from different manufacturers is not permitted. When changing to a lubricant with a different designation or switching from mineral oil to synthetic oil or from synthetic oil with a certain base to synthetic oil with another base, the gears must be flushed thoroughly with the new type of oil. Residues left behind must be minimised. We recommend that a performance guarantee is obtained from the manufacturer or supplier of the oil.

9. Maintenance and inspection list

Action	Frequency	Notes
Check oil temperature	Daily	
Check for changes in gear noise	Daily	
Check oil level	Daily	
Check gears for leaks	Weekly	
First oil change after commissioning	After 500 hours of operation	See oil analysis / oil change
Oil analysis	After approximately 500 hours of operations / at least every 12 months	See oil analysis / oil change
Further oil changes	After 2,500 hours of operation / at least every 12 months	See oil analysis / oil change
Clean drain plug	At the same time as oil change	
Clean gear housing	At the same time as oil change	
Check that fastening screws are securely tightened	Monthly	

10. Oil samples

The oil sample must be taken in such a way that it is representative. The sample must be taken within 10 minutes of taking out of operation. This avoids separation or settling to a large extent. It is important when selecting the sampling point that the moved oil is accessible. The sampling point must be cleaned prior to taking the oil sample.

11. Oil analysis

The lubricant must be regularly exchanged or analysed by the lubricant manufacturer or at a certified test laboratory. A reference analysis following commissioning is recommended.

Analyses must provide the following minimum information:

- Viscosity at 40 °C and 100 °C
- Neutralisation number NN (acid number AN)
- Water content (Karl-Fischer method)
- Particulate measurement with evaluation according to ISO 4406 or amount of solid foreign matter with evaluation according to EN 12662
- Elemental analysis (RFA (EDX) / ICP, state test methods)
- Comparison with fresh oil or existing trend analyses
- Assessment / estimation for continued use
- Also recommended: IR spectrum

12. Foaming characteristics

Foam forms due to air bubbles rising to the surface of the lubricant. Any foaming should be eliminated as soon as possible. Normal lubricants contain sufficient anti-foaming agents when new. The ASTM D 892 or ISO DIS 6247 method is used to determine if an oil has a tendency to foam.

13. Air release capacity

Air release capacity is the characteristic allowing an oil to release undissolved air. DIN 51 381 determines the length of time in minutes required to drive out air until a value of 0.2 vol. % of the starting value is achieved. The air release capacity rating is not an indicator of the absolute air content of the oil analysed. It is an indication of the capacity of the oil to release air blown in or dispersed. The actual air content in the oil, which is of an order of magnitude of between 7 and 10 vol.%, depends on the type of base oil and the additives, how long ago the oil was filled, any mixing with other types of substances and structural features of the system.

14. Water solubility

Lubricants should not contain any free water during operation.

15. Subsequent additives

Additives used subsequently such as wear reducers, viscosity improvers or anti-foaming agents may have a negative effect on the performance characteristics of the hydraulic fluid and its compatibility with our components and are not permitted. Rollstar does not accept any liability for damage to its components as a result of subsequent additives.

A tightening of the requirements of this instruction may be indicated by the product data sheets of the individual components.

Where conditions of use are subsequently altered or deviate from the order confirmation, written approval from Rollstar of the lubricant to be used is required.

In the event of guarantee, liability and warranty claims against Rollstar maintenance records and/or the results of fluid analyses must be provided.

A Hydraulic fluids for hydraulic motors and hydraulic gear motors

1. Requirements with regard to hydraulic fluids

Mineral oil-based hydraulic fluids for hydraulic components must meet the minimum requirements of DIN 51524.

The specified limiting values of each of the components used in the hydraulic system, such as viscosity and cleanliness class, must be adhered to by the hydraulic fluid used taking into account the envisaged operating conditions.

2. Air release capacity

Hydraulic fluids contain approximately 7 to 13 vol. % of air in dissolved form (at atmospheric pressure and 50 °C). According to DIN 51524, for the viscosity class ISO VG 46, for example, an air release capacity rating of ≤ 10 minutes is required, 6 minutes is standard, lower values are preferable.

3. Water solubility

Hydraulic fluids should not contain any free water during operation. The tolerable water content for hydraulic fluids is a maximum of 500 ppm.

4. Solid particle contamination and cleanliness classes

Solid particle contamination is the main cause of malfunctions in hydraulic systems.

In general, during operation a minimum cleanliness class of 20/18/15 according to ISO 4406 or better must be maintained with servo valves requiring better cleanliness classes of at least 18/16/13.

In their delivered state hydraulic fluids often do not meet these purity requirements. During operation and in particular when filling careful filtering is necessary to ensure the required cleanliness classes.

Cleanliness requirement for hydraulic fluids:	ISO 4406 cleanliness class
New oil, filtered	Min. 16/14/11
Operation permitted	18/16/13
Oil change or filtration necessary	Max. 20/18/15

5. Viscosity

The permitted viscosity range for complete systems must be determined using the permitted viscosity of all components and must be maintained for each individual component.

a) Rollstar hydraulic motors

We recommend that for optimum efficiency and service life the operating viscosity (at operating temperature) is selected within the optimum range of

$v_{opt} = \text{optimum operating viscosity } 16...36 \text{ mm}^2/\text{s}$

depending on the circuit temperature (closed circuit) or reservoir temperature (open circuit).

Please note the limiting viscosity range

$v_{min} = 10 \text{ mm}^2/\text{s}$ short term ($t < 3 \text{ min}$) at maximum permitted temperature of $t = +100 \text{ °C}$

$v_{max} = 1,000 \text{ mm}^2/\text{s}$ short term ($t < 3 \text{ min}$) at cold start ($p = 30 \text{ bar}$, $n = 800 \text{ min}^{-1}$, $t_{min} = -20 \text{ °C}$).

For starting up without load only. Optimum operating viscosity must be reached within approximately 15 minutes.

Note that the maximum hydraulic fluid temperature of 100 °C must not be exceeded (including locally, e.g. in the bearing area). The temperature in the bearing area is – depending on pressure and speed - up to 20 °C higher than the average leakage oil temperature.

b) Rollstar hydraulic gear motors (hydraulic motors and planetary gears) with gear lubrication by leakage oil

With regard to lubrication of the gears, HLP oils with a minimum viscosity of 40 mm²/s at operating temperature must be used. Additional lubrication of the gears is not necessary.

We recommend that for optimum for efficiency and service life the operating viscosity (at operating temperature) is selected within the optimum range of

$v_{opt} = \text{optimum operating viscosity } 80...150 \text{ mm}^2/\text{s}$

$v_{min} = 30 \text{ mm}^2/\text{s}$ short term ($t < 15 \text{ min}$) at maximum permitted temperature of $t = +100 \text{ °C}$

$v_{max} = 1,000 \text{ mm}^2/\text{s}$ short term ($t < 3 \text{ min}$)

c) Lubrication with gear lubrication by leak-oil and additional flushing

At high ambient temperatures and/or operation under max. continuous pressure and/or maximum permitted continuous rotational speed, additional flushing with hydraulic oil is necessary. The additional flushing oil connection can be found on the hydraulic motor, occasionally also on the first (smallest) planetary stage, with return taking place together with the leakage oil via the leakage oil line.

d) Hydraulic gear motor with separate splash lubrication of the planetary gear

Here the hydraulic motor is sealed separately from the planetary gear, for the hydraulic motor the above section **Rollstar Hydraulic Motor** applies. For the planetary gear the section **Lubricating oils for spur and planetary gears** apply.

6. Approved hydraulic fluids for Rollstar hydraulic motors

Brand	Viscosity DIN ISO3348 at 40°C mm ² /S (cSt)			
	ISO VG 22	ISO VG 32	ISO VG 46	ISO VG 68
ARAL	Vitam GF 22	Vitam GF 32	Vitam GF 46	Vitam GF 68
BP	Energol HLP-HM 22	Energol HLP-HM 32	Energol HLP-HM 46	Energol HLP-HM 68
CASTROL	HYSPIN AWS 22	HYSPIN AWS 32	HYSPIN AWS 46	HYSPIN AWS 68
ESSO	NUTO H 22	NUTO H 32	NUTO H 46	NUTO H 68
FUCHS	RENOLIN MR5 VG 22	RENOLIN MR10 VG 32	RENOLIN MR15 VG 46	RENOLIN MR20 VG 68
MOBIL	DTE Excel 22	DTE Excel 32	DTE Excel 46	DTE Excel 68
MOTOREX	COREX HLP 22	COREX HLP 32	COREX HLP 46	COREX HLP 68
SHELL	Shell Tellus S2 M 22	Shell Tellus S2 M 32	Shell Tellus S2 M 46	Shell Tellus S2 M 68

B Lubricating oils for spur and planetary gears

1. Requirements with regard to gear oils

Gears come with splash lubrication as standard. For inclined or vertical installation following consultation suitable additional measures can be taken for lubrication.

Branded gear oils suitable for gear lubrication are those with EP additives which in the FZG normal test (A/8, 3/90) according to DIN 51354 reach load stage 12 without damage and have CLP quality compliant with DIN 51517-3.

2. Water solubility

Gear lubricants should not contain any free water during operation.

The tolerable water content for mineral oil and poly-alpha-olefin (PAO) lubricants is a maximum of 600 ppm.

3. Solid particle contamination and cleanliness classes

Solid particle contamination is the main cause of gear wear.

In general, during operation a minimum cleanliness class of 20/18/15 according to ISO 4406 or better must be maintained.

In their delivered state hydraulic fluids often do not meet these purity requirements. During operation and in particular when filling careful filtering is necessary to ensure the required cleanliness classes.

Cleanliness requirement for gears:	Cleanliness class ISO 4406
New oil, filtered	Min. 18/15/14
Operation permitted	20/17/16
Oil change or filtration necessary	Max. 22/19/18

4. Approved lubricants for Rollstar planetary gears

Lubricant selection table for mineral oils

Brand	Viscosity DIN ISO3348 at 40°C mm ² /s (cSt)			
	ISO VG 150	ISO VG 220	ISO VG 320	ISO VG 460
ARAL	Degol BG 150	Degol BG 220	Degol BG 320	Degol BG 460
BP	Energol GR-XP 150	Energol GR-XP 220	Energol GR-XP 320	Energol GR-XP 460
CASTROL	Optigear BM 150	Optigear BM 220	Optigear BM 320	Optigear BM 460
FUCHS	RENOLIN CLP Plus 150	RENOLIN CLP Plus 220	RENOLIN CLP Plus 320	RENOLIN CLP Plus 460
KLÜBER	Klüberoil GEM 1 - 150 N	Klüberoil GEM 1 - 220 N	Klüberoil GEM 1 - 320 N	Klüberoil GEM 1 - 460 N
MOBIL	Mobilgear 600 XP 150	Mobilgear 600 XP 220	Mobilgear 600 XP 320	Mobilgear 600 XP 460
MOTOREX	GEAR COMPOUND PLUS 150	GEAR COMPOUND PLUS 220	GEAR COMPOUND PLUS 320	GEAR COMPOUND PLUS 460
SHELL	Shell Omala S2 G 150	Shell Omala S2 G 220	Shell Omala S2 G 320	Shell Omala S2 G 460

Lubricant selection table for poly-alpha-olefins (PAO)

Brand	Viscosity DIN ISO3348 at 40°C mm ² /s (cSt)			
	ISO VG 150	ISO VG 220	ISO VG 320	ISO VG 460
FUCHS	RENOLYN UNISYN CLP 150	RENOLYN UNISYN CLP 220	RENOLYN UNISYN CLP 320	RENOLYN UNISYN CLP 460
MOBIL	Mobil SHC Gear 150	Mobil SHC Gear 220	Mobil SHC Gear 320	Mobil SHC Gear 460
MOTOREX	GEAR SYNTEC CLP 150	GEAR SYNTEC CLP 220	GEAR SYNTEC CLP 320	GEAR SYNTEC CLP 460
SHELL	Shell Omala S4 GX 150	Shell Omala S4 GX 220	Shell Omala S4 GX 320	Shell Omala S4 GX 460

5. Viscosity

The oil viscosity of the oil sample should not deviate from the oil viscosity of the oil specified in the technical data by more than 10%.

6. Oil level / level indicator

The oil quantity indicated in the dimensional drawings is a guide value only. The oil quantity should be determined by the dip stick or level indicator.

Planetary gears with recirculating lubrication

Where high amounts of heat are generated (e.g. at high speed, high ambient temperature, etc.) recirculating lubrication may be advisable. This allows the oil to be cooled and filtered. Recirculating lubrication designs are available on request.