Operation Manual

for

Agitator Drives Type

SLM RAV

Execution acc. to Directive 94/9/EC

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Contents of Operation Manual

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This operation manual describes agitator drives type SLM RAV.

Prior to commissioning, this operation manual must be read thoroughly and fully understood by the operational staff (erecting and qualified staff). The manual contains important instructions for the safe operation and designated use of the agitator drive. Observing these instructions helps to achieve a high level of availability and a long working life of the agitator drive while ensuring a safe operation.

Further operation manuals regarding components of the agitator drive, e. g. electric motors, monitoring equipment, etc. shall equally be observed.

Pictorial representations and information given in this operation manual are subject to technical modifications resulting in the improvement of KLAUS UNION products.

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1. General

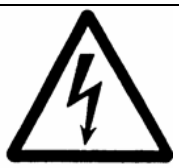
This operation manual contains fundamental instructions to be observed during installation, operation and maintenance. By all means, this operation manual must be read by the installation personnel and the responsible qualified staff prior to installation and commissioning. The manual is always to be held available on site.

In addition to the general safety instructions given in this section, the special safety instructions mentioned in the following sections are to be observed.

KLAUS UNION will not assume any responsibility for damage incurred due to non-observance of this operation manual.

2. Marking of Safety Instructions

The safety instructions given in this operation manual are specially marked:

	**Dangerous situation.** Possible consequences: Damage to health and life of persons.
	**Electrical hazard.** Possible consequences: Severe or even lethal injuries.
	**Important instructions regarding explosion protection.**
	**Danger to health of persons with a pacemaker resulting from strong magnetic field.**

In case of dangers to the machine and its functions the word

A T T E N T I O N

has been inserted.

3. Qualification and Training of Staff

The staff responsible for the operation, maintenance, inspection and assembly must have the appropriate qualifications to perform these duties. Scope of responsibility, purview and supervision of staff must be clearly organized by the operating company. If the staff do not possess of the necessary expertise they must be trained to acquire the necessary knowledge. Furthermore, the operating company is to ensure that the contents of the operation manual is fully understood by the staff.

4. Dangers of Non-Compliance with Safety Instructions

The agitator drives described in the present operation manual are usually used in industrial plants for the transport of partly hazardous products. Non-compliance with safety instructions can therefore cause danger to persons as well as to the environment. Non-compliance will result in the loss of any claim for damages.

In detail, non-compliance with the operation manual can result in the following dangers, e.g.:

- Danger to persons by electrical, mechanical and chemical influences
- Danger to the environment by leakage of dangerous substances
- Failure of important functions of the machine or plant

5. Safety-Conscious Work

Safety instructions mentioned in this operation manual, existing national regulations for prevention of accidents as well as any internal working, operating and safety instructions of the operating company have to be observed.

	**When operating the pump in hazardous locations, articles marked with the Ex–sign are to be given special attention and observance.**

6. Safety Instructions for the Operating Company/Operator

	**In case hot (temperature exceeding 50°C) or cold (temperature lower than 0°C) surfaces cause danger, they must be protected against accidental contact.**

	**Electrical hazard may be given. The corresponding instructions are to be observed.**

	**Magnet drives cause strong magnetic fields. Persons with a pacemaker should not stay close to the magnet drive or come into close bodily contact with parts of it**.

For processing dangerous products, evacuation lines or drains must be installed in a way to prevent any danger to people or environment. Local government regulations are to be observed.

7. Safety Instructions for Maintenance, Inspection and Assembly

The operating company has to ensure that any maintenance, inspection and assembly works are performed by authorized and qualified staff. The staff must have read and fully understood the operation manual.

As a matter of principle, any works on the agitator drive must be carried out during standstill. The casing must be depressurized and fully drained. Instructions given in the section "Commissioning and Shutdown" of this operation manual must be observed.

	**Agitator drives processing noxious liquids must be decontaminated.**

Immediately upon termination of the works, any safety and protection devices must be reinstalled and put into operation. During re-commissioning, the instructions given in the section "Commissioning and Shutdown" of this operation manual must be observed.

	**The lifting capacity of lifting gear and tackle must be designed to correspond at least with the own weight of the complete agitator drive.**

8. Unauthorized Modification and Manufacture of Spare Parts

Modification of or changes to the agitator drive may only be carried out upon agreement with the manufacturer. Original spare parts and accessories authorized by the manufacturer contribute to your safety. KLAUS UNION will refuse to accept any responsibility for damage resulting from the use of other parts.

	**If the agitator drive is modified or changed without authority and / or other than original spare parts are used for repair works, the explosion protection will be forfeited.**

9. Designated Use

Operational reliability of the agitator drive is only granted for its designated use. The limiting values indicated in the data sheet, particularly those regarding operation-temperature, pressure, motor-power and rotational speed must not be exceeded.

	**Driving motor or gear motor must have an approval for the use in areas subject to explosion hazards.**

1. Scope of Delivery

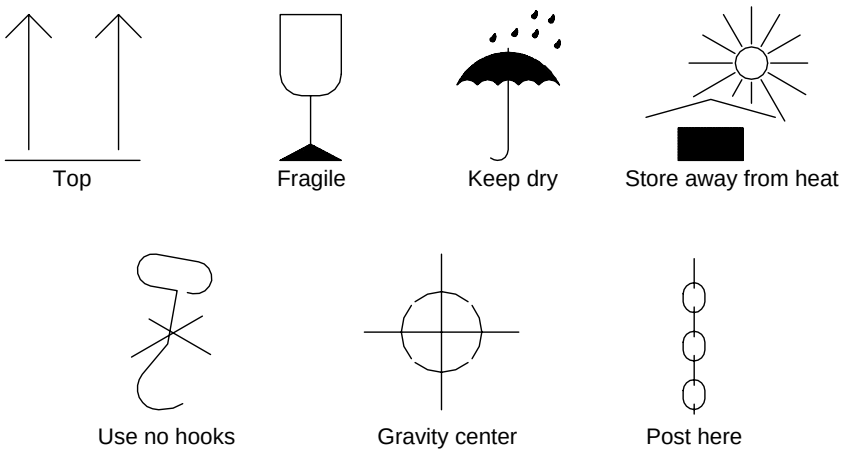
The contents of the individual packing units is listed in the packing list. Upon delivery, it is to be checked whether the consignment as mentioned on the packing list is complete. The supplier is to be given written notice immediately of any damage to the goods incurred during transport and / or missing parts.

2. Degree of Disaggregation

The degree of disaggregation depends on mode and conditions of transport, local conditions and lifting equipment available. On principle, it is possible to disassemble the pump into several sub-assemblies. However, the pump is to be transported in as complete a unit as possible. However, if the pump is delivered in sub-assemblies, refer to the drawing enclosed with the packing list for the contractual degree of disaggregation.

3. Packing

The transport route is decisive for the kind and material of packaging. If not particularly stipulated in the contract, the packing corresponds with the packaging regulations HPE laid down by the Bundesverband Holzmittel, Paletten, Exportverpackung e.V (Federal Association Wood for Packaging, Pallets, Export Packaging Inc.). The graphical symbols attached to the packing are to be observed:



4. Transport

Transport of the agitator drives must be carried out expertly. It must be ensured that the agitator drive does not slip out of the transport suspension. Shocks and impacts are to be avoided.

	**Suspended loads must not be transported over the heads of persons.**

	**The lifting capacity of lifting gear and tackle must be designed to correspond at least with the own weight of the complete agitator drive.**

5. Preservation and Intermediate Storage of the Pump

The agitator drive has been provided with a preservative either according to the customer's specification or as detailed in the operation manual. For a longer-term storage of the centrifugal pump, special preservative measures are to be taken.

Prior to delivery, shaft ends have been equipped with protection caps for protection against dirt and damage. The connecting flanges of the casing are provided with flange covers for protection against dirt. Protection caps and flange covers must not be removed during intermediate storage.

Having been packed into seaworthy cases for their transport, the agitator drives can be stored for a period of up to one year in their packing without special measures having to be taken. Nevertheless, to avoid damage to the anti-friction bearings in the drives owing to vibrations, e. g. due to machines operated in close vicinity, the agitator drives should be stored in rooms free of vibrations.

For intermediate storage, parts of the following low-alloy components must be treated with a preservative:

- bare shaft ends of drive shafts
- surfaces of casing made of cast steel GP240GH (1.0619)

Concerning the anti-friction bearings it is understood that the lubricant in them will not be adversely affected during a one-year storage period provided the pumps are stored appropriately. If possible, the pumps should be turned by hand once a month during the storage period.

Commercially available preservatives can be used. For application and removal of the preservative, specific instructions given by the respective manufacturer must be observed. Preservation will protect the material for about 1 year. In case of a longer storage period, preservation must be renewed.

The storage area must be dry and free of dust.

When storing agitator drives equipped with their gear motors, equally observe the instructions concerning preservation and storage given in the operation manual covering the driving gear motor.

A T T E N T I O N	**For outdoor storage, the agitator drive must be provided with a water-proof cover.** **Please observe instructions given in gear-motor´s operation manual.**

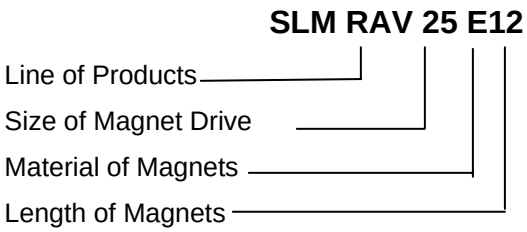
1. General

The particular feature of this agitator is its permanent-magnetic synchronous coupling. An outer magnet carrier (part no. 818.1 or 861) connected with the motor shaft ensures the slipless transmission of the required torque to an inner magnet carrier (part no. 818.2) which is connected with the agitator shaft (part no. 210).

An isolation shell (part no. 817) located between the outer magnet carrier and the inner magnet carrier seals the product chamber from the atmosphere.

The outer magnet carrier is directly mounted on the driven shaft of the motor's gear. The agitator shaft is arranged on steal bearings. The bearings are of permanent grease-lubricated design and sealed with radial shaft seal rings.

2. Identification Marking



3. Constructive Design

3.1 Agitator Casing

The agitator's casing comprises the mounting flange with stand pipe (part no. 712) and a motor lantern (part no. 146.1). The agitator is flanged on the tank by means of the mounting flange. Please refer to the dimensional outline drawing for further connection options and main dimensions.

3.2 Magnet Drive

The magnet drive hermetically seals the component in contact with the liquid from driving component at the atmosphere. The magnet drive comprises the inner and outer magnet rotors and the isolation shell. The isolation shell located between the two rotors seals the system. The power transfer is effected without slip via the magnetic field lines between the rotors.

In case of overloading, the magnet drive „decouples“. Then, the rotors will run asynchronously with the driven rotor turning much slower than the driving rotor. This kind of operation is not to its intended use and must be avoided (for further information refer to section „Maintenance“.

3.3 Arrangement of Shaft on Bearings

The agitator shaft is arranged on permanently grease-lubricated anti-friction bearings. The bearing comprises a cylindrical roller bearing (part no. 322) designed as a movable bearing and a ball bearing (part no. 321) designed as a fixed bearing. Radial shaft seal rings (part no. 421) seal the bearings.

To protect the bearing from corrosion, nitrogen can be applied via a corresponding connection at the casing.

1. General Instructions

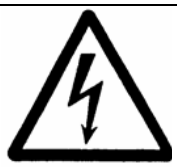
Prior to installation, the agitator drive should be checked for any damage it might have suffered during transport. The flange covers may only be removed right before installation.

KLAUS UNION cannot be held responsible for any damage resulting from inexpert installation.

The pictorial representations have been simplified.

	**Prior to installing the agitator drive with the pertaining gear motor in areas subject to explosion hazards, ensure that the entire equipment has been approved for the prevailing explosion protection zone.**

	**Instructions given in the operation manuals of the gear motor are to be observed.**

	**The installation of electrical equipment is exclusively to be performed by qualified staff. Any regulations valid at the time are to be observed.**

	**Magnet drives cause strong magnetic fields. Persons with a pacemaker should not stay close to the magnet drive or come into close bodily contact with parts of it.**

2. Installation Conditions

Arrange pipework and equipment pertaining to the agitator drive in a way to have enough space available for assembly and maintenance works. For dimensions of the agitator drive refer to the attached installation plan.

3. Installation

The degree of disaggregation depends on mode and conditions of transport, local conditions and lifting equipment available.

Prior to assembly of the agitator on the tank, the direction of rotation of the drive unit shall be checked.

4. Auxiliary Connections

Depending on the construction type, the agitator drive can be equipped with connections for heating or cooling, flushing and monitoring. Refer to the installation plan attached to the pump for the exact location of those connections.

	**The instruments for the monitoring such as temperature sensors, pressure sensors, etc. must have the corresponding approval for use in areas subject to explosion hazards.**

5. Electrical Connection

	**The electrical connection of the driving motor must be performed by a skilled person. The relevant regulations on that subject are to be observed.**

	**An earthing cable is to be provided between agitator drive and foundation for equipotential bonding.**

1. Preparations for Commissioning

1.1 Grease-Lubricated Anti-Friction Bearings

The agitators will be supplied with permanently-grease lubricated anti-friction bearings already fully greased at delivery.

1.2 Checking the Direction of Rotation

The motor's direction of rotation must be identical with the direction-of-rotation arrow on the agitator's casing.

To check the motor's direction of rotation, switch the motor on and watch the fan impeller through the fan cowl.

1.3 Connections for Flushing Liquid and Nitrogen Filling

Refer to dimensional outline drawing for the location of inlet and outlet nozzles for flushing liquid and nitrogen.

2. Monitoring Equipment

Several options are available for monitoring of the agitator to prevent potential failures from causing damage to the unit.

2.1 Nitrogen Quantity

Application of nitrogen ensures inerting of the interior of the agitator and protection of the shaft bearing against corrosive atmospheres. Thus, monitoring of the nitrogen quantity can prevent damage to the bearings and thus failure of the agitator.

2.2 Speed

The agitator drive is equipped with a speed monitoring device. This device permits to detect whether the agitator shaft is running at the same speed as the drive shaft. In case of overloading, the magnet drive will decouple. The agitator shaft will either be blocked or it will be turning at a lower speed than the driving element. After a short while, this operation mode will cause irreparable damage to the magnet drive.

2.3 Geared Motor

If the geared motor is not in good working order (e. g. the bearing is defective or concentric running between output flange driven shaft is not ensured) it may happen that the outer magnet carrier contacts the rub ring in the motor lantern. The rub ring prevents direct contact between outer magnet carrier and the isolation shell and thus damage to the isolation shell which would result in a leakage.

By monitoring the power input of the geared motor, contact of the outer magnet carrier with the rub ring at the motor lantern can be detected.

3. Commissioning

In case either the operation parameters are modified or they no longer correspond with the ones stipulated in the order (viscosity, density, temperature of the liquid, speed), it is to be checked whether:

- the magnet drive is still sufficient,
- the motor is not overloaded,
- the maximum allowable temperature is not exceeded,
- the allowable speed is not exceeded.

	**During commissioning, operate the agitator for at least 3 hours at operating conditions and pay attention to any unusual noise and high temperatures at the agitator's surface. Measure the surface temperature with a commercial surface thermometer.**

4. Shutdown

Switch off the motor and interrupt the nitrogen feeding.

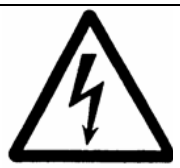
1. General

Please observe the instructions given in the section "Safety" of this operation manual when carrying out any maintenance works.

During the guarantee period, any maintenance works are either to be performed by KLAUS UNION staff or with KLAUS UNION's authorisation. Dismantling and Re-assembly of the agitator drive have to be carried out by qualified staff.

	**Magnet drives cause strong magnetic fields. Persons with a pacemaker should not stay close to the magnet drive or come into close bodily contact with parts of it.**

	**Agitator drives processing dangerous liquids are to be decontaminated.** **When draining the agitator drive, any danger to persons and environment must be precluded.**

	**On principle, the driving motor must have been de-energized prior to effecting any works on agitator drives. Unintentional energizing of the drive must be precluded.**

2. Lubrication of Bearings

2.1 Anti-Friction Bearings

	**To avoid the anti-friction bearings becoming an ignition source, the anti-friction bearings must be maintained according to the instructions given in the operation manual.**

The anti-friction bearings are designed for a rated working life of 25000 hours at a bearing temperature of 90°C. Replace the anti-friction bearings after 90 % of their service life at the latest. However, the working life of the bearings can reduce due to higher bearing temperatures and unfavourable operating conditions (strong vibrations, aggressive environmental conditions, etc.).

If the pump has not been used for long periods (more than 1 year) the grease has to be replaced.

3. Inspection and Maintenance

3.1 Inspection during Operation

To prevent the occurrence of ignition sources, which can be caused by failures and result in an explosion, the operating company has to take measures for monitoring the agitator drive.

3.2 Maintenance

Check the parts for their re-usability and replace damaged components using new original spare parts.

3.3 Tightening Moments for Screws

In case materials of screws are not indicated here, please contact KLAUS UNION.

Part No.	Position	Screw Material	Thread	Tightening Moment [Nm]
901.1	Isolation Shell Flange	A4 - 70	M12 M16	65 Nm 135 Nm

4. Spare Parts

The attached spare parts list enumerates the recommended spare parts.

Exclusively use original spare parts for repairs and replacements.