JAHNS

HYDRAULIK

Operating instructions for agitator

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1.0 General

The descriptions and instructions in these operating instructions concern the standard version. These operating instructions take into account neither all possible design details nor versions.

1.1 Areas of application

The agitator may be operated only for the areas of application confirmed by the manufacturer. In the case of changed operating conditions, consult the supplier /manufacturer.

1.2 Performance data

The name plate on the agitator shows the operating data, the series, the size and the Com. No. When ordering spare parts or in the case of queries, always state this Com. No. In the case of queries please contact your supplier or the manufacturer.

2.0 Safety

These operating instructions contain basic instructions that have to be observed in installation, operation and maintenance. Therefore these operating instructions must be read absolutely before installation and commissioning by the fitter as well as the responsible skilled personnel / operator and must be constantly available at the place of use of the plant. Not only the general safety instructions listed under this main section have to be complied with but also the special safety instructions inserted under the other items.

2.1 Marking instructions in the operating instructions

The safety instructions contained in these operating instructions, non-compliance with which can cause danger to persons, are marked specially with the general danger symbol.

Attention!

In the case of safety instructions non-compliance with which can cause danger to the agitator and its function, the word **ATTENTION!** is inserted. Instructions applied directly to the agitator, such as the direction of rotation arrow, must be complied with absolutely and kept in completely legible condition.

2.2 Personnel qualification and training

The personnel for operation, maintenance, inspection and installation must have the corresponding qualification for this work. The area of responsibility, competence and supervision of the personnel must be regulated exactly by the operator. If the personnel do not have the necessary knowledge, then they must be trained and instructed. Furthermore the operator must ensure that the contents of the operating instructions are understood fully by the personnel.

2.3 Dangers on non-compliance with the safety instructions

Non-compliance with the safety instructions can result in both danger for persons and for the environment and the agitator. Non-compliance with the safety instructions leads to loss of any claims for compensation.

In detail, non-compliance can for example result in the following dangers:

- Failure of important functions of the plant.
- Failure of prescribed methods for maintenance and repair.
- Endangering persons by electrical, mechanical and chemical effects.
- Danger to the environment due to leakage of hazardous substances.

2.4 Safety-conscious working

The safety instructions listed in these operating instructions, the existing national regulations for accident prevention as well as possible internal working, operating and safety regulations of the operator must be complied with.

2.5 Safety instructions for the operator / user

If hot or cold agitator parts lead to dangers, these parts must be protected against contact.

Dangerous goods, e.g. explosive, toxic or hot must be discharged so that no danger for persons and the environment arises. Legal regulations must be observed.

Dangers due to electrical energy must be excluded. For details of this refer for example to the regulations of the VDE and of the local energy supply utilities.

2.6 Safety instructions for maintenance, inspection and installation work

The operator must ensure that all maintenance, inspection and installation work is performed by authorized and qualified skilled personnel that has informed itself sufficiently by thorough study of the operating instructions.

Basically work on the agitator may be performed only at standstill. Observe the procedure described in the operating instructions for shutting down the agitator.

Agitator parts such as shaft and agitator blade, which move media endangering health, must be decontaminated.

Attention!

Directly after completion of the work, all safety and protective devices must be refitted or put into operation.

2.7 Unauthorized conversion and spare parts manufacture

Conversion or modifications of the agitator are permitted only after consultation with the manufacturer. Original spare parts and accessories authorized by the manufacturer serve for safety. The use of other parts excludes liability for the resulting consequences.

2.8 Inadmissible modes of operation

The operating safety of the delivered agitator is guaranteed only in use as intended. The stated limit values may not be exceeded under any circumstances.

3.0 Transport / temporary storage

3.1 Transport

The complete agitator must be transported correctly. Make sure that hoists and slinging gear are sufficiently dimensioned. Do not lift and transport the assembled agitator using its shaft but the drive (motor or gearbox), hold or guide the shaft only for balancing.

3.2 Temporary storage

Temporary storage should be dry and free of dust and frost. Protect the agitator against penetration of impurities. After lengthy storage it can be necessary to replace the seals, and to change the oil in the gearboxes.

4.0 Description

Agitation is one of the most important basic operations of applied process engineering. In nearly all manufacturing processes, materials are agitated with the goal of speeding up adjustment or transport processes in fluid systems. Our agitators have proven themselves for more than 20 years in many areas of process engineering.

We use high-quality materials as well as motors and gearboxes of leading manufacturers. The designs are made in a modular system, which facilitates adaptation to special operating conditions without great expense.

4.1 High-speed mixers

Electric motors with 700, 950, 1400 or 2800 rpm. The agitator shaft is bonded and pinned directly to the drive shaft.

A 4-blade sheet metal propeller or one or several 3-blade marine propellers is standard for V4A high-speed mixers. The agitating blades are detachable and in some versions can be shifted on the shaft. In the V4A high-speed mixers a combination with a dissolver is also possible.

In the sheathed versions the agitator shaft is sheathed corresponding to the requirements with pipe material made of PPH, PVDF or PVC. The sheath tube is welded tightly with the blade hub, the carrier is located in the interior. A 3-blade steep propeller (material PPH/GFK or PVC) or a 3-blade marine propeller (material PVDF or PPH) is used.

4.2 Geared agitator

Spur gear with 20 - 400 rpm. The agitator shaft is bonded and pinned directly with the drive shaft in the version without bearing lantern.

Flat gear or bevel gear with 20 - 200 rpm. In these geared agitators, the agitator shaft is fitted with keyway connection directly in the hollow shaft of the gearbox in the version without bearing lantern.

1 to 4 oblique blade agitators with 2-blade 45° or according to requirements also 3-blade or 4-blade with 30°, 45° or 90° are standard in V4A geared agitators. The oblique blade agitators can be shifted on the shaft in the V4A geared agitator.

In the sheathed versions the agitator shaft is sheathed corresponding to the requirements with tube material made of PPH, PVDF or PVC. The sheath tube is welded tightly with the blade hub, the carrier is located in the interior. 1 to 4 oblique blade agitators with 2-blade 45° or according to requirement also 3-blade or 4-blade with 30°, 45° or 90° are used. The blades can be removed using large threaded hubs. If several blades are arranged on the shaft, the next larger thread is always used for the blade arranged above. The distance and the position of the blades in relation to one another is determined in the order, a subsequent change is not possible.

4.3 Bearing lantern

ARH agitator without bearing lantern.

ARL agitator with a bearing lantern, with double ball bearing (bearing sealed on both sides) and coupling with keyway connection. In addition the bearing on the vessel side is sealed with a rotary shaft seal.

ARL2 agitator with a high bearing lantern, fourfold ball bearings, otherwise the same design as ARL.

4.4 Sealing flange

D1 sealing flange made of PPH or PVDF as splash protection in low construction with an external V-ring made of Viton on PTFE/carbon.

D2 steam-proof sealing flange with interior Viton axial rotary shaft seal on PTFE/carbon.

D3 sealing flange for V4A agitators, V4A flange, rotary shaft seal with double sealing lip (material PTFE/carbon).

4.5 Sealing chamber

DB1 sealing chamber with one slip ring seal, pressurized with sealing fluid, pressure < 0.5 bar

DBT sealing chamber with 2 slip ring seals in tandem arrangement, pressurized with sealing fluid, pressure < 0.5 bar

DBK sealing chamber with 2 slip ring seals in back-to-back arrangement, pressurized with sealing pressure, pressure 2 - 4 bar

4.6 Divided agitator shaft

As from a certain length, it can be required to divide the shaft into one or several parts for transport reasons or for easier installation on site. With sheathed agitators the separating points are located in a sealed, dismantlable housing.

SK flange welded on the agitator shaft and on the drive shaft and connected with screws.

RK agitator shaft and drive shaft are connected through a bush with ring clamping elements.

5.0 Installation

The installation site must be selected so that the agitator is easily accessible. The vessel cover or the crossbeam intended for holding the agitator must be sufficiently dimensioned for the weight and the forces arising in operation in order to guarantee vibration-free operation of the agitator. Vibration dampers are not required but can be used. The agitator is normally delivered completely assembled, solely large oblique blade agitators are removed for transport reasons. The agitator shaft may not be canted on introduction into the vessel or loaded by the weight of the drive. If necessary, the agitator blade can be unscrewed to introduce the agitator shaft into the vessel.

5.1 Installation

Use the mounting screws corresponding to the agitator flange in size and number and secure them by spring lock washers or other securing elements. **Do not forget the seal** when installing on pressure or vacuum vessels. The installation position is vertical. Deviations must be agreed with the manufacturer. On non-compliance with the installation instructions the warranty claim expires.

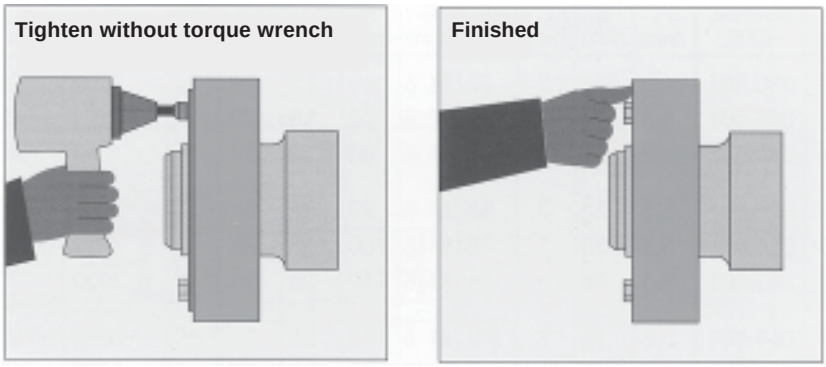
5.2 Installation of SK flange coupling

With a divided agitator shaft, take care that the centering shoulder engages correctly in the opposite flange.

5.3 Installation of RK ring clamping coupling

Only lightly oil the shaft ends, do not grease them!

Set coupling combination (bush with the two ring clamping couplings) on the drive shaft. Tighten slightly the upper ring clamping coupling on the drive side. Fit the agitator shaft in the sleeve of the coupling combination. Tighten the screws of the two ring clamping couplings uniformly, distributed in several stages, until the graduated taper ring and graduated taper bush align with the face on the screw side according to the Figure.



Attention! Non-aligning parts lead to unquiet running of the agitator and to high wear of the bearings on the drive. And thus lead to premature failure of the agitator!

5.4 Installation of agitating blade

In agitators made of V4A, the blade, according to size, is clamped firmly with 2 or 4 set screws in the hub on the smooth shaft. If several blades are arranged on one shaft, then offset the blades in each case by 90° to one another. The distance between two blades should correspond to around one blade diameter if not otherwise ordered.

In the case of sheathed agitators the blade hubs are fastened on the shaft using a large thread. If several blades are arranged on one shaft, then the spacing between them as well as the offset are specified by production. A subsequent change is not possible. In some agitators, the blades can be secured in addition by lock nuts.

5.5 Installation inspection

After installation check that the agitator shaft and agitator blades do not run against any place in the vessel, turn the agitator shaft by hand to check this. Clean the agitator shaft and agitator blades.

5.6 Motor connection

The electrical connection of the agitator may be made only by skilled personnel!

Check the available line voltage with the data on the name plate for agreement. The connection diagram for the motor is affixed to the inside of the terminal box cover. A motor protection switch is always required for the electric motor, except in the version with winding protective contact (WSK) or thermistor which serve for switching the motor off directly. Without series connected motor protection switch set correctly to nominal current, the warranty expires.

Apart from the requirements of a perfect electrical installation and complying with the corresponding directives, the VDE regulations and if necessary regulations of the local energy supply utilities, attention must be paid especially to the direction of rotation of the agitator. The direction of rotation of the agitator is in the normal case clockwise viewed from above. Note that for geared agitators the motor can turn in the opposite direction to the shaft according to the number of gear steps! The attached direction arrows are determinative for the direction of rotation of the agitator blades.

6.0 Commissioning

Check the direction of rotation of the motor by switching it on and then off. This must agree with the direction of rotation arrow.

Geared agitators are filled with oil and ready for operation. The agitator is now ready.

7.0 Operation

Operation of the agitators is in accordance with the circumstances of the plant. The agitator may be operated only within its intended limits. The maximum speed especially must not be exceeded, since the power consumption increases with the third power of the speed!

7.1 High-speed agitators

Attention!

Agitators with motor or with a variable speed gear and a speed between 700 and 2800 rpm. These versions may not be in operation under any circumstances when filling or emptying the vessel. The liquid coverage must be at least 6 times the propeller diameter.

Non-compliance can lead to destruction of the agitator!

7.2 Low-speed agitators

These include all geared agitators with constant or continuously variable speed up to approx. 400 rpm. All operating conditions are permissible without restrictions.

7.3 Speed control

If an agitator has been ordered for operation on a frequency converter, then we have assumed a maximum frequency of 87 Hz. In all other agitators, unless otherwise ordered, 50 Hz are assumed. Agitators should not be operated above the corresponding speeds, since the power consumption increases with the third power of the speed!

In variable speed drives it can happen that resonance occurs at one place in the speed range. Please mark this point and operate the agitator a little above or below this critical speed. Whether resonance occurs depends not only upon the agitator but also upon the vessel (size, material, stiffness) and the agitator crossbeam. Provided you do not work with the resonance speed, no damage can arise when running through it.

7.4 Temperatures

The maximum permissible temperatures for the different versions of the agitators are

PVC	50°C
PPH	90°C
PVDF	130°C
V4A	160°C

8.0 Putting out of service

Observe the corresponding safety instructions when working on the agitator, on the agitator blade and in the vessel.

If the agitator is taken out of operation to perform work on the agitator, the drive must be secured against unauthorized switching on, e.g. lock the switch, possibly remove fuses, use short-circuit plugs or disconnect the motor.

Attention!

Directly after completion of the work, all safety and protective devices must be refitted or put into operation.

8.1 Maintenance

Subject the agitator to a simple visual inspection at certain intervals of time for bent or broken agitating blades or shafts, adhering product residues, external damage and loose screw connections. Check and if necessary free from dust the ventilation slots on the motor so that heat dissipation remains guaranteed. Ball bearings sealed on both sides are used in the motor and in the bearing lantern, these are lubricated for life and thus maintenance-free. The bearings should be replaced after 20,000-30,000 operating hours. Please observe the separate instructions of the manufacturer for maintenance of the motor or gearbox.

8.2 Gaskets

Rotary shaft seals, V-rings or axial shaft seals are contacting seals and thus subject to a certain amount of wear. Check these regularly and replace them in the case of visible wear.

8.3 Slip ring seals

Single or double-acting slip ring seals are installed in a separate housing and connected to a sealing fluid circuit. The sealing pressure is between 0.5 and approx. 3 bar according to version. The sealing fluid must be product-compatible. Refer to the separate publication for maintenance instructions.

9.0 Cleaning

All motors are in type of protection IP55, the gear housings are fully enclosed, therefore spray and splash water proof.

Bearing lanterns are equipped with ball bearings sealed on both sides and have lateral windows because of the better heat dissipation and for assembly and disassembly of the couplings. Therefore do not spray the bearing lanterns directly with the water jet. Even if the other components tolerate this, cleaning with a moist sponge or cloth and normal household cleaners is recommended.

Short version

- **Read the operating instructions**
- **Observe the safety instructions**
- **Use a sufficiently dimensioned hoist**
- **Transport the agitator supported on the drive**
- **Ensure stable mounting of the agitator**
- **Compare the operating voltage with the name plate**
- **Protect the electric motor with motor protection switch to nominal current**
- **Observe the direction of rotation of the agitator**
- **Do not operate the agitator above the stated speed**
- **Never operate the high-speed mixer in the crossover mode**
- **Check the agitator regularly for damage**
- **Keep the ventilation slots of the electric motor clear**