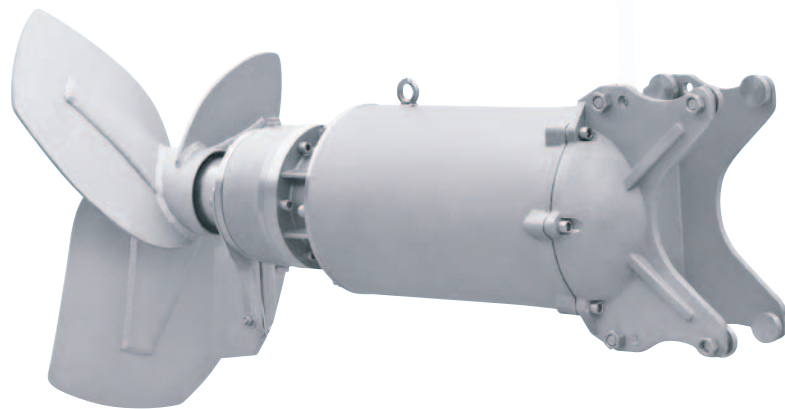




**Stainless steel submersible  
motor agitator**

**Optimix 2A I35-380**

for biogas and liquid manure containers  
for use in ATEX zone 1



## **Operating instructions and spare parts list**

Original edition (GER)



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## 1 General

### To the operating personnel

These operating instructions provide information regarding safety, design, function, operation and maintenance of Optimix submersible motor agitators, type UG. Following the instructions carefully will ensure long, trouble-free and safe operation.

### Other applicable documents

- Operating instructions for the agitator mast and the control unit
- Accident Prevention Regulations and Safety Information (Appendices)















### Storage

The operating instructions (incl. the jointly applicable documents) must always be kept readily available near the propeller agitator!

## 2 Safety

### Prohibiting, warning, mandatory and information signs

Excerpt from the Safety and Health Protection Marking in accordance with the Accident Prevention Regulations (BGV A 8 / DIN 4844):

	Unauthorized access forbidden!		Warning - risk of falling!
	Fire, naked light and smoking forbidden!		Warning of automatic starting!
	Access forbidden, risk of falling through!		Use respiratory protection!
	Reaching in forbidden!		Use a body harness!
	Warning of a dangerous area!		Use eye and ear protection!
	Warning of potentially explosive atmosphere!		Use protective gloves!
	Warning of dangerous voltage!		Follow the instructions for use!

## Fundamental safety instructions

The safety information serves to avoid danger to persons, damage to the agitator and detrimental effects on the environment. It is mandatory for all users to read these safety instructions and always to adhere to them.



### Danger of injury due to improperly secured parts!

If necessary, use suitable hoisting equipment designed to accommodate the weight and shape of the agitator and accessories (e. g. excavator, crane).

Persons must not remain under the load whilst lifting, transporting and lowering the device.

Never leave the load unattended when it is in a raised condition. Do not reach under the agitator when lifting or lowering it.

Never grasp moving parts!



### Danger of injury due to impacts! Wear a safety helmet!

Danger of injury due to falling parts! Wear safety shoes!

Danger of injury due to sharp edged metal parts! Wear safety gloves!



### Warning of potentially explosive and flammable atmospheres!

Gases can escape from the fermenter, which may be toxic, inflammable and potentially explosive!

Assembly and maintenance work on explosion-protected machines shall be carried out by suitably qualified persons observing the Operational Safety Act (BetrSichV corresponds with 1999/92/EC) as well as the safety and maintenance information in these operating instructions. Danger of explosion due to lightning strike!

When carrying out maintenance work on container openings, make sure that no potentially explosive atmosphere exists for the entire duration of the work!

Work influencing explosion protection must only be carried out by appropriately trained or proficient specialists.

The permit (see Chapter 2 Safety Information) must be completed before any work on the agitator is performed and must be signed by the person responsible. If the work is not carried out by SUMA, it must be performed by a trained service technician and approved. The technician must provide written confirmation and attach a certificate mark to the machine. This confirmation must be filed in the operator's explosion protection documentation and shall be presented upon request.

Danger of explosion due to lightning strike!

### Increased explosion hazard!

- Gas may escape when opening or dismantling the agitator.
- **MAKE ABSOLUTELY SURE** to keep all sources of ignition (e.g. naked flames, hot heat sources, tools prone to sparking, electrical equipment without explosion protection) away from potentially explosive areas (Ex zones)!
- **ONLY USE non-sparking tools** (also applies to drills, bits, core drills, chisels, etc.)! Welding work, burning work and work generating sparks must **UNDER NO CIRCUMSTANCES** be carried out within Ex zones!
- Do not smoke and do not use naked flames, mobile phones or other ignition sources in the vicinity of the biogas system.
- Provide sufficient ventilation for the fermenter during assembly and maintenance work. Observe the regulations for the biogas system!
- Secure the plant against being accessed and operated by unauthorised persons



### Hazard due to dangerous voltage!

Any work on electrical equipment may **ONLY** be carried out by a qualified electrician.



### Danger of injury

Please observe the relevant accident prevention regulations for agricultural biogas systems, the Operational Safety Act (BetrsichV) and other technical regulations as well as the safety instructions.

Supplementary to the operating instructions, the generally applicable and local regulations governing the prevention of accidents, work safety and environmental protection must be made available and observed.

Persons who are under the influence of alcohol, drugs or medicines must not transport, install, commission, operate or repair the to propeller agitator.

The operating personnel must be at least 18 years old.

Ensure that the operating personnel are instructed regularly in all relevant questions of work safety and environmental protection and that they are acquainted with and observe these operating instructions and the safety instructions contained in them.

Pay attention to the warning and instruction signs attached to the propeller agitator. Also make sure that these are not removed UNDER ANY CIRCUMSTANCES and that they remain LEGIBLE.

NEVER switch on the device if it is not properly and fully assembled, or when there are persons within the danger zone.

During mounting and maintenance work, keep persons and animals away from the fermenter and the working area of the device. Pay particular attention to children playing!

Never leave the machine unattended during assembly and maintenance work.

Before working in the fermenter, on and in the vicinity of the propeller agitator and on the electrical equipment:

- *MAKE ABSOLUTELY SURE to switch off the machine at the mains switch and to secure it against being accidentally switched on again by means of a padlock (remove the key) and affix a corresponding warning sign.*
- *MAKE ABSOLUTELY SURE TO WEAR personal safety equipment (safety belt, safety rope, gas warning device, respiratory equipment, safety shoes, protective gloves etc.)!*

The submersible agitator must not be put into operation without the safety / protective equipment fitted by the manufacturer or installed on site.

Faults in the agitator must be rectified without delay. Do not alter or convert the propeller agitator, otherwise the declaration of conformity and the operating licence will be void.

When changing defective components, make sure to only use original spare parts with identical electrical and mechanical data, as otherwise neither the safety, function nor explosion protection can be maintained.

All safety devices, seals, attachments as well as electrical connections and cables must be inspected regularly for perfect condition.

For warranty details, please refer to our General Terms and Conditions of Delivery or your contract documents.



### Danger of environmental damage due to oils, lubricants and cleaning agents!

These materials may on no account be allowed to enter the soil, water, sewer or fermenter. Hazardous materials, as well as containers and cloths contaminated by these MUST be stored and transported in suitable containers and disposed of in accordance with regulations!

Suitable personal protective equipment is to be used when handling hazardous materials.

## 3 Intended use

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The agitators of type Optimix are designed for the agitation of liquid suspensions and biological liquids, such as liquid manure, sewage sludge or renewable raw materials.



### Danger of explosion!

The Optimix submersible motor-driven agitators are approved according to the explosion protection directive 94/9/EU for use in Ex zone 1, as well as outside Ex zones. Operation of the unit in Ex zone 0 is not permissible. If necessary, it is to be guaranteed by the customer that unintentional operation in an impermissible Ex zone is reliably prevented. If an Ex zone 0 is present above the substrate due to the installation situation/plant, it must be ensured by means of suitable safety device(s) that, in case of emergency, all poles of the voltage and current supply to the agitator are disconnected in good time. The screened cable is suitable for use within an Ex zone 0.

Operation of the agitator is only permitted when the propeller is fully submersed. The substrate to be agitated must be in fluid state, the dry matter content (DMC) must not exceed 8%, the temperature must be within a range of 5 °C to max. 52 °C and it must have a pH-value between 5.5 and 7.8.

The submersible agitator may only be installed and operated in a horizontal position

### Misuse

The agitator may be installed, operated and serviced exclusively in accordance with the specifications in this operating manual. Any other use is considered to be misuse, in particular if

- use is not in accordance with the declaration of conformity,
- the agitator, mast, support or control unit are not ready for operation or have been modified,
- the agitator is not suitable for the substrate to be agitated,
- there are foreign bodies in the substrate, e.g. cords, plastic straps, foils, wood, ropes, chains.

The user or operator of the agitator is responsible for all damage resulting from inappropriate use.

### Liability exclusions

The SUMA company will assume no liability for injuries to persons or for damage to property and the environment and/or for operating losses that occur due to failure to observe or not fully observing the operating instructions.

Warranty and liability claims for personal injury and damage to property and the environment are excluded if they are due to one or more of the following causes:

- inappropriate transport, installation, commissioning, operation or maintenance;
- use with defective safety devices or with improperly attached or non-functional safety and protective devices,
- failure to observe the operating instructions with regard to mounting, commissioning, operation and maintenance,
- unauthorised intervention or structural modification;
- insufficient monitoring of parts that are subject to wear,
- improperly performed maintenance,
- use other than for the intended purpose;
- influence of foreign objects.

Corrosion caused by electro-chemical reactions (e.g. pH value of substrate, concentration of hydrogen sulphide), by microbial influences (e.g. bacteria, algae, fungi) or by potential equalisation current (e.g. different earth potentials) does not represent a defect (reason for complaint).

## 4 Structure and function

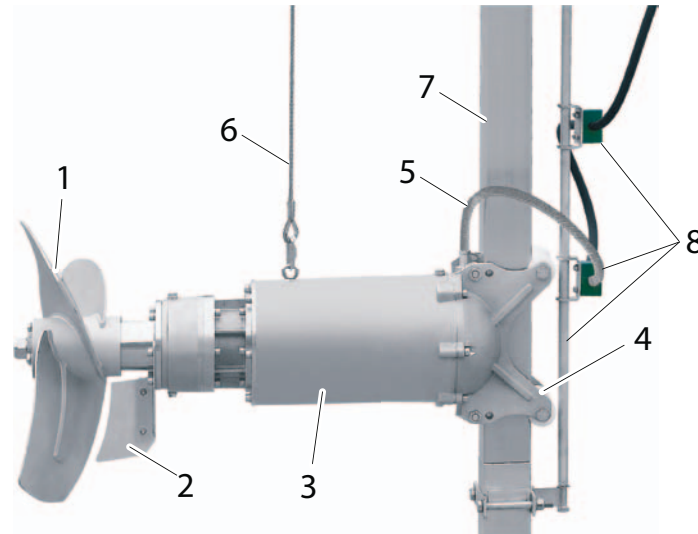


Figure 1: Optimix with motor support (standard model)

- |                                |                                     |
|--------------------------------|-------------------------------------|
| 1 Stainless steel propeller    | 5 Connecting cable with cable gland |
| 2 Scraper                      | 6 Hauling cable (optional)          |
| 3 Optimix submersible agitator | 7 Sliding mast (optional)           |
| 4 Roller guide                 | 8 Cable guide, cpl. (optional)      |

The submersible motor agitator serves for mixing renewable raw materials (RRM), liquid manure and similar substrates. The electric motor-driven submersible agitator is designed for submersed operation in an appropriate fermenter in a potentially explosive Ex zone 1 environment and complies with the directive 94/9/EC.

The submersible agitator can be attached to most sliding masts by means of the motor support. An attachment eye for a hauling rope (6) is attached to the motor housing for the vertical adjustment. Due to the 4-roller guide of the motor support, the agitator can be raised and lowered on the square mast virtually without friction. The 4-roller guide is designed as standard for a 100 x 100 mm square sliding mast; it can also be used for a 120 x 120 mm or 80 x 80 mm sliding mast by exchanging the rollers. This enables universal utilisation with the most various installation kits.

The submersible motor is manufactured with gear and bearing flange made from cast stainless steel (1.4301); the propeller is made from stainless steel or optionally from a wearing steel. The submersible agitator is of modular design, submersible electro-motor with flange-mounted planetary gear and bearing flange for holding the propeller. The conical shaft in the bearing flange is mounted in the oil bath by two angular roller bearings and sealed off from the agitating substrate with a mechanical seal.



## 5 Scope of supply

The scope of supply may differ from the illustration on the front page!

### Standard model with motor support

Description	Quantity
Optimix 2A, complete (with propeller V2A, 10 m screened connecting cable) Roller guide for 80 mm or 100mm square tube	1

### Accessories (optional)\*

Description	Quantity
Start-up control (manual switch, soft start,...)	1
Screened connecting cable in a custom length	1
Cable guide, cpl.	1
Different installation kits with sliding mast for biogas or liquid manure containers	1
Propeller, wear resistant steel	1

\*see also our currently valid sales lists.



**Notice:** The submersible motor propeller is delivered without the switch box.

Safety and monitoring equipment (e.g. EMERGENCY-STOP and start-up control) shall be provided for on site and can be optionally ordered as an accessory.

## 6 Type plate

The type plate of the agitator is mounted at the cable outlet on the motor, bearing the following information:

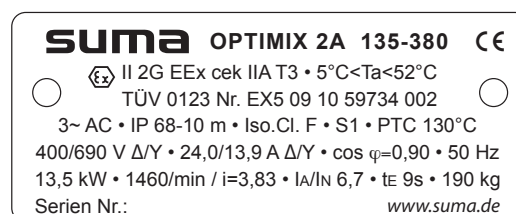


Figure 2: Optimix UG 150-380 type plate

## 7 Technical data

Optimix type	2A 135-380
Winding manufacturer	ATB
Winding type	AF 160
Rated power	13.5 kW
Rated voltage	400 VΔ (690 VY)
Frequency	50 Hz
Rated speed	1460 rpm
Rated current	24.0 AΔ (13.9 AY)
Starting current $I_A/I_N$	6.7
Power factor $\cos \varphi$	0.90
Efficiency	90 %
Insulation class	F
Heating time $t_E$	9 sec
Temperature sensor	PTC 130°
Operating mode	S1 (100 % ED) - maximum of 6 starting procedures per hour
Activation	Star-delta / direct start-up / soft start Frequency converter (see note below)
Cable length	10 m or optionally up to 50 m
Protection class	IP 68 - 10 m
Gear transmission ratio	3.83
Sound pressure level	< 72 dB (A)
Area of application	5°C ... 52°C   pH 5.5 ... 7.8   TS < 8%
Ignition protection type	II 2G Ex cek IIA T3
EC type testing certificate	EX5 09 10 59734 002 TÜV Süd Product Service GmbH (0123)
Propeller	H620
Weight including motor support	190 kg
Dimensions incl. motor support [mm]	1,110 x 580 x 615



**Notice:**

The use of frequency converters with electrical devices that are used in a potentially explosive area is permitted only if the frequency converter is explicitly approved for such use.

## 8 Assembly of the submersible motor agitator

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### General



**Danger of personal injury and damage to property and the environment!**

It is essential to follow the safety instructions in chapter 2 *Safety*.

The submersible motor agitator Optimix 2A is designed in such a way that it can be installed and dismantled from outside. The geared motor is intended for submersion operations up to a filling level of 10 m, for which it is designed according to its protection class IP68. The maximum ambient temperature for the operation of the geared motor must be at least 5 °C and at the most 52 °C.

Attention must also be paid during assembly that enough space is available around the propeller for faultless agitator operation. The adjustment possibility can be limited on site if required, in order to prevent contact of the propeller with the floor wall or roof of the machine.

### Before installation



**Warning of potentially explosive and flammable atmospheres!**

Before installing the propeller agitator, make sure that no potentially explosive atmosphere exists for the entire duration of the work. Before working in potentially explosive areas, a permit (see Appendix *Safety information*) must be filled in and signed by a responsible person.



**Danger of injury due to improperly secured parts!**

- Use suitable hoisting equipment designed to accommodate the weight and shape of the propeller agitator (e. g. excavator, crane).
- Persons must not remain under the load whilst lifting, transporting and lowering the propeller agitator.
- Never leave the load unattended when it is in a raised condition.
- Do not reach under the agitator when lifting or lowering it.
- Never grasp moving parts!

### Conditions for assembly

- The static and dynamic design of the container and the sliding mast with the adjustment equipment must be suitable for use with the submersible motor agitator.
- Depending on the installation situation, a work platform may be required for the operation of the agitator.
- Before drilling holes and making openings, the container wall must be checked for clamping and heating elements and similar.
- The container must be emptied or the substrate must be sufficiently lowered, ventilated and cleaned.

### Mounting the agitator mast with the control unit

- Mount the agitator mast with the support according to the manufacturer's instructions.
- Check the function of the mast.

### Mounting the submersible motor agitator



**Caution!** Danger of damage to the device

When introducing, assembling and attaching the agitator to the sliding mast, avoid contact of the propeller or damage to the connecting cable.

- Open the rear sliding rollers on the motor support,
- Suspend the Optimix securely on the motor support and lift it in the container onto the sliding mast, attach the sliding rollers and secure them so that they can still be rotated.
- Fasten the hauling cable to the motor support.
- Test the lifting and pivoting functions of the submersible agitator and limit them if necessary.
- Attach appropriate cable guide, making sure that the cable support is suitable for the cable diameter and that it does not impermissibly constrict the cable.

### Finishing the agitator installation

- Inspect the agitator for damage,
- Check the bolted connections with a torque wrench.  
(see *Tightening torques* in *Chapter 10*).
- Align the agitator in the desired position.

### Connect the power supply



**Hazard due to dangerous voltage!**

Any work on electrical equipment may **ONLY** be carried out by a qualified electrician.

The cable must be sufficiently dimensioned.

The submersible agitator must be integrated into the local potential equalisation system. All conductive parts must be earthed or connected to conductive parts. The bleeder resistance must be less than  $10^9 \Omega$ .

Potential equalisation currents or static charging are to be permanently avoided.

#### Creating electrical connections

The installation of the electrical equipment including the wiring is carried out by the installer and must take place according to the requirements from EN 60079-14. In particular, the protection of the motor and the gearbox against excessive heating up must be ensured in accordance with the specifications.

The electrical connection must be made by a specialist in accordance with the valid safety and accident prevention regulations. Relevant assembly and operating regulations (e. f. for cable cross-sections, fuses, protective conductor connection) must be taken into account. In potentially explosive areas, only approved screw connections and terminal boxes may be used.

The motor is to be protected by a suitable protection device against impermissible heating up; all poles of the motor are to be disconnected in both the standstill condition and in the case of tripping - e.g. by a combination of a motor protection switch (overload relay with phase-failure protection) and thermistor tripping unit.

PTC temperature sensors (thermistors) are integrated in the motor winding, which are provided for "Thermal Machine Protection (TMS)" in conjunction with a thermistor tripping unit. Thermal monitoring of the motor temperature using a thermistor tripping unit is necessary and ensures optimum motor protection in combination with an overload relay (over-current protection).

**Notice:** PTC thermistors have a maximum test voltage of 2.5 V (under no circumstances must 230 V be applied). The use of an operating hour meter for determining service intervals is recommended.

The electric motors with a rated voltage of 400 VΔ / 690 VY are suitable for a 6-pole start (star-delta) and also for a 3-pole start by means of soft start, frequency converter or direct start.

**Caution:** If the customer uses a frequency converter to control the agitator, then this must be suitable for operation in the applicable Ex zone.

For electrical connection, the Optimix submersible motor is equipped with a special microbe-resistant screened cable 7x4 + 2x1 mm<sup>2</sup>. The connecting wires bear numbers or colour codes (acc. to DIN 47100).

Designation	No.	Colour
U1	1	white
V1	2	brown
W1	3	green
U2	4	yellow
V2	5	grey
W2	6	pink
T1	7	black
T2	8	black

Figure 3: Colour code of cable identification)

For a 3-pole start in delta connection (400 V), the cable cores shall be bridged as follows:

U1+W2 to L1 | V1+U2 to L2 | W1+V2 to L3

## Cable screening

The connecting cable has a screen that is not connected inside the motor. The screen can be used for monitoring the cable insulation. Monitoring of the cable insulation is prescribed for cables that are fed through an ATEX zone 0.

## Connecting the submersible motor

- Check whether the electrical data of the agitator and control unit match.
- Connect the supply cable to the motor in clockwise direction.

## Check the direction of rotation of the motor

- By briefly starting the motor (trial operation) check the direction of rotation. Clockwise rotation should mean that the propeller has the correct rotational direction, but please check this to make sure. Looking at the front of the propeller, the rotation must be in clockwise direction.

## After completed installation

- Test the function of the motor circuit breaker.
- Check the proper assembly of the potential equalisation between the fermenter / container, agitator and distributor.

## 9 Stirring operation

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**Danger of personal injury and damage to property and the environment!**

It is essential to follow the safety instructions in chapter 2 *Safety*.

### Prerequisites

- The agitator may only be installed and operated in a horizontal position.
- The propeller must not be blocked by solid deposits.
- The propeller must always be fully submerged in the substrate during agitating. If necessary, a suitable monitoring facility must be installed on site.

During operation, pay attention to unusual noises and vibrations (e. g. caused by loose parts, damage to the motor, gear unit, bearing or shaft, vortex formation etc.).

The Optimix is equipped as standard for operation in one rotational direction, in clockwise direction (to the right), viewed from the propeller to the motor. A reversal of the direction of rotation, e.g. in order to free the propeller from vortices, is permitted in the case of the series-standard propeller type 'H' only in a manual and supervised operating condition. Operation of the propeller is only allowed in immaculate and fully functional condition.

**The agitator may not be operated under any circumstances if**

- maintenance and service work is being carried out,
- the agitator is damaged, or there is a suspicion that damage may be caused during operation,
- the sliding mast or the hauling cable fixture are not properly fastened or do not have the necessary strength quality for safe operation,
- the propeller is not or not fully submerged in the substrate.

If damage to or deterioration of the agitator or the fixing parts or the supply lines are discovered, or if non-hazardous operation is not guaranteed for some other reason, the agitator must be taken out of service immediately or, if applicable, must on no account be taken into service.

Foreign bodies in the stirring medium, such as twine, string and plastic tapes can cause imbalance of the propeller, which in turn can lead to a higher load on the bearings or to material fatigue. These foreign bodies can also cause early failure of the mechanical seal.

## General



### Notice

Vibration strengths  $v_{\text{eff}} \leq 3.5 \text{ mm/s}$  are normal during agitator operation. In the event of deviation from normal operation - e.g. increased temperatures, loud noises or vibration - the agitator should be switched off and checked for damage in case of doubt.

## Adjusting the agitating position



### Caution! Danger of damage to the device

Adjusting and changing the agitating position by lateral swinging or height adjustment may take place **only** when the agitator is stationary.

**Make absolutely sure that the hauling cable is always kept taut so that the cable cannot come into contact with the propeller. Never work with a damaged hauling cable.**

As the substrate to be agitated (particularly co-ferments) can be very different in its composition, a binding statement as regards optimal agitation cannot be made. How often and how long the agitator must run depends on the consistency of the substrate.

Based on experience, the best agitation results for avoiding floating layers is achieved, when the agitator is laterally swivelled to the left by approx.  $45^\circ$  and the top edge of the propeller is about 20 to 30 cm below the filling level. In case of thick floating layers, it is recommended to not process these in continuous operation but at intervals.

If several agitators exist, it is often recommendable to start them fairly simultaneously, in order to quickly achieve a rotary movement in the container; after this, the additional agitator can usually be deactivated. All agitators shall mix in one direction, not in opposite to one another.

A non-homogenous substrate often results from an insufficient agitator capacity, e.g. due to worn propellers or from the poor flow capability of the substrate due to a too high dry matter content (%TS). See Chap. 9 *Faults and troubleshooting*.

## 10 Faults and troubleshooting



Danger of personal injury and damage to property and the environment!

It is essential to follow the safety instructions in chapter 2 *Safety*.

Fault	Possible cause	Remedial action
No function	Motor or gear unit defective	Replace the geared motor or repair it (have it repaired).
	The RCCB has triggered	Check the connecting cable, replace if necessary (have replaced); dismantle the agitator and check for leak tightness (have checked); check circuit breaker.
	Motor circuit breaker has triggered	Switch the circuit breaker back to operating position, check cause if necessary (have checked);
	Safety switching device has triggered	Release control circuit, check cause if necessary.
	Control unit or electrical connection defective	Repair the control unit or electrical connection (have repaired)
	Propeller is blocked	Release the blockage by reversing the rotational direction.
	One or more phases missing	Check fuses, terminal box, power cable and motor connection.
Stirring power is too weak	Propeller worn	Determine wear on the basis of the power consumption and replace the propeller if necessary.
	Stirring time too short, breaks between too long.	Increase agitation intervals; optimise agitating position.
	Dry matter content of the substrate is too high.	Check substrate quantity, composition and solids content and dilute or reduce the addition of solids if necessary.
Motor burnt out	Motor circuit breaker incorrectly connected or adjusted	Replace motor (have replaced) and correctly adjust the circuit breaker.
	Motor incorrectly connected	Replace motor (have replaced) and connect correctly.
	Connecting cable is damaged	Replace the connecting cable (have replaced)





Fault	Possible cause	Remedial action
Electro-motor overloaded	Density of the substrate is too high.	Check the quantity, composition and solid content of the substrate and dilute it if necessary. Exchange the propeller.
	Poor cooling	Dry matter content of the substrate is too high Reduce substrate temperature.
	Substrate is clinging to the motor housing	Dry matter content of the substrate is too high, dilute it if necessary; Agitating power too low; if necessary replace the propeller (or have it replaced).
	Bearing defective.	Reduce substrate temperature.
	Voltage too low during operation	Check connecting cable (cross-section and length) supply voltage, power consumption.
	Foreign materials have wrapped themselves around the propeller	Remove foreign materials, possibly by briefly reversing the rotational direction.
propeller agitator runs unevenly	Propeller is damaged or distorted.	Replace the propeller (or have it replaced). Check the installation situation and remove any foreign bodies if necessary
	Foreign materials have wrapped themselves around the propeller	Remove foreign materials, possibly by briefly reversing the rotational direction.
Strange drumming noises on the agitator.	Propeller is catching the scraper	Check propeller bearing, replace if necessary, readjust scraper
Unusual operating noises	Loose parts	Retighten all nuts, bolts and screws
	Damage to the agitator	Call SUMA Customer Service or your dealer for assistance; if necessary, dismount the agitator and check it (or have this done).

## 11 Inspection and maintenance



**Danger of personal injury and damage to property and the environment!**

It is essential to follow the safety instructions in chapter 2 *Safety*.



**Warning of potentially explosive and flammable atmospheres!**

In order to avoid ignition sources of mechanically produced sparks caused by unlubricated operation of the planetary gear or the bearing flange, the oil level must be checked at regular intervals, every 2,000 hours of operation, but at least annually.



**Warning of potentially explosive and flammable atmospheres!**

Before dismantling the propeller agitator, make sure that no potentially explosive atmosphere exists for the entire duration of the work. Before working in potentially explosive areas, a permit (see Appendix *Safety information*) must be filled in and signed by a responsible person.

### Servicing Plan

Component	Checking	Check	Operating resources / remark
Propeller agitator	Function	Daily during operation	Also observe whether any unusual noises or vibrations occur.
	Cleaning	At least 2,000 operating hours per year	Free the agitator of wrapped or adhering foreign matter.
	Damage and corrosion	At least 2,000 operating hours per year	Repair (have repairs done) if necessary. Replace defective parts (have them replaced).
Sliding mast with support	Function	Daily during operation	Visual inspection, if necessary swivel the agitator
	Corrosion and firm seating	At least 2,000 operating hours per year	Repair (have repairs done) if necessary. Replace defective parts (have them replaced).
Hauling cable and cable guide	Damage	Upon each use, at least monthly	Visual inspection, if necessary lower and lift the agitator.
Connecting cable and cable guide	Damage, impermissible buckling	At least 2,000 operating hours per year	Visual inspection, if necessary, replace defective parts (have replaced).
Propeller	Damage and wear	As required, at least on a yearly basis	Replace if necessary
Planetary gear	Oil change	2,000 operating hours, at least every 2 years	See under <i>Changing the gear oil</i>
	Replace bearing		See under <i>Replacement of the bearings</i>
Bearing head	Oil change	2,000 operating hours, at least every 2 years	See under <i>Changing the gear oil</i>
	Replace bearing		See under <i>Replacement of the bearings</i>

## Tightening torques (for bolts in Nm)

- So that screws can maintain the stipulated tension force achieved by screwing in, the screws must only be tightened to the maximum permissible torque rating. If exceeded, the screw may be elongated and the tension force is lost.
- The following recommendation for tightening torques are calculated at an average friction coefficient of  $\mu_{ges}=0.14$ . Additional lubrication substantially changes the friction coefficient, so that tightening torques are reduced.

Bolt	M8	M10	M12	M14	M16	M20	M24
Quality A2/A4-70							
$\mu=0.10$	16	32	55	88	134	262	451
$\mu=0.14$	20	40	69	111	171	334	574

## Before maintenance work

- If the propeller agitator has to be dismantled for maintenance work, SUFFICIENTLY reduce the filling level in the fermenter!

## Inspection work

### Mechanical connections

- All mechanical connections must be secured against self-loosening. The propeller and moving parts must be checked regularly for free running and firm seating.

### Cleaning

- The agitator and the propeller should be inspected and freed of wrapped or adhering matter at regular intervals, but at least once per year.

### Corrosion

- Since the composition of the agitating medium can vary widely and may also be aggressive and abrasive, the agitator must be checked a year for corrosion and wear as a precaution. If necessary the damaged areas are to be repaired by a suitable silicone-based protective coating.

In rare cases, local corrosion can occur due to contact with liquid manure and fermenting substrates. This is usually attributable to an electro-chemical reaction (e.g. sulphur concentration, low pH value) or to potential equalisation currents (e.g. between equipment earthing and container earthing) or to microbial corrosion (e.g. due to additives in the animal fodder).



### Notice

The inspection work is to be carried out. The work is to be performed in accordance with BGV A3.

## Wear-related maintenance work

All moving parts, in particular bearings, shaft sealing rings and propellers, are subject to wear, which is dependent on the running time, the loading level and the operating conditions. Since operating conditions can be very different, the following are only recommendations for precautionary replacement.

## Oil change

An oil change in the planetary gear and in the bearing head must be carried out at the latest every 2,000 operating hours or at least every two years. The oil should be drained immediately after stopping the agitator, whilst still in a warm condition. 0.75 litres in the planetary gear and 0.2 litres of gear oil in the bearing head are required for re-filling.

Gear oil in accordance with SAE 85W-140 or API GL-5 is recommended.

The propeller must be dismantled to drain off the oil in the bearing head.

An oil change in the motor interior is not necessary, since the oil predominantly serves to cool the built-in motor.



## Notice

If the old oil in the gearbox or in the bearing head is in a very dirty condition, then these should be rinsed out before refilling with new oil. To do this, fill with the necessary quantity and operate the agitator briefly (up to 3 minutes), drain off the rinsing liquid completely and fill with a suitable gear oil.

The rinsing fluid can be a thin gear oil, a mixture of gear oil and diesel or only diesel. When using diesel as the rinsing fluid, the agitator must not be operated for more than 1 minute.



## Caution

The interior of the Optimix with the motor winding may not be rinsed under any circumstances with another liquid, as otherwise the insulation of the motor and the connecting cable could be damaged.

Oil batches	Motor housings	Planetary gear	Bearing flange
2A 135-380	3.0 litre AGIP OTE 68	0.75 litre SAE 85W140	0.2 litre SAE 85W140

## Exchanging the shaft seals

The service life of dynamically loaded shaft seals cannot be precisely evaluated, therefore it is recommended that all shaft sealing rings are replaced as a precautionary measure (1 in the motor and 1 in the planetary gear - see also Chapter 12 *Spare parts and orders*) after 8,000 operating hours at the latest.

## Replacement of the bearings

In order to ensure trouble-free operation, all bearings should be replaced before the nominal service life  $L_n$  expires: Data is given in hours of operation [h] and on basis of a regular oil change.

Optimix type	Motor bearing : 2 ball bearings 6208.C3	Planetary bearing 3 needle bearings K16x24x20	Propeller bearing 2 angular roller bearings 30207A
2A 135-380	40,000 h	20,000 h	20,000 h

## 12 Repairs

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**Danger of personal injury and damage to property and the environment!**

It is essential to follow the safety instructions in chapter 2 *Safety* and chapter 9 *Inspection and maintenance*.

### Replacement of the propeller

Wear is dependent on the running time and the substrate that is present. As the power consumption or current consumption is reduced with wear, we recommend that the propeller is replaced after reaching half of the rated current load at the latest. The conical spring washer (special lock washers) should be replaced at the same time. Take care when replacing that the mounting surfaces are clean.

After replacing the propeller, the scraper must be readjusted so that there is a gap of 1 - 2 mm to the edge of the propeller is given at both ends of the scraper plate.

### Renewal of the bearings

It is recommended to have the bearings in the bearing casing by the propeller replaced by the manufacturer or a specialist company.

### Replacing the gear unit

It is recommended to have the gear unit replaced by the manufacturer or a specialist company.

### Replacing the submersible motor

It is recommended to have the motor replaced by the manufacturer or a specialist company.

### 13 Spare parts and ordering

#### Structure of the Optimix complete with motor support

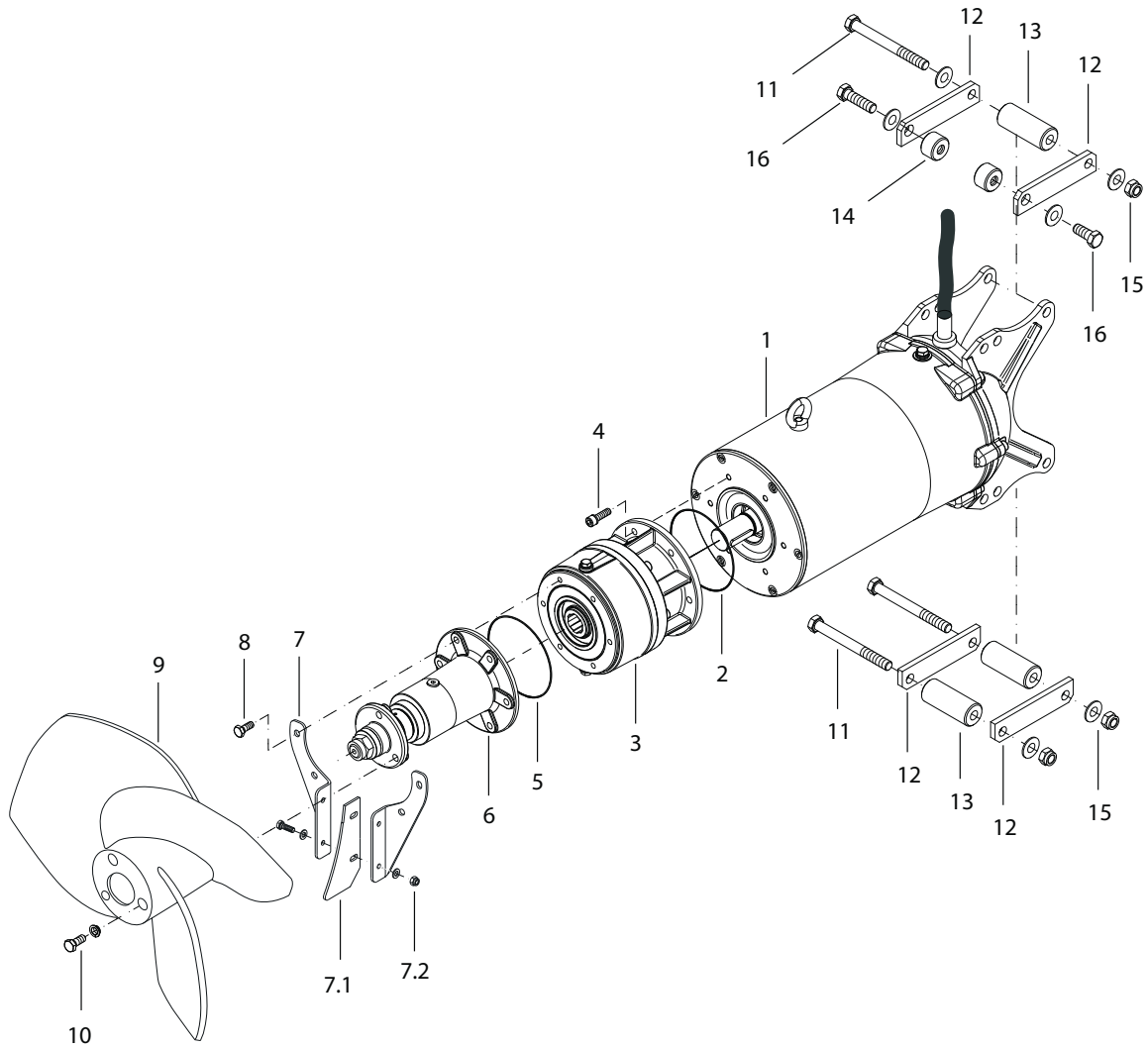


Figure 4: Structure of the Optimix with roller guide



## Structure of the Optimix complete with motor support

Item	Part no.	Quantity	Designation	Remarks
1		1	Submersible motor 13.5 kW with connecting cable	UG 150
2	61160	1	O-ring	Ø146 x 2 NBR
	61175		Flat seal Ø200 x 131 x 1	(as an option to the O-ring)
3	110367	1	Planetary gear cpl. type 5905-M3	1.4301 (ss304)
4	100274	6	Hexagon socket screw	M10x30 DIN 912 A2
	49525	6	Spring washer	Ø10 DIN 127 A2
5	60140	1	O-ring	Ø128 x 2 NBR
	60170		Flat seal Ø180 x Ø94 x 1	(as an option to the O-ring)
6	110369	1	Bearing flange F7 V2A, complete	with hub and mechanical seal
7	67010	1	Scraper holder	cpl. incl. item 7.1 and 7.2
7.1	67012	1	Scraper plate	V2A
7.2	100298	2	Hex-head bolt	M8 x 25 DIN 933 A2
	100458	4	Washer	Ø 8.4 DIN 9021 A2
	106377	2	Securing nut	M8 DIN 985 A2
8	100274	6	Hexagon socket screw	M10x30 DIN 912 A2
	49525	6	Spring washer	Ø10 DIN 127 A2
9	67062	1	Propeller H620 V2A	
10	103026	3	Hex-head bolt	M12 x 30 DIN 933 A2
	41366	3	Special spring lock washer	Ø12 A2
11	111384	3	Hex-head bolt	M16 x 170 DIN 931 A2
	108137	6	Washer	Ø17 DIN 125 A2
12	111386	4	Sliding rail PVC	for 100 mm square tube
13	103256	3	Sliding roller	Ø40 POM
14	110409	2	Guide roller	Ø40 A2
15	104596	3	Securing nut	M16 DIN 985 A2
16	106162	2	Hex-head bolt	M16 x 45 DIN 933 A2
	108137	2	Washer	Ø17 DIN 125 A2

Structure of the submersible motor

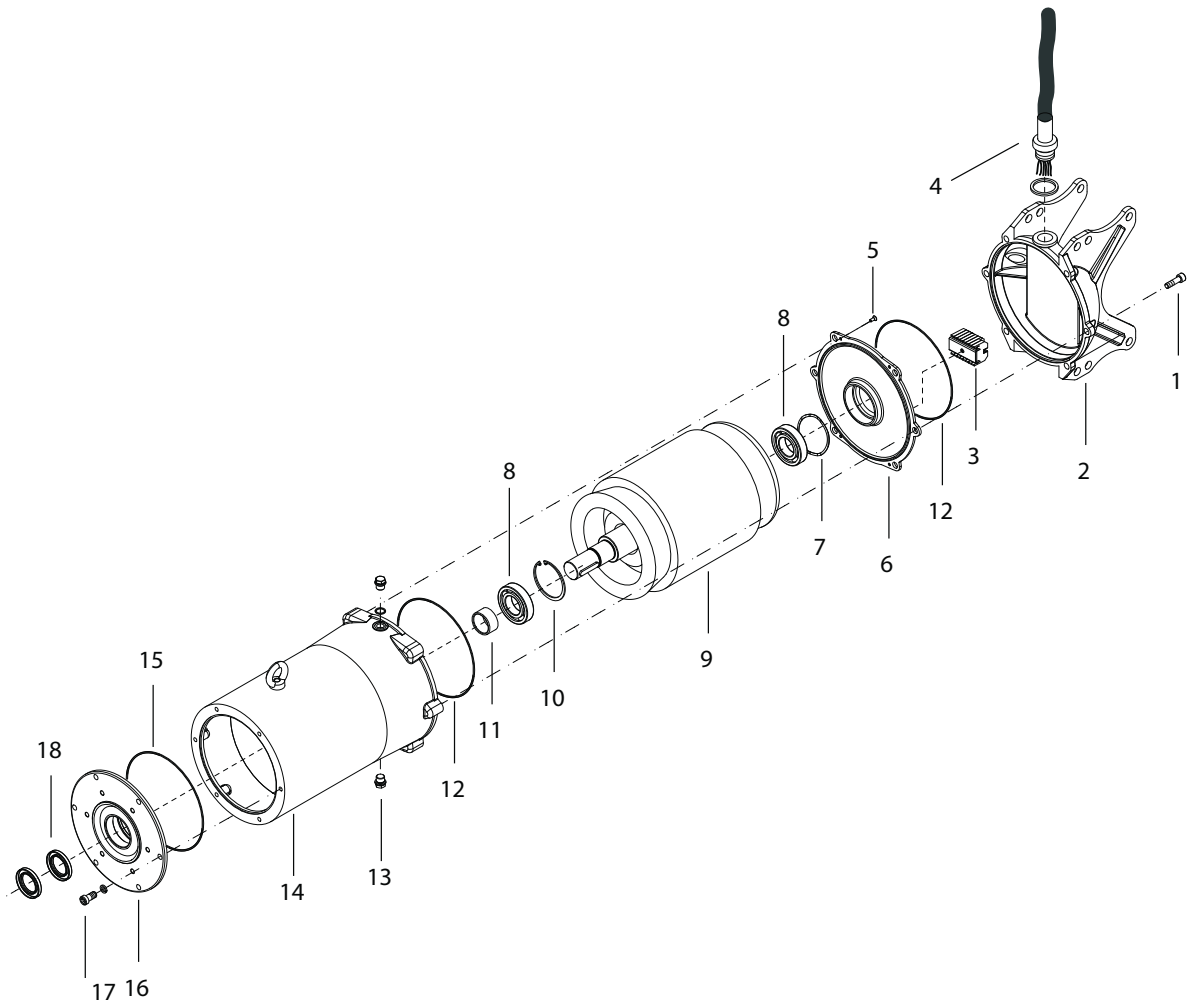


Figure 5: Structure of the submersible motor





## Individual items for submersible motor 13.5 KW

Item	Part no.	Quantity	Designation	Remarks
1	100276	6	Hexagon socket screw	M12 x 30 DIN 912 A2
2	105593	1	Roller cover	1.4301 (ss 304)
3	112371	1	Terminal block Ex "e"	BKA4-8
	112488	1	Mounting rail for terminal block	
	112283	2	Bolt	M3 x 20 DIN 912 A2
	112478	1	Bolt	M6 x 12 DIN 7985 A2
4	111383	1	Connecting cable 7x4+4x1 mm <sup>2</sup> , screened	
	65141	1	Cable gland "Ex"	
	100555	1	Sealing ring	Ø32 x Ø38 x 2 DIN 7603 Cu
5	111380	4	Countersunk Philips screw	M5 x 12 DIN 965 A2
6	105587	1	Bearing cover	1.4301 (ss 304)
7	64810	1	Wave spring washer	KAS 80
8	63810	1	Ball bearing	6208 DIN 672
9	65580	1	Built-in motor 13.5 kW	AF160L/4F-11
10	62510	1	Retaining ring	J80
11	65630	1	Wearing ring	40 x 45 x 20
12	109612	2	O-ring	Ø246 x 2 NBR
13	106002	2	Sealing plug	M16 x 1.5 DIN 910 A4
	106384	2	Sealing ring	Ø16 x Ø20 x 2 DIN 7603 Cu
14	105589	1	Motor housings	1.4301 (ss 304)
15	109614	1	O-ring	Ø200 x 2 NBR
16	105588	1	Motor flange	1.4301 (ss304)
17	105470	6	Hexagon socket screw	M10x20 DIN 912 A2
	100269	6	Spring washer	Ø10 DIN 7980 A2
18	65610	2	Shaft sealing ring	45 x 65 x 7 BABS

Structure of planetary gear type 5905 M3 and bearing flange F7

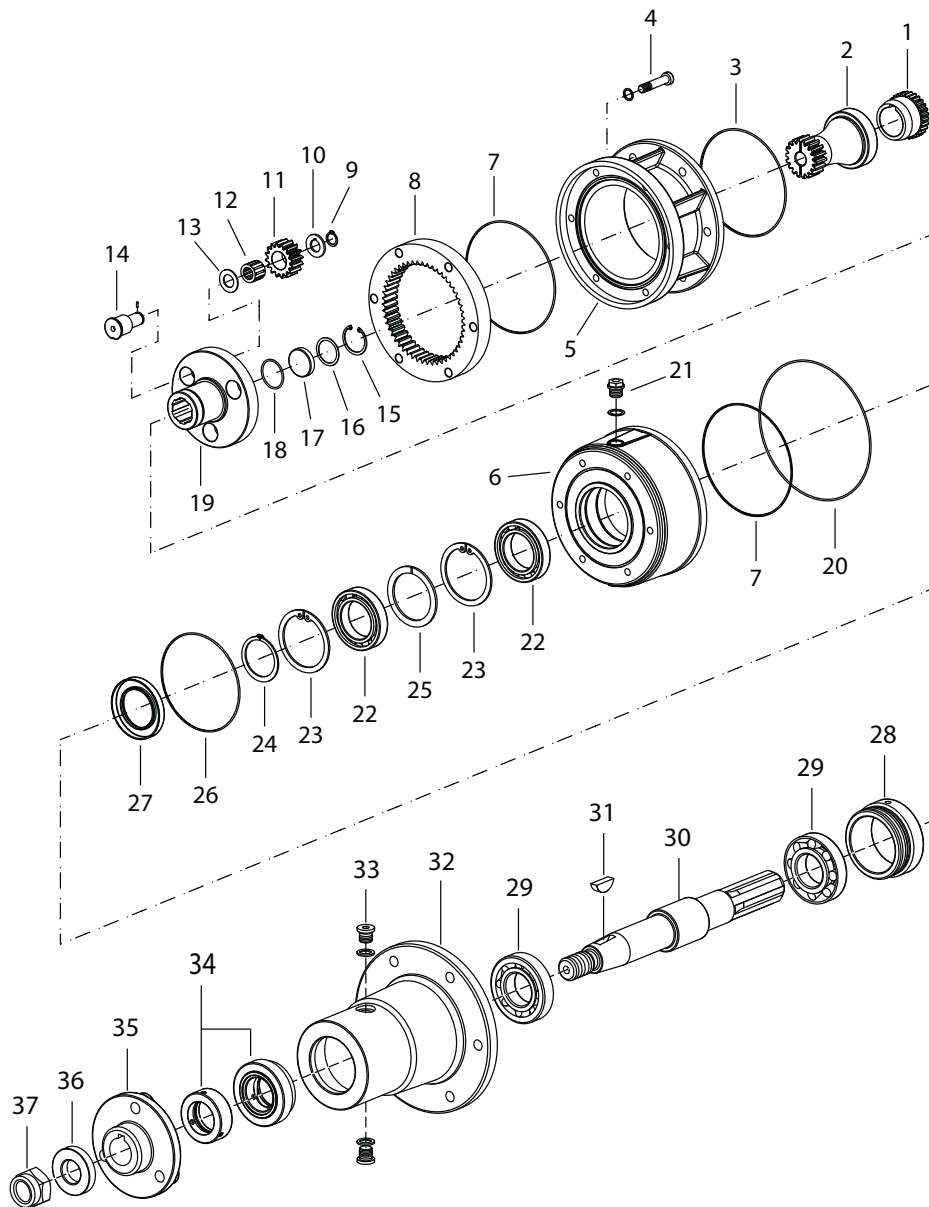


Figure 6: Structure of planetary gear with bearing flange F7

Parts list for Planetary gear type 5905-M3

Item	Part no.	Quantity	Designation	Remarks
1	61044	1	Profile bushing M3	for motor shaft Ø 38
2	61052	1	Sun gear	for profile bushing
3	61180	1	O-ring	Ø 146 x 2 NBR
4	100361	6	Bolt	M 10 x 50 A2 DIN 912
	100269	6	Spring washer	Ø 10 DIN 7980 A2
5	105586	1	Gear unit housing	1.4301 (ss304)
6	105585	1	Gear unit flange	1.4301 (ss304)
7	61160	2	O-ring	Ø 146 x 2 NBR
8	61070	1	Internal gear	
9	61190	3	Retaining ring	J 16 DIN 472
10	61090	3	Contact washer	
11	61060	3	Planet gear	
12	61130	3	Needle roller cage	K 16 x 24 x 20 DIN 5405
13	61110	3	AX disk	AS 1730
14	61080	3	Bolt	
	61230	3	Clamping sleeve	Ø 2 x 6
15	61210	3	Retaining ring	A 37 DIN 471
16	61300	1	Shim ring	Ø 37 x 0.1 / 0.1 / 0.2 / 0.5 (set)
17	61100	1	Washer	
18	61150	1	O-ring	Ø 37 x 2 NBR
19	61030	1	Planet carrier	
20	61170	1	O-ring	Ø 182 x 2 NBR
21	110412	2	Sealing plug	M18x1.5 DIN 910 A2
	49521	2	Sealing ring	Ø18 x Ø22 x 1.5 DIN 7603 Cu
22	61120	2	Ball bearing	6010.C3 DIN 625
23	61220	2	Retaining ring	J80 DIN 472
24	61200	1	Retaining ring	A50 DIN 471
25	61280	1	Support disk	Ø80 x 3.0
26	61140	1	O-ring	Ø 128 x 2 NBR
27	61310	1	Shaft sealing ring	50x80x10 BA

Parts list for bearing flange F7

28	61420	1	Threaded ring	
29	40800	2	Taper roller bearing	30207-A DIN 720
30	40280	1	Conical shaft Ø35	16MnCr5 hardened
31	41200	1	Woodruff key	
32	105592	1	Bearing flange F7	1.4301 (SS304)
33	106004	2	Sealing plug	G1/4 DIN 908 A2
	100553	2	Sealing ring	Ø14 x Ø18 x 1.5 DIN 7603 CU
34	61430	1	Mechanical seal	Ø 35 - SiC / SiC cpl.
35	41355	1	Propeller hub	1.4305
36	41405	1	Washer	1.4305
37	41505	1	Securing nut	M24 DIN 985 A2





## 15 Biogas - Safety information



### Biogas characterisation

Biogas is a colourless fermentation gas which is insoluble in water and which is produced by the anaerobic decomposition of biomass, such as liquid manure, sewage sludge or biowaste. In general, it contains between 40 % and 75 % methane and between 20 % and 50 % carbon dioxide, in addition to hydrogen sulphide as a trace gas in concentrations of 10 ppm up to maximum 1 % (generally 0.01 % - 0.4 %), depending on the fermented material. Biogas may also contain various esters, organic sulphur compounds, alkyl benzenes and ammonia (up to 30 ppm) in addition to hydrogen, nitrogen and carbon monoxide, and sometimes may contain suspended matter.

Biogas must be identified with the symbols Xn (harmful to health) and R 20 (harmful to health on inhalation) from a hydrogen sulphide concentration of 200 ppm upwards. No classification on the basis of the hydrogen sulphide content is foreseen below this concentration. Nevertheless, gas mixtures containing hydrogen sulphide are harmful even below the mandatory identification content: consequently, even 50 ppm hydrogen sulphide content causes irritation to the eyes and respiratory tracts. Severe poisoning with the risk of unconsciousness and death can be anticipated from a concentration of 700 ppm (0.07 %) upwards.

The ignition temperature of biogas is around 700 °C (methane: 595 °C), the lower explosive limit is approx. 6 % by volume biogas (methane: 4.4 % by volume) and the upper explosive limit is approx. 12 % by volume biogas (methane: 16.5 % by volume).

### Three substance diagram

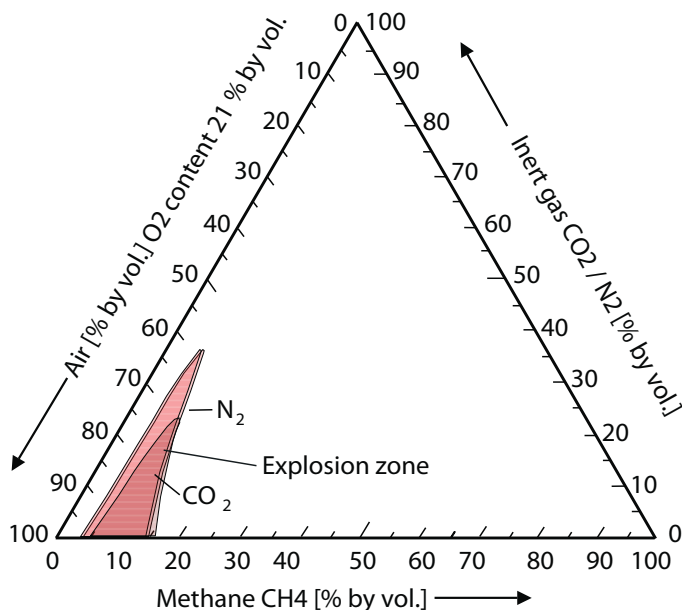


Figure 1: Three substance diagram for the methane/air/CO<sub>2</sub>-N<sub>2</sub> mixture explosive zone (according to Tabasaran / Rettenberger (UBA - research report 12/1982, no. 10302207 part 1))

Biogas is somewhat lighter than air and forms a potentially explosive atmosphere with air. Increased risk of explosion can be anticipated in the presence of sources of ignition, such as hot surfaces, naked flames, mechanically/electrically produced sparks, electrostatic discharges and lightning strikes.

When heated/combusted, the biogas produces hazardous gases (e.g. carbon monoxide, sulphur dioxide, sulphur trioxide and formaldehyde).

The material resistance is greatly dependent on the trace gas content, e.g. hydrogen sulphide.

Depending on the concentration, temperature and humidity, hydrogen sulphide attacks most metals and plastics. Stainless steels of grade 1.4301 (AISI 304) are resistant to a certain extent and stainless steels of grade 1.4571 (316) are largely resistant, as are plastics such as PE, PTFE, PP or polyisobutylene.

## 16 Permit for work in potentially explosive areas

Mark the applicable with a cross. Strike through the non-applicable parts in marked lines.

Permission for welding, burning and other work that generates sparks, for drilling, grinding, hammering and mortising work, and for the employment of devices that are not explosion-proof.

A

1. Client: ..... Building: ..... Tel.: ..... Foreman: .....
2. Place and type of work .....
3. Permission from ..... o'clock, until ..... o'clock, for the time .....
4. For workplace/company ..... Building ..... Foreman .....

B

### Dangerous places in the vicinity

	of the workplace, buildings, apparatuses etc.	Responsible person	Building	Telephone
1.				
2.				
3.				
4.				

C

### Safety measures

to be carried out by: ..... done

1. Examination of pipes and apparatuses in the vicinity of the workplace for leaks .....
2. Fire extinguishers and other safety measures
  - a. Provision of fire fighting water, fire extinguishers at the workplace .....
  - b. Connect fire brigade hose .....
  - c. Appoint safety supervisors .....
  - Contractor       Member of staff       Supervisor       Fireman
  - d. Elimination of inflammable materials, vapours, gases or dust deposits .....
  - e. ....
3. Marking of the workplace (road, railway track etc.)
  - a. By means of red flags (20 m on both sides of the workplace) .....
  - b. By means of signs (e.g. fire work on pipe bridge) .....
  - c. Cordoning off, bypass for tank trucks, blockage for railway vehicles .....
4. Securing the vicinity against welding sparks
  - a. Covering the neighbouring lines .....
  - b. Erect protective wall, protect roof cladding, possibly keep damp .....
  - c. Stop work when there is train traffic .....
  - d. Maintain a minimum distance to flammable tankers, tank farms etc. of      m .....
  - e. Cover or seal pipe penetrations, gratings, light shafts and sewer manholes .....
  - f. ....
5. For work in and on containers, apparatuses, pits, pipelines, on removed plant parts, in confined rooms etc. additional measures for:
  - a. Permission to drive in ..... No. .... of .....
  - b. Work permit ..... No. .... of .....
  - c. Safety certificate for electrical equipment ..... No. .... of .....
  - d. ....
6.
  - a. Report daily before commencing work in the case of B 1, 2, 3, 4. ....
  - b. Report the end of work daily in the case of B 1, 2, 3, 4. ....
7.
  - a. Marked safety measures checked by (name) .....
  - b. Workplace checked after completion of the work by (name) .....

D

### Agreement of the responsibilities for the dangerous places

Beginning of work reported ..... on: ..... to: .....

For B 1 measures C number .....

For B 2 measures C number .....

For B 3 measures C number .....

For B 4 measures C number .....

Permit issued .....

Date

Signature of the works manager

## 17 Extract from the German regulations for the prevention of accidents with regard to liquid manure storage, pits, sewers and wells (VSG 2.8)

### § 1 Basic principles

This accident prevention regulation applies to the storage of liquid manure as well as for the erection, the setting-up and the operation of pits, sewers and wells.

#### Performance directive for § 1

1. Pits include, for example, containers, foil-lined ground basins for liquid manure storage (lagoons), basins and other depressions.
2. Watering and drainage channels are not sewers in this sense.
3. Wells include, for example, well chambers, inspection manholes, rainwater catchment basins, water basins, street-side basins.

### § 2 Prevention of falling in

The entrepreneur must ensure that

1. pits, sewers and wells are secured against persons falling in by means of protection devices or covers. If these are not deeper than 1 m, other safety measures are sufficient.
2. foil-lined ground basins and rainwater catchment basins are equipped with aids for climbing out for people who have fallen in.

#### Performance directive for No. 1

1. Open slurry and liquid manure pits, foil-lined ground basins and rainwater catchment basins are as a rule secured against falling in if they have a closed, impassable safety device with a height of 1.80 m and a 30 cm high kerb exists at removal and agitation points.
2. Another safety measure is a flat slope, for example.
3. Foils and similar covers are not considered to be protection against the falling in of persons.
4. You are referred to the accident prevention regulations 'Workplaces, physical structures and facilities' (VSG 2.1) and the state building regulations.

#### Performance directive for No. 2

The following are considered to be aids for climbing out, e.g. steps, ladders or rescue routes made of tyres tied together with polyester ropes. The distance between the aids for climbing out should not exceed 20 m.

### § 3 Openings

The entrepreneur must ensure that

1. persons cannot fall into the removal, entrance or similar openings
2. receiving basins sunk into the ground are covered or protected by non-slip gratings that can bear the weight of a vehicle if necessary,
3. pits with receiving facilities, into which the loads of vehicles or transport containers are emptied, are provided with a base and a parapet; it may be possible to open or move the parapet at the filling place, but not to remove it,
4. pits, sewers and wells that are normally climbed into must be equipped with devices that enable climbing inside without danger. The openings must be dimensioned so that the rescue of accident victims is possible.
5. suitable tools are used for the safe removal and refitting of manhole covers.

#### Performance directive for No. 1

The opening can be secured, for example, by a non-slip grating which, if necessary, is capable of bearing the weight of a vehicle. Opened well chambers and inspection manholes can be secured e.g. by suitable cordoning-off measures.

#### Performance directive for No. 4

1. Safe entering is possible e.g. via ladders, manhole steps and insertable support rods at the entrances. The opening width should be at least 80 cm. You are referred to the accident prevention regulations 'Workplaces, physical structures and facilities' (VSG 2.1).
2. With regard to the openings in closed liquid manure containers, you are referred to DIN 11 622-1 'Silage silos and liquid manure containers; dimensioning, execution, composition; general requirements'.

#### Performance directive for No. 5

Suitable tools are, for example, cover jacks.

### § 4 Entering and rescuing accident victims

(1) The entrepreneur must ensure that

1. only persons who are aware of the associated dangers climb into pits, sewers and wells,
2. the necessary aids for securing the persons entering are kept near to the entrance area and that the secured persons are familiar with the handling of the aids.

#### Performance directive for paragraph 1 no. 1

There is a danger of asphyxiation, poisoning, fire or explosion in pits, sewers and wells due to

- biological processes (fermentation, rotting), in particular in the case of a damp and rotten substrate or if pits and sewers contain faeces,
- defective supply lines (natural gas),
- chemical reactions.

(2) Before entering and during the stay in pits, sewers and wells, it must be ensured that

- there is no danger of poisoning,
- there is sufficient breathing air,
- operating equipment is reliably secured against being switched on.

#### Performance directive for paragraph 2

Sufficient breathing air is to be determined e.g. by the examination of the atmosphere with an appropriate measuring instrument; it can also be manufactured by the adequate exchange of air (air supply and exhaust).

(3) Entering is permissible only if a second person above ground is within the range of vision. The person entering is to be secured in such a way that his rescue is possible at any time.

(4) The entering of liquid manure pits is permissible only if the person entering is roped up and the rope is anchored outside the liquid manure pit and the person entering is secured by two further persons.



## Performance directive for paragraph 4

The same safety measures may also be necessary in the case of deep liquid manure channels.

- (5) Entering in order to rescue accident victims is permissible only if the person entering is secured in such a way that he can leave the danger area himself at any time and uses suitable breathing aids.

## Performance directive for paragraph 5

1. The requirement for the protection of the person entering is to be regarded as fulfilled, if
  - one person secures the person entering with roping and rescue lifting equipment (tripod) in connection with rescue belts and safety ropes,
  - two further persons secure the person entering with a rope that is firmly anchored outside.
2. Breathing aids are, for example, breathing apparatus that is independent of the environment atmosphere, such as
  - oxygen self rescuer (oxygen-fed escape hood),
  - fresh air suction hose devices.

- (6) Open flames are not permitted.

## **§ 5 Containers and ducts for animal faeces**

- (1) The entrepreneur must ensure that

1. Noxious gases from pits and ducts in the open air are prevented by suitable measures from flowing into buildings,
2. Closed pits have non-closable ventilation openings to the open air on the opposite sides,
3. Noxious gases in pits and ducts in buildings are exhausted by suitable means,
4. Ducts must be designed such that unnecessary dispersion of the faeces is avoided.
5. Operating consoles of stirring, pumping and rinsing equipment must be installed above ground.
6. Closed rooms in which operating consoles are located must not have openings into containers and ducts.
7. Operating instructions are permanently attached to the operating consoles,
8. Above-ground containers that have to be ascended to for operation are equipped with ladders and work platforms.

## Performance directive for paragraph 1 no. 1

1. The noxious gases include in particular hydrogen sulphide, methane, ammonia and carbon dioxide.
2. Suitable measures are, for example, siphons, evaporating shafts and tightly closing valves or rubber aprons in the ducts between pits and buildings, whose function is checked at regular intervals.

## Performance directive for paragraph 1 no. 2

With regard to the openings, you are referred to DIN 11 622-1 'Silage silos and liquid manure containers; dimensioning, execution, composition; general requirements'.

## Performance directive for paragraph 1 no. 3

Suitable measures and equipment for ensuring the extraction of noxious gases are, for example

- opening of doors, gates and windows,
- stable ventilators, which extract the gases immediately above the floor,
- positive air pressure systems in sealed stables, in which the positive pressure forces the gases via exhaust ducts into the outside air.

## Performance directive for paragraph 1 no. 8

With regard to the vertical ladders and work platforms, you are referred to DIN EN ISO 14122 'Safety of machines, fixed entrances to mechanical plants'

- (2) Agitating, pumping and rinsing equipment in buildings may only be switched on if the forced extraction of the noxious gases is ensured. The extracted gases must not endanger persons.

## Performance directive for paragraph 2

1. The requirement is considered to be fulfilled in the case of self-activating agitating, pumping and rinsing equipment if the facility for the extraction of the noxious gases switches on compulsorily upon the start-up of the agitating, pumping and rinsing equipment and switches off only after completion of the work process. In all other respects you are referred to the performance directive for paragraph 1 number 3.
2. Endangerment of persons is not to be expected if the extracted gases are released into the outside air at a minimum height of 2 m above the ground.

## **§ 6 Removal of animal faeces from pits and ducts**

- (1) Smoking and naked flames are not permitted in the immediate vicinity of removal openings during stirring and removal of faeces; sparks are to be avoided.
- (2) During stirring and removal of faeces, persons and animals may only remain in buildings in which open containers and ducts are located if sufficient ventilation is ensured.

## Performance directive

You are referred to § 5 paragraph 1 number 3 including the performance directive.

## **§ 7 Warning signs**

The entrepreneur must ensure that warning signs indicating the dangers due to gases are attached in clearly visible places at the openings of pits and ducts.

## Performance directive

1. Examples of the wording of warning signs:

- At removal, exhaust and entrance openings: 'Caution! Danger of poisoning!' 'Caution! Danger of explosion!'
- At access openings: 'Entry only if ventilation is switched on' 'Attach a rope to yourself before entry'
- In the door or gate area of stables: 'Remaining in the building during the agitation and removal of liquid manure is deadly dangerous.'

2. You are referred to the accident prevention regulation 'Health and safety protection marking' (VSG 1.5).

...

## 18 Checklist for initial commissioning



**Notice:** In accordance with the German Device and Product Safety Act (Geräte- und Produktsicherheitsgesetz - GPSG), technical work equipment (machines, plants), among other items, may only be put into operation if conformity with Machine Directive 98/37/EU has been established. This means that, for technical work equipment which has been changed, installed on site and/or combined with third party parts, conformity with directive 98/37/EU must be established in order for them to be put into operation.

User	
Address	
Post Code/Town	
Telephone	
Machine type/no.	

Item	Guidelines for evaluation for the initial commissioning*.	Yes	Remark:
1	Are all documents (declaration of conformity, operating instructions) complete, in the national language and accessible?	<input type="checkbox"/>	
2	Will use be for the intended purpose according to the documentation (declaration of conformity, operating instructions)?	<input type="checkbox"/>	
3	Have all safety and installation specifications in the operating instructions been observed / implemented?	<input type="checkbox"/>	
4	Has the assembly been carried out correctly and checked (torques, seals, fixings)?	<input type="checkbox"/>	
5	Is there sufficient protection against mechanical hazards due to crushing, shearing, cutting, being caught up or pulled in, knocks and abrasion?	<input type="checkbox"/>	
6	Is there sufficient protection against electrical hazards due to short circuit, overload, fault conditions, touching live parts and electrostatic discharge?	<input type="checkbox"/>	
7	Is there sufficient protection against noise, vibrations, heat and hazardous substances?	<input type="checkbox"/>	
8	Is safe, proper use and non-hazardous operation ensured? (check by test operation if necessary)	<input type="checkbox"/>	
9	Have all sources of ignition been removed from the vicinity of the agitator or are they avoided?	<input type="checkbox"/>	

\* Depending on the scope and hazard potential of the technical equipment, a detailed evaluation procedure may be necessary when putting into operation for the first time.

Responsible for installation / assembly:	Responsible for electrical installation:	Responsible for putting into operation:



## 19 EC declaration of conformity

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Declaration of conformity within the meaning of the directive 94/9/EC

Manufacturer           SUMA Rührtechnik GmbH  
                                  Martinszeller Str. 21  
                                  87477 Sulzberg / Germany

Product designation:   **Optimix A2 135-380**

Product description:   The agitators of type Optimix 2A are designed for the agitation, mixing and homogenisation of biological liquids, such as liquid manure, sewage sludge or renewable raw materials. A suitable operating and mounting device is required for the use of the agitators.

We hereby we declare on our sole responsibility that the SUMA agitators of the type Optimix comply with the health and safety requirements, for use as intended according to the directive mentioned:

Harmonised standards applied:

EN 12100-1	EN 13463-1	EN 13463-8	EN 60079-7
EN 12100-2	EN 13463-5	EN 60079-0	EN 60079-14

Other applied Directives (each in the currently valid version):

98/37/EC	2006/95/EC
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The identification plates of the devices contain the following information **CE** **Ex** II 2G Ex cek IIA T3 5°C<Ta<52°C

This declaration of conformity applies only to devices and accessories made by SUMA if

- the specifications in the operating instructions are complied with in every particular and
- the agitators are operated in the composition and with the accessories designed by SUMA.

If alterations, installation into or combination with other machines, devices or components take place, then commissioning is prohibited until such time as the conformity of the end product to Directives 94/9/EC and 98/37/EC (or 2006/42/EC respectively) has been confirmed.

This declaration is not a guarantee of properties within the context of product liability laws.

Sulzberg, 08.10.09

SUMA Rührtechnik GmbH

(Paul Thürwächter)  
Executive Manager



SUMA Rührtechnik GmbH

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