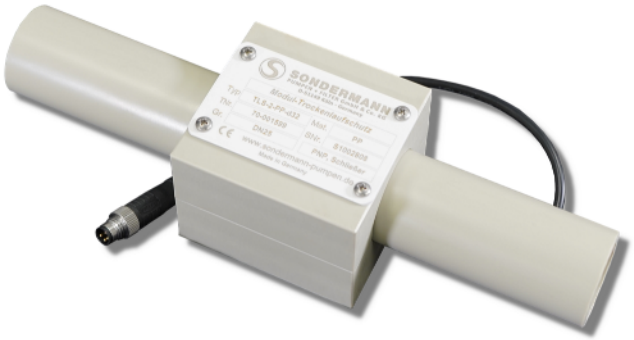
More than just pumps

For protection against dry running and low liquid level monitoring - sensor TLS

Operation Manual

TLS Type 1

TLS Type 2



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1. Basic Information

1.1 Notes on the operating manual

This operating manual has been prepared to meet all product-specific and user-related requirements of the law and of all relevant regulations and rules, technical standards, directives and agreements.

The manual includes important information on the functioning of MAGSON magnetically coupled centrifugal pumps and how to use, install, service and dispose of them.

In the following, the magnetically coupled centrifugal pumps are referred to as “pump”.

Before putting the pump into operation, carefully read the operating manual and make sure that it is always ready at hand to all users of the pump.

Complying with all instructions of this operating manual is an essential prerequisite to guarantee the safe operation and maintenance of the pump.

Make sure that all operators and service technicians have fully read and understood the manual before they start working at or with the pump.

1.2 Validity of data

All technical data, dimensions and indications of weight etc. were valid at the day when this manual went to press. Specifications listed here may differ from the actual design of the pump but will not modify any relevant information in principle.

1.3 Purpose

The dry-running sensor TLS Type 1 or TLS Type 2 is used to detect air bubbles in liquid-filled pipelines. With type 1, the liquid flows directly through the sensor module. Pay attention to the resistance of the materials used to the media used. For the materials used, see data sheet / nameplate.

With type 2, the sensor module is clamped onto existing pipe.

1.4 Use to the intended purpose

The following scenarios are considered misuse:

- # it is used other than to the intended purpose
- # it is operated beyond its defined limits

1.5 Limit of use

Suitable media	: Liquids with a conductivity up to 50 mS/cm For chemicals, please go to the resistance list Note the built-in materials.	
Max. fluid temperature (type 1)	: PP 80°C	PVDF 90 °C
Max. pressure (type 1)	: 6 bar	

Additional limits

Ambient temperature	: 0 °C – +40 °

1.6 Warranty and liability

The pump must only be used to the intended purpose specified by this operating manual. Inappropriate operation or insufficient service and maintenance will cancel the right to all warranty claims.

1.7 Contact details

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2. Safety

2.1 Personal qualification and training

The personnel for operation, maintenance, inspection and assembly must have the appropriate qualifications for this work.

The area of responsibility, competence and the supervision of the personnel must be precisely regulated by the operator. If the personnel do not have the necessary knowledge, they must be trained and instructed. If necessary, this can be done by the manufacturer / supplier on behalf of the operator of the machine. The operator must also ensure that the personnel fully understand the contents of the operating instructions.

2.2 Dangers if the safety instructions are not observed

Failure to observe the safety instructions can endanger people as well as the environment and the machine. Failure to observe the safety instructions can lead to the loss of any claims for damages.

In detail, non-observance can, for example, result in the following hazards:

- Failure of important functions of the machine / system.
- Failure of prescribed methods for maintenance and repair.
- Danger to people from electrical, mechanical, magnetic and chemical effects.
- Endangerment of the environment through leakage of dangerous substances.

2.3 Safety conscious working

The safety instructions listed in these operating instructions, the existing national regulations for accident prevention as well as any internal work, operating and safety regulations of the operator must be observed.

2.4 Safety instructions for operators / users

Risks from electrical energy are to be excluded (for details, see e.g. the regulations of the VDE and the local energy supply companies)

2.5 Unauthorized modification and manufacture of spare parts

Modifications or changes to the machine or the device are only permitted after consultation with the manufacturer. Original spare parts and accessories authorized by the manufacturer ensure safety. The use of other parts can void liability for the resulting consequences.

2.6 Inadmissible modes of operation

The operational safety of the machine or device supplied is only guaranteed if it is used as intended in accordance with Section 1 "General" of the operating instructions. The limit values specified in the data sheet must not be exceeded under any circumstances.

2.7 Standards and directives

Name	Contents
2006/42/EG	Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/ECG (recast) (1)
2014/30/EU	Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast)

Tab. 1: European Directives

Name	Contents
EN 61000-6-4:2007+ A1:2011	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
EN 61000-6-2:2005/ AC:2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN ISO 12100:2010-11	Safety of machinery – General principles for design - Risk assessment and risk reduction (ISO 12100:2010)
EN 60204-1:2006/ AC:2010	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Tab. 2: EN Standards

2.8 Depiction of safety instructions

All safety instructions of this document are marked with symbols designed on the basis of the SAFE principle. Each of them describes the kind and source of danger, possible consequences and information on how to avert them.

DANGER
The symbol warns you of a potential accident resulting from ignoring safety or other instructions. The accident will cause serious and maybe even mortal injuries or death when touching a high-voltage electrical equipment, for example.

WARNING
The symbol warns you of a potential accident resulting from ignoring safety or other instructions. The accident may cause serious and maybe even mortal injuries or death when touching a high-voltage electrical equipment, for example.

CAUTION
The symbol warns you of a potential accident resulting from ignoring safety or other instructions. The accident may cause slight injuries like burns, injuries of the skin and bruises, for example.

ATTENTION
The symbol warns you of a potential material damage.

NOTE
The symbol indicates an important information.

2.9 Symbols used

Symbol	Meaning
↗	Cross-reference such as "see chapter xx", "see page yy"

Tab. 3: Symbols used

3. Technical Information

3.1 General description

The dry running sensor type is used to detect air bubbles in liquid-filled pipelines. This makes it possible to recognize whether, for example, a pump is sucking in air instead of medium and thus running dry. An empty storage tank can also be detected in this way.

The medium in the pipeline must be conductive so that the sensor can work. The built-in sensor works without contact and does not have to be in direct contact with the medium.

To protect pumps from running dry or to report empty, it is recommended that the TLS sensor be installed in the suction line directly in front of the suction port of the pump.

Two different versions are available:

3.2 TLS Type 1:

The TLS Type-1 is a module made of PP or PVDF, which is installed in the pipeline. For this purpose, the dry-running protection module has corresponding connections on both sides (thread or union nut or flange).

Since the actual sensor works without liquid contact, the nominal cross-section is fully available as a free passage and no additional pressure loss is generated.

3.3 TLS Type 2:

The TLS type-2 is a module made of PP, which is clamped on an esisting pipe.

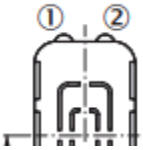
The pipe itself must not be conductive (do not use steel this sensor for steel pipes). The sensor detects without liquid contact whether there is air or air bullbes inside the pipe.

3.4 How it works

The sensor built into the TLS module detects the electrical field that occurs when the liquid flows through the pipe. This field changes if the liquid contains air bubbles or foam and reports this to the evaluation unit / control.

The sensor works in a protected and contactless manner outside of the liquid flow. This means that the sensor has no resistance in the pipeline and does not generate any additional pressure loss.

The actual sensor has 2 LED lamps to indicate the operating status:



1) LED color yellow: detecting liquid
2) LED color green: Power supply

When the yellow LED lights up, the sensor signals: Medium present
When the green LED lights up, the sensor signals: Power supply on

3.5 Name plate

In addition to the type designation, the nameplate shows the material and the serial number.

With the TLS Type 1, please check the resistance of the media to the specified materials. We would be happy to provide you with a resistance list for this purpose.

4. Transport and temporary storage

4.1 Transport

1. Unpack the device upon receipt and check for transport damage.
2. In the event of transport damage, the transport company must always carry out an inventory of the facts.
3. Ensure that the information on the nameplate corresponds to the order / design data.
4. Dispose of packaging material in accordance with locally applicable regulations.

4.2 Temporary storage

Intermediate storage must be dry.

Temperature: -10 ° C to 45 ° C

Air humidity: max. 95% rel. Humidity, non-condensing

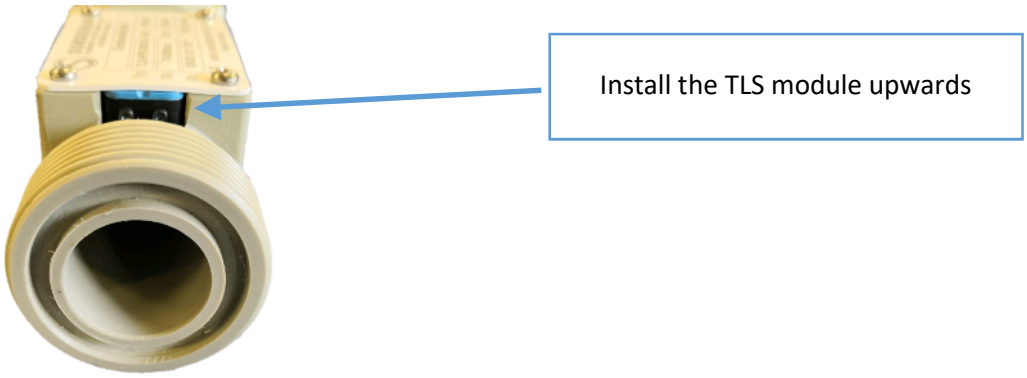
5. Installation

5.1 Installation instructions

Ideally, the sensor is installed in front of the suction port of the pump in the suction line. A certain direction of flow does not need to be taken into account.

The preferred installation position is horizontal with the sensor unit facing up. If the sensor unit is oriented downwards, malfunctions are possible (air bubbles are not recognized).

Vertical or inclined installation is also possible.



5.1.1 TLS Type 1

Type 1 has to be installed within the pipe. Connection with thread or flange (depends on execution). Please be aware to use chemical resistant Gaskets or O-Rings.

5.1.2 TLS Type 2

Type 2 is clamped at existing pipe. Clamp the two half-shells over the existing pipe using the screws provided so that the sensor unit is oriented upwards.

Make sure that:

- Outer diameter of the pipe matches the nominal size of the sensor
- Pipeline is not conductive (do not use steel pipes)
- There are no deposits within the pipeline
  (can cause malfunctions)

6. Electrical Connection

NOTE
Qualified personnel only are allowed to connect the control unit.
The electrical connection and the additional protection must be carried out by a specialist in accordance with the local regulations of the EVU or VDE.

WARNUNG
Electrical hazard from touching parts that have become live due to faulty conditions

Fasten loose connctions, replace damaged wires immediately
Carry out any work only when the energy supply is disconnected
Wires not tob e pinched or squeezed. Wires must be laid in such a way that they cannot be tripped over or damaged
Check electrical equipment regularly in accordance national regulations
Work on the electrical equipment may only be carried out by authorized specialist personnel

The TLS sensor is supplied with a 30 cm breakout cable with an M8 x 4 connector. Counter coupling with 2m cable is included in the scope of delivery.

The sensor requires a supply voltage of 24 VDC and has a PNP output signal. (Normally open)

Connection either to an existing on-site PLC control or to the SAFETEC evaluation unit available separately from us.

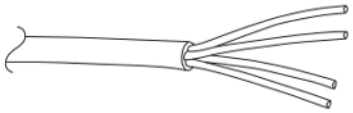
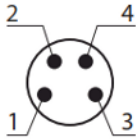
The SAFETEC evaluation unit has a built-in timer which only switches off the connected pump drive after an uninterrupted signal duration of several seconds (adjustable). This means that brief air bubbles and air bubbles are hidden immediately after the pump has started.

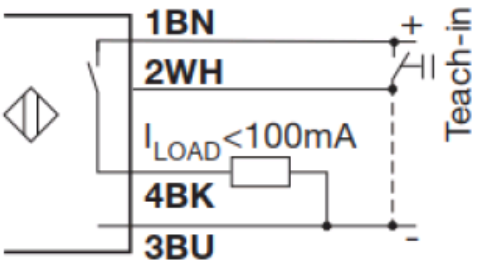
The sensor must be connected without voltage (UV = 0 V)

Only apply or switch on the voltage supply (UV> 0 V) after all electrical connections have been made.

Explanations of the connection diagram:

- NC = Opener
- NO = Normally open
- Q = Switching outputs
- Teach = external Teach (refer to „Calibration", Page 16

TLS	Litze	Stecker
1	BN: + (L+)	+ (L+)
2	WH: Teach	Teach
3	BU: - (M)	- (M)
4	BK: Q	Q
	AWD: 4 x 0.14 mm² 	



Execution PNP-Normally open

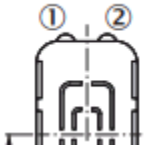
7. Commissioning

Check whether the screw connections are tight (TLS Type 1)

After switching on the supply voltage, the green LED lights up.
The yellow LED signals, whether the sensor detects liquid within the pipe.

Yellow LED on: liquid detectred, switching output is closed

YellowLED off: no liquid or a lot air bubbles detected
Dry run detected, switching output is open.



3) LED color yellow: detecting liquid
4) LED color green: Power supply

Check whether the sensor correctly detects the full and empty pipeline.

7.1 Calibration

The sensitivity of the TLS sensor can be adapted to the local conditions such as (wall thickness and pipe material, media data, etc.).

If the sensor does not react as expected after switching on, the sensitivity must be adjusted.

By short-circuiting the teach input (pin 2 or white wire) with L +, the respective state is learned. Depending on how long the teach input is connected to L +, the full or empty state is saved.

Teach-in-mode	Teach-in procedure	Teach-in time	LED light	Result
Full condition	Pin 2 or white wire to be connected to L+	> 2s ... < 7s	Green LEC flashes (1 Hz), yellow LED off	Yellow LED flashes 3 times (with 1 Hz)
Empty condition		> 14s ... < 12s	Grteen LED flashes (1 HZ), yellow LED on	Green LED flashes 3 times (with 1 Hz)
Abort calibration		> 14s		The switching setpoint remains unchanged. Green LED off, yellow LED flashes (4Hz)

We recommend teaching in the empty state first and then the full state.

8. Troubleshooting

If the sensor does not react as expected, carry out the calibration again.

Otherwise please check:

- Correct installation of the TLS module with the sensor on top
- Is the medium conductive?
- Is the pipeline free of deposits inside?
- Is the pipeline made of non-conductive material? (TLS type 2)

The troubleshooting table shows the measures to be taken if the sensor is no longer functioning.

Display LED / error image	Root cause	Action
Green LED does not light up, yellow LED flashes (4 Hz, min 1 s)	Output short circuit or input voltage is below 10 V.	Check output wiring or power supply

9. Maintenance

WARNING

Electrical hazard from direct contact with live parts

All work may only be carried out by qualified specialist personnel in the disconnected state and secured against being switched on again.
The manufacturer's instructions must be observed.
Observe the safety rules for working on electrical equipment.

The sensor type TLS is maintenance-free.

10. Disposal

This product and parts of it must be disposed of in an environmentally friendly manner:

ATTENTION

Please note the currently regulations applicable in your area (especially with regard to electronic scrap)!

For Germany:

The cleaned old parts can be handed in at the municipal collection points of the cities and municipalities.

Attachment

Technical details

Connection type	Cable with plug M8, 4-pin, 0,3 m 1)
Switching output	PNP
Output function	Normally open
Setting	Teach-in setting via line (filled or empty)
Degree of protection	IP67, IP68, IP69K
Suitable media	Liquids with a conductivity up to 50 mS/cm
Supply voltage UV	DC 10 ... 30 V
Residual ripple	≤ 10 %
Voltage drop	≤ 2 V
Current consumption	≤ 13 mA
Ready delay	≤ 300 ms
Output current Imax.	≤ 100 mA
Switching sequence max.	10 Hz
Protection class	III
Operation ambient temperature	-25 ° C ... + 80 ° C

More than just pumps

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