

Translation of the original
Installation and Operating Manual

Pump Condition Monitoring System SAFERUN[®]



CE

 **RICHTER**
Process Pumps & Valves

 **INEX**
FLUIDS & METERING

Richter Chemie-Technik GmbH
Otto-Schott-Str. 2
D-47906 Kempen
Tel.: 49(0)2152-146-0
Fax: 49(0)2152-146-190
E-mail: richter-info@idexcorp.com
www.richter-ct.com

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1 General

1.1 Information on this manual

This installation and operating manual is part of the **SAFERUN**[®] pump condition monitoring system and describes the correct and safe use of the unit in all operating phases.

The **SAFERUN**[®] pump condition monitoring system determines the current operating condition of the connected pump via sensors in the can. The current measurements are compared with the operating performance curve set. The operating point of the pump is displayed by LEDs on the transducer and transmitted via the power interface to a master control system. Other measurements of the system are also transmitted via this interface by means of the HART protocol.

In addition, the measurements are collected in a data memory and can be read out via the radio interface for subsequent evaluations.

1.1.1 Notes on use

The staff commissioned with the installation, operation and maintenance of the unit must have carefully read and understood the operating manual before the start of any work.

In addition to this installation and operating manual, the operating manual of the pump as well as the manuals of the additional components indicated in the Annex are also authoritative.

In the case of references to other documents, the notes on safety contained in them must also be observed.

The diagrams in this operating manual serve to provide a basic understanding and are not necessarily true to scale.

1.1.2 Notes on safekeeping

The operating manual is part of the unit and must be kept safe so that it is accessible to the staff at all times.








General

1.2 Explanation of symbols

1.2.1 Pictograms used

The warnings used in this operating manual are also provided with pictograms to clearly show the nature of the possible risk.


The following pictograms are used:

Symbol	Meaning
	General warning
	Risk from electricity
	Special risks from use in a potentially explosive area
	Risk of environmental contamination
	General notes and useful tips on handling
	Special notes for using the unit in a potentially explosive area
	Special notes for using the unit

General


1.2.2 Structure of the warnings

The following types of warnings are used in this operating manual:

	⚠ DANGER
	Danger to life! Consequences if not observed... <ul style="list-style-type: none">▶ Prevention 1▶ ...


A warning of this danger level describes an imminent dangerous situation. If the imminent dangerous situation is not prevented, this may result in death or serious injuries.

Follow the instructions in this warning sign in order to avoid the risk of death or serious injuries to people.

	⚠ WARNING
	Risk of injury! Consequences if not observed... <ul style="list-style-type: none">▶ Prevention 1▶ ...

A warning sign of this danger level describes a possible dangerous situation. If the dangerous situation is not prevented, this may result in death or serious injuries.


Follow the instructions in this warning sign in order to avoid the possible risk of death or serious injuries to people.

	⚠ CAUTION
	Personal injury due to... Consequences if not observed... <ul style="list-style-type: none">▶ Prevention 1▶ ...

A warning sign of this danger level describes a possible dangerous situation. If the dangerous situation is not prevented, this may result in slight or minor injuries.


Follow the instructions in this warning sign in order to avoid personal injuries.

General

	ATTENTION
	Property damage due to... Consequences if not observed... <ul style="list-style-type: none">▶ Prevention 1▶ ...

A warning sign of this danger level describes possible property damage. If the situation is not prevented, this may result in damage to property.

Follow the instructions in this warning sign to prevent damage to property.

	NOTE
	Notes ...

This sign contains additional information which is important for further processing or facilitates the work step described.

1.3 Liability restrictions

The manufacturer assumes no liability for damage and disruptions to operation owing to:

- non-observance of this operating manual,
- improper use,
- employment of unskilled or not sufficiently trained staff,
- defective connection,
- use of non-original spare parts and accessories,
- technical modifications and conversions unless they have been agreed on with the manufacturer,
- failure to perform the prescribed maintenance work.

1.4 Copyright protection

This documentation is protected under copyright law.

All rights including rights to photomechanical copying, reproduction and dissemination by means of special processes (for example data processing, data carriers and data networks), also parts thereof, as well as content and technical changes are reserved.

1.5 Manufacturer's details

Richter Chemie-Technik GmbH

Otto-Schott-Str. 2

D-47906 Kempen

Tel.: +49 (0) 2152 146-0

Fax: +49 (0) 2152 146-190

E-mail: richter-info@idexcorp.com

Internet: <http://www.richter-ct.com>

1.6 Richter service

In the event of technical questions about the unit, we would ask you to contact the manufacturer direct (address see chapter 1.5).

In this case please keep the following details ready at hand:

- Commission No. (XX-XXXXXX-XX-XX)
- Unit designation and pump type


The necessary details can be found on the name plate of the pump.

2 Safety

This chapter contains important notes on all safety aspects for the optimum protection of the staff as well as safe and trouble-free operation.

In addition to the general safety notes provided in this chapter and notes on special risks, each chapter contains the safety notes relevant for safe action.

Dangers which may occur in a particular action step are described prior to each action step.

	⚠ DANGER
	<p>Risk to life due to non-observance of the safety notes!</p> <p>Life-threatening situations can arise if the safety notes and action instructions contained in this operating manual are not observed.</p> <ul style="list-style-type: none">▶ Observe all warnings and instructions provided here.▶ In the case of references to other documents, also observe the safety notes contained in them.

Furthermore, the national installation standards (e.g. in Germany the VDE regulations) as well as the applicable safety regulations, occupational safety ordinances and accident prevention regulations apply to the field of operation of the unit.

2.1 General safety notes

The unit complies with the general state of the art and was designed and manufactured in compliance with all applicable regulations and guidelines.

The following safety notes must always be observed to ensure safe handling of the unit:

Regularly check the unit for externally visible damage and defects. Replace a defective unit immediately.

Only have installation and/or maintenance work performed by authorised skilled staff.

Secure the working area before starting any cleaning, maintenance and repair work.

Observe prescribed deadlines for recurrent checks/inspections.

Only replace worn or defective parts with original spare parts.

Only use suitable tools.



After repair work, attach all protective facilities again and check their electrics and mechanics.

Ensure that the operating manual is accessible to the staff at all times.

2.2 Particular risks

The unit itself does not represent any risks. However, depending on the place of use, special safety provisions in accordance with the Ordinance on Industrial Safety and Health and accident prevention regulations apply to the deployment area of the unit.


The unit satisfies the requirements in accordance with RL 94/9/EC (ATEX 95) for use in potentially explosive environments. The type test certificate is enclosed in the Annex.

	⚠ DANGER
	<p>Risk to life through non-observance of the safety notes during operation in an potentially explosive environment!</p> <p>Life-threatening situations may arise if the safety notes and action instructions contained in this manual are not observed.</p> <ul style="list-style-type: none">▶ Observe all warnings and instructions provided here.▶ In the case of references to other documents, also observe the safety notes contained in them.
	NOTE
	Notes on safety in potentially explosive environments are specially identified by the symbol on the left.

2.3 Intended use

The **SAFERUN**[®] pump condition monitoring system is intended to monitor the operating condition of mag-drive centrifugal pumps of the MNK series of Richter Chemie-Technik GmbH.

Any other or additional use is deemed to be not in accordance with the intended use.

	▲WARNING
	<p>Risk through improper use! Improper use and/or a different use of the unit may result in risks and cause property damage.</p> <p>► Only use the unit as intended.</p>

Claims for damages as a result of improper use are excluded.

The operating company alone bears the risk.

2.4 Foreseeable misuse

The unit is not designed as an alternative to plant measuring equipment and must not be used as a substitute for safety-relevant measuring or monitoring systems.

The manufacturer assumes no liability for consequential damage which could arise as a result of evaluation errors of the system or any misinterpretation of the error messages displayed.

2.5 Responsibility of the operating company

As the unit is used in the industrial sector, the operating company of the unit is subject to the statutory obligations relating to occupational safety and health.

In addition to the safety notes in this operating manual, the safety, accident prevention and environmental protection regulations applicable to the operation of the unit must be observed.

The operating company must:

obtain information about the applicable occupational safety and health regulations and determine additional risks in a risk assessment which arise from the special working conditions at the place of use of the unit. The company must implement them in the form of operating instructions for the operation of the unit.

satisfy the necessary requirements at the place of installation.

attach suitable warning signs at the place of installation referring to the risks in the working area.

check during the entire period of operation of the unit whether the operating instructions the company has prepared comply with the current status of the codes of practice and, if necessary, modify them.

clearly regulate and lay down the responsibilities of the staff for installation, operation, maintenance and cleaning.

make sure that all employees who handle the unit have read and understood the operating manual. Furthermore, the company must train the staff at regular intervals and inform them about the risks present in the working area.

regularly check that the staff work in a safety and risk-conscious manner in compliance with the operating manual.

make sure that this installation and operating manual and all other applicable regulations are accessible to the operating and maintenance staff.

check and document the observance of the specified cleaning and maintenance intervals.

provide the staff with the necessary protective equipment.

2.6 Staff requirements

2.6.1 Staff qualifications

The following qualifications for different fields of activity are mentioned in this operating manual:

■ **Instructed person**

has been instructed in a course by the operating company about the tasks assigned to him and possible risks in the event of improper conduct.

■ **Skilled staff**

are, in view of their specialised training, knowledge and experience as well as knowledge of the relevant provisions, able to perform the work assigned to them and to recognise and avoid any possible risks on their own.


■ **Qualified electrician**


is, in view of his specialised training, knowledge and experience as well as knowledge of the relevant standards and provisions, able to perform work on electrical equipment and to recognise and avoid any possible risks on his own.

The qualified electrician is trained for the particular place of use where he works and knows the relevant standards and provisions.

Only persons who can be expected to perform their work reliably are permitted as personnel. People whose reactions are affected, for example through drugs, alcohol or medication, are not permitted to work.


Staff who have to be trained, familiarised, instructed or who are undergoing general vocational training may only be allowed to work on the machine under the constant supervision of an experienced person.

	▲DANGER
	<p>Risk to life owing to inadequate qualifications!</p> <p>Improper work with and on the machine may result in serious personal injury and property damage.</p> <p>► Only allow suitably qualified personnel to perform or activities.</p>

	NOTE
	<p>When selecting staff, observe the age and occupation-specific regulations applicable at the place of use of the unit!</p>


Safety

2.6.2 Unauthorised persons

	⚠ WARNING
	<p>Risk to and by unauthorised persons!</p> <p>Unauthorised persons who do not satisfy the requirements described do not know the risks in the working area.</p> <ul style="list-style-type: none">▶ Keep unauthorised persons away from the working area.▶ In case of doubt, talk to the people and instruct them to leave the working area.▶ Interrupt the work for as long as unauthorised persons are in the working area.


2.6.3 Instruction

The staff must be regularly instructed by the operating company.

	NOTE
	<p>For better monitoring, document the performance of the instructions and have it acknowledged by the participants by countersigning.</p>

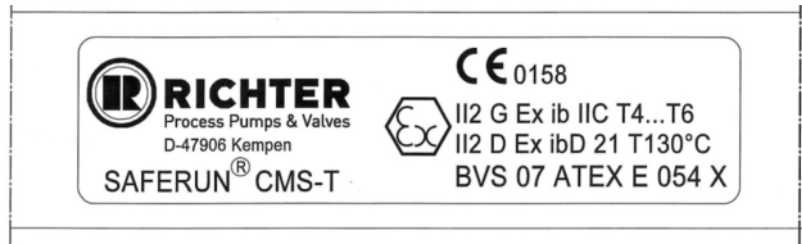
2.7 Personal protective equipment

The staff must wear the protective clothing prescribed by the operating company for the place of use of the unit for all work on the unit.

	⚠ WARNING
	<p>Risk of injury due to incorrect or missing protective equipment!</p> <p>During work it is necessary to wear personal protective equipment to minimise health risks.</p> <ul style="list-style-type: none">▶ Always wear the protective equipment prescribed by the operating company during work.▶ Replace worn or defective protective equipment immediately.▶ Follow all the signs on personal protective equipment put up in the working area.

2.8 Safety notes on the SAFERUN[®] CMS-T transducer

2.8.1 Name plate on the SAFERUN[®] CMS-T transducer



9299-00-5157/4-0

Identification in accordance with ATEX (gas explosion protection):

Abbreviation	Meaning
II2 G	Group II; category 2G
Ex	Symbol
ib	Intrinsic safety for zones 1, 2
IIC	Explosion group
T1 ... T6	Temperature classes T1 to T6

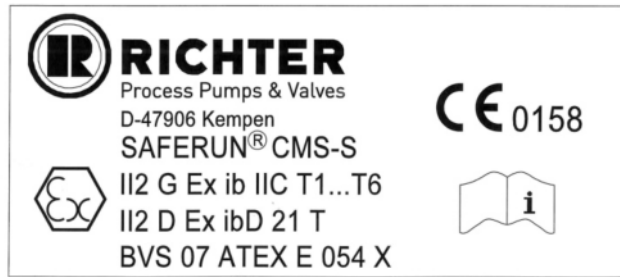
Identification in accordance with ATEX (dust explosion protection):

Abbreviation	Meaning
II2 D	Group II; category 2D
Ex	Symbol
ibD 21	Intrinsic safety for zone 21
T130 °C	Maximum surface temperature

EC type test certificate for **SAFERUN[®]**-CMS-T transducer:

BVS 07 ATEX E 054 X

2.8.2 Name plate on the can SAFERUN® CMS-S



9299-00-5158/4-0

Identification in accordance with ATEX (gas explosion protection):

Abbreviation	Meaning
II2 G	Group II; category 2G
Ex	Symbol
ib	Intrinsic safety for zones 1, 2
IIC	Explosion group
T1 ... T6	Temperature classes T1 to T6

Identification in accordance with ATEX (dust explosion protection):

Abbreviation	Meaning
II2 D	Group II; category 2D
Ex	Symbol
ibD 21	Intrinsic safety for zone 21
T	Maximum surface temperature


EC type test certificate for the can **SAFERUN®** CMS-S:
BVS 07 ATEX E 054 X

Safety


2.9 Ban on conversion work

Conversions and modifications of any kind to the unit are forbidden.
The manufacturer assumes no liability for any damage resulting therefrom.

2.10 Spare parts

	⚠ WARNING
	<p>Risks of injury due to incorrect or defective spare parts!</p> <p>Incorrect or defective spare parts may result in injury, damage, malfunctions or complete failure and impair safety.</p> <ul style="list-style-type: none">▶ Only use original spare parts of the manufacturer.

2.11 Notes on the environment

	ATTENTION
	<p>Risk to the environment due to incorrect handling of substances detrimental to the environment!</p> <p>Considerable damage to the environment may occur if substances detrimental to the environment are handled incorrectly, especially if incorrectly disposed of.</p> <ul style="list-style-type: none">▶ Observe the notes on disposal contained in this operating manual.

3 Design and function

3.1 Description of function

The **SAFERUN**[®] pump condition monitoring system determines the current operating condition of the pump connected using sensors in the can **SAFERUN**[®] CMS-S.

The system reports changes in the operating condition which permit conclusions to be drawn about the operation of the pump in relation to the admissible operating ranges specified by the manufacturer.

The messages are a help for the operating company to avoid critical conditions which may, over a prolonged period of time, result in damage down to the total failure of the pump.

The system records, via sensors in the can **SAFERUN**[®] CMS-S, the power acting at the magnetic drive of the pump and continuously compares it with reference values and the result is reported as an overrun or undershoot.

The operating condition of the pump is displayed by coloured LEDs in the housing cover.

Max. about 2,000 datasets are stored in a non-volatile memory and can be read out via the radio interface (RFID) with a handheld unit (option PDA) designed for this purpose.

The unit is connected to the power supply by the multi-core connection cable. The analogue output signal is emitted via the 4-20mA power interface. The value of the output current corresponds to the present operating point of the pump. The output current depends on the parameterisation.

Owing to the HART capability of the system, additional information (temperature, speed, torque, flow rate and current operating point analogous to the output current in %) can be transmitted to a master process system for further processing.

The requirements placed on the power supply are listed in the Annex (Technical data).



ATTENTION

In the case of flushing with an external or the pump fluid, dry running or a lack of lubrication of the plain bearings in the pump cannot be detected.

3.2 Design of the system

The system consists of a sensor unit integrated in the can of the pump (can **SAFERUN**[®] CMS-S) and the **SAFERUN**[®] CMS-T transducer mounted externally. Both units are linked by a detachable cable connection.

The system is supplied with power via a suitable external power source (e.g. a certified feed and signal isolator in a 3-wire circuit with circuits with the ignition protection class "intrinsic safety").

The measurements are transmitted to the master system via the 4-20mA power interface.

The parameters are set and the stored measurements read out with a portable reading unit (option PDA) via the RFID radio interface of the **SAFERUN**[®]-CMS-T.



NOTE

The **SAFERUN**[®] CMS-T transducer may only be connected to the original **SAFERUN**[®] CMS-S can from Richter.

3.3 Unit components



Fig. 1

SAFERUN[®]-CMS-T transducer with the sensor cable and holding plate



Fig. 2

SAFERUN[®]-CMS-S can with integrated sensor

3.4 Scope of delivery

The unit can be supplied with the pump or individually.

i	NOTE
	It may be specified in the order whether the SAFERUN [®] CMS-T transducer is to be supplied with a short or long sensor cable . The standard is with a short cable and the SAFERUN [®] CMS-T transducer mounted on the pump.

3.4.1 Pump with **SAFERUN**[®] CMS-T transducer

Richter pump of the MNK series with **SAFERUN**[®] CMS-S can
SAFERUN[®] CMS-T transducer with short sensor cable (0.3 m)

Installation and operating manual - pump

Installation and operating manual - **SAFERUN**[®]

3.4.2 **SAFERUN**[®] CMS-T transducer without pump

i	NOTE
	If the SAFERUN [®] CMS-T transducer is delivered without a pump, the pump must be already fitted with the SAFERUN [®] CMS-S can.

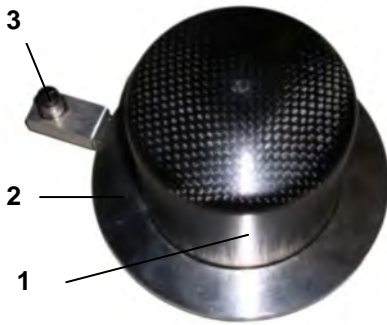
- **SAFERUN**[®] CMS-T transducer with short sensor cable (0.3m)
- Installation and operating manual **SAFERUN**[®]

i	NOTE
	As a standard, the SAFERUN [®] CMS-T transducer is supplied with a short sensor cable (0.3 m). It may be specified in the order whether the SAFERUN [®] CMS-T transducer is to be delivered with a long sensor cable (5 m). The commission No. xx-xxxxxx-xx-xx of the pump must be specified in the order.

3.5 Description of modules

The individual modules of the system are described in the following:

3.5.1 SAFERUN[®] CMS-S can



- 1 Can
- 2 Support ring with sensor housing
- 3 Jack for connection to the **SAFERUN[®]** CMS-T transducer

Fig. 3

3.5.2 Sensor



SAFERUN[®] sensor (integrated in the **SAFERUN[®]** CMS-S can)

Fig. 4

3.5.3 SAFERUN[®] CMS-T transducer



- 1 Transducer housing
- 2 Display panel
- 3 RFID antenna
- 4 Operation display

Fig. 5

3.6 Methods of attachment

3.6.1 Attachment to the pump

As the standard, the **SAFERUN**[®] CMS-T transducer is attached directly to the pump with the holding plate. The short sensor cable (0.3 m) is required for this.

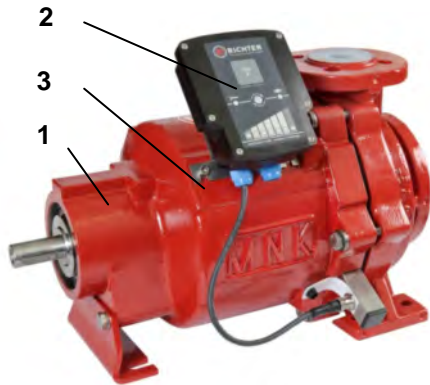


Fig. 6

SAFERUN[®] CMS-T transducer mounted on pump

- 1 Bearing pedestal
- 2 Transducer with holding plate
- 3 Attachment screws

3.6.2 Other methods of attachment

Alternatively, the **SAFERUN**[®] CMS-T transducer can be installed away from the pump. For this purpose, a long sensor cable (5 m) must be used; this is available as an option.

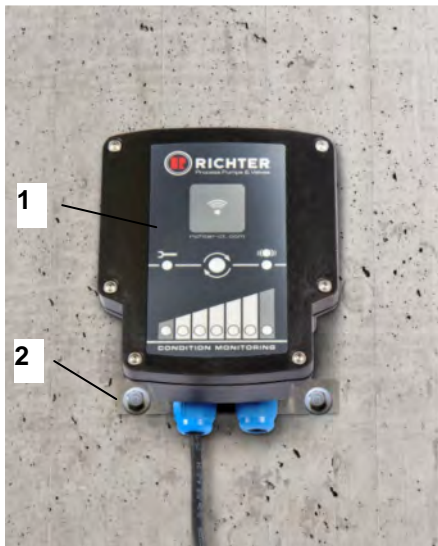


Fig. 7

SAFERUN[®] CMS-T transducer mounted on wall

- 1 Transducer with holding plate
- 2 Wall attachment

3.7 Control elements, displays and connections

3.7.1 Control elements



Fig. 8

Control elements on the **SAFERUN**[®] CMS-T transducer exterior

- 1 Antenna interface of the RFID radio interface



Control elements inside the **SAFERUN**[®] CMS-T transducer (view with housing opened)

- 2 RESET button

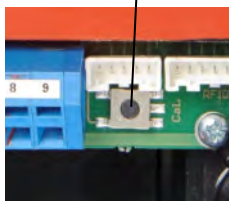


Fig. 9

3.7.2 Operation displays

All operation displays of the transducer are located on the upper side of the **SAFERUN**[®] CMS-T transducer.

The operation displays of the **SAFERUN**[®] CMS-T transducer

- 1 Error display temperature sensor (flashes red)
- 2 Direction of rotation cw (green) / ccw (red)
- 3 Load change (red display 2-3 seconds) drive stoppage/blockage (flashes red fast)

a – g Operating point of the pump

The operating point display of the **SAFERUN**[®] transducer

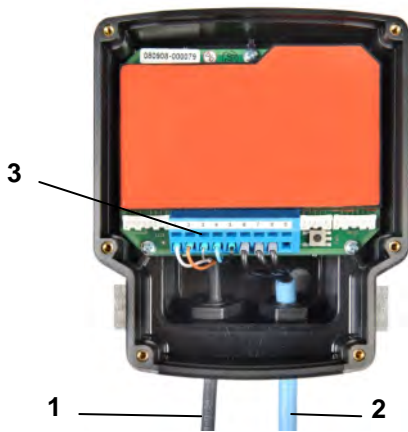
- a Inadequate lubrication/dry running (red)
- b Lower limit of the pump performance curve undershot (yellow)
- c, d, e Safe operating range (green)
- f Upper limit of the pump performance curve overshoot (yellow)
- g Maximum flow rate overshoot (red)



Fig. 10

i	NOTE
	See chapter 6.5 for a detailed description of the status displays.

3.7.3 Connections



Location of the connections on the **SAFERUN[®]** CMS-T transducer (viewed with housing opened)

- 1 Cable inlet M20 x 1.5 for sensor cable
- 2 Cable inlet M20 x 1.5 for power supply
- 3 9-pin terminal strip for connection of sensor and power supply

Fig. 11

i	NOTE
	The pin assignment of the terminal strip is described in chapter 5.5.2.1.

3.8 Optional accessories

The following components are available as options:

PDA with RFID reader and software

Sensor cable 5m

Explosion-protected battery box for the independent supply of the **SAFERUN**[®] CMS-T transducer

3.8.1 PDA with RFID reader

A handheld unit (PDA) with RFID reader is required to set the **SAFERUN**[®] CMS-T transducer and read out the stored measurement data.



Fig. 12

Non-explosion-protected design:

- e.g. iPAQ from HP
- Operating system: Windows Mobile 6
- Compact Flash (CF) slot
- CFC reader
(radio adapter; also suitable for other RFID types)

3.8.2 Sensor cable 5m



Fig. 13

If the pump is installed at an almost inaccessible or almost hidden location, the transducer can be installed away from the pump using a 5m sensor cable.

3.8.3 Explosion-protected battery box



Fig. 14

The transducer can be supplied with power from an explosion-protected battery box for situations where no power supply is available.

The capacity of the explosion protected battery box is sufficient for operation of the transducer for approx. 3 days.


i	NOTE
	For further information on the explosion-protected battery box, see operating manual of the explosion-protected battery box.

4 Transport and packaging

4.1 Transport inspection


As a standard, the unit is supplied with the components specified in the chapter Scope of delivery.

i	NOTE
	<ul style="list-style-type: none"> ▶ Check the delivery for completeness and visible damage directly after receipt. Immediately report an incomplete or damaged consignment to the supplier. ▶ If the unit is not installed directly after delivery, it must be put into proper storage (for notes, see chapter Storage).

	▲WARNING
	<p>Risk of injury due to damaged unit!</p> <p>A damaged unit can cause risks which may result in injuries.</p> <ul style="list-style-type: none"> ▶ Do not put a damaged unit into service.

4.2 Notes on transport

i	NOTE
	<p>If the unit was supplied with a pump, also observe the notes on transport in the operating manual of the pump.</p>

	ATTENTION
	<p>Possible damage during transport!</p> <p>During transport of the pump with the SAFERUN[®] CMS-T transducer mounted, the SAFERUN[®] CMS-T and/or the sensor jack on the SAFERUN[®] CMS-S can may be damaged.</p> <ul style="list-style-type: none"> ▶ When slinging ropes or belts, make sure that the load-lifting device cannot damage the transducer and/or the sensor jack on the SAFERUN[®] CMS-S can. ▶ Do not expose the SAFERUN[®] CMS-T transducer to any hard impacts during transport.

4.3 Disposal of the packaging

The packaging protects the unit against in-transit damage. The packaging materials are selected from environmentally compatible and disposal aspects and are therefore recyclable.

Recycling the packaging saves raw materials and reduces the volume of waste. Dispose of packaging materials no longer required in accordance with the locally applicable regulations.


5 Installation


5.1 Safety notes

The unit is an intrinsically safe electrical device of the category 2 and approved in accordance with EC type test certificate for the following areas:

- Installation in zones 1 and 2 of a potentially explosive area,
- with intrinsically safe power circuits in category 2 with protection level "ib" of a potentially explosive area.


Observe the following safety notes for installation of the unit:

	⚠ DANGER
	<p>Risk from electricity!</p> <p>Risk to life exists on contact with live wires or components!</p> <ul style="list-style-type: none">▶ Before the start of work, switch off electric power supply and secure against being switched on again.

	⚠ WARNING
	<p>Risk of injury due to improper assembly and installation!</p> <p>Improper assembly and installation may result in serious personal injury or property damage.</p> <ul style="list-style-type: none">▶ Ensure there is adequate space for assembly before starting work.▶ Pay attention to tidiness and cleanliness at the assembly location! Loosely stacked components or tools lying around are sources of accidents.▶ Assemble components correctly.▶ Wear the protective clothing prescribed by the operating company for the place of use of the unit.

Installation

5.2 Qualifications of the staff

	⚠ DANGER
	<p>Risk to life if the qualifications of the staff are inadequate!</p> <p>Installation may only be performed by specially trained and skilled staff.</p> <ul style="list-style-type: none">▶ Work on the electrical equipment may only be performed by qualified electricians.▶ Observe the safety regulations applicable in the work area.

5.3 Requirements on the assembly location

Observe ambient conditions in accordance with the technical data.

5.3.1 Additional requirements for installation in a potentially explosive area



If the unit is assembled in a potentially explosive area, the following additional requirements must be satisfied to ensure safe operation:

Only safeguard operation using the intrinsically safe power isolator in the 3-wire circuit (see Technical data, section 10.1).

The **SAFERUN**[®] CMS-T transducer may only be exposed to a magnetic field of max. 7.5 A/m.

The temperature class of the **SAFERUN**[®] CMS-S can depends on the maximum fluid temperature at the place of installation (see Technical data, section 10.1).

The **SAFERUN**[®] CMS-S can must be installed and used so that electrostatic charging processes are excluded.

The **SAFERUN**[®] CMS-S can must be installed and used so that chemical incompatibilities with the fluid conveyed can be excluded.

5.4 Notes on assembly

The length of the standard sensor cable permits the **SAFERUN**[®] CMS-T transducer to be attached directly to the pump.



Fig. 15

Assembly directly on the pump

1. Undo both screws from the bearing pedestal.
2. Attach **SAFERUN**[®] CMS-T transducer with the holding plate to the bearing pedestal using the screws and Loctite.

With the optionally available 5m sensor cable, it is possible to install the **SAFERUN**[®] CMS-T transducer away from the pump.

Installation away from the pump

1. Attach **SAFERUN**[®] CMS-T transducer with holding plate correctly on a component or a wall.



Fig. 16

Installation

5.5 Electrical connection

5.5.1 Connect the SAFERUN[®] CMS-T transducer to the SAFERUN[®] CMS-S can

The SAFERUN[®] CMS-S is connected to the SAFERUN[®] CMS-T by a screw-type industrial plug connector.



ATTENTION

Possible damage to the SAFERUN[®] CMS-T transducer!

The SAFERUN[®] CMS-T transducer may only be connected to the original SAFERUN[®] CMS-S from Richter.



NOTE

Even though all connection points of the system are protected against the admissible limit values being exceeded, screwing the connection cable on or off during operation should be avoided.



NOTE

- ▶ The SAFERUN[®] CMS-S can must already be installed in the pump.
- ▶ The plug connection of the SAFERUN[®] CMS-S can is situated on the right-hand side as a standard feature (viewed from the direction of the motor).

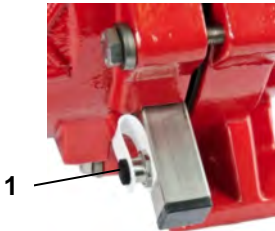


Fig. 17



Fig. 18


Procedure:

1. Screw off the protective cap (1) on the connector of the SAFERUN[®] CMS-S can.
Keep the protective cap safe for later use.
2. Connect the connector (2) of the SAFERUN[®] CMS-T transducer to the jack and screw tight.

Installation

5.5.2 Connect SAFERUN[®] CMS-T transducer to the power supply

The SAFERUN[®] CMS-T is connected to the power supply by means of the terminal strip inside the SAFERUN[®] CMS-T.

	ATTENTION
	<p>Possible damage to the SAFERUN[®] CMS-T transducer!</p> <p>The SAFERUN[®] CMS-T transducer may only be connected to a power supply which complies with the specifications stipulated in the Technical data.</p>

The SAFERUN[®] pump condition monitoring system can be used in areas which are not potentially explosive and also in potentially explosive areas with the appropriate power supply.

i	NOTE
	<ul style="list-style-type: none">▶ The outside diameter of the connection cable must be from 6 mm to 9 mm in order to ensure a sealing effect of the cable fitting of the protection class IP65 (to EN 60529).▶ For an intrinsically safe power supply to the SAFERUN[®] CMS-T transducer, it is recommended to use a shielded installation cable. Depending on the shielding concept of the operating company, the cable shield can be on one side or both sides either to the earth potential or the terminal 9 "Shield".



Fig. 19 Position of the cable inlets and terminal strip

5.5.2.1 Pin assignment of terminal strip

The pin assignment of the terminal strip is described in the following table:

Cable	Terminal No.:	Assignment	Core
Sensor cable	1	Magnetic field sensor +	White
	2	Magnetic field sensor -	Brown
	3	Shield	Shield and grey core (via joint insulated conductor end sleeve)
	4	Temperature sensor	Blue
	5		Black
Power supply output signal	6	+24VDC	Customer
	7	-24VDC -O (4-20mA / HART)	
	8	+O (4-20 mA / HART)	
	9	Shield	Shield

i	NOTE
	The terminals 3 and 9 are connected internally.

Installation


5.5.2.2 Connection plan

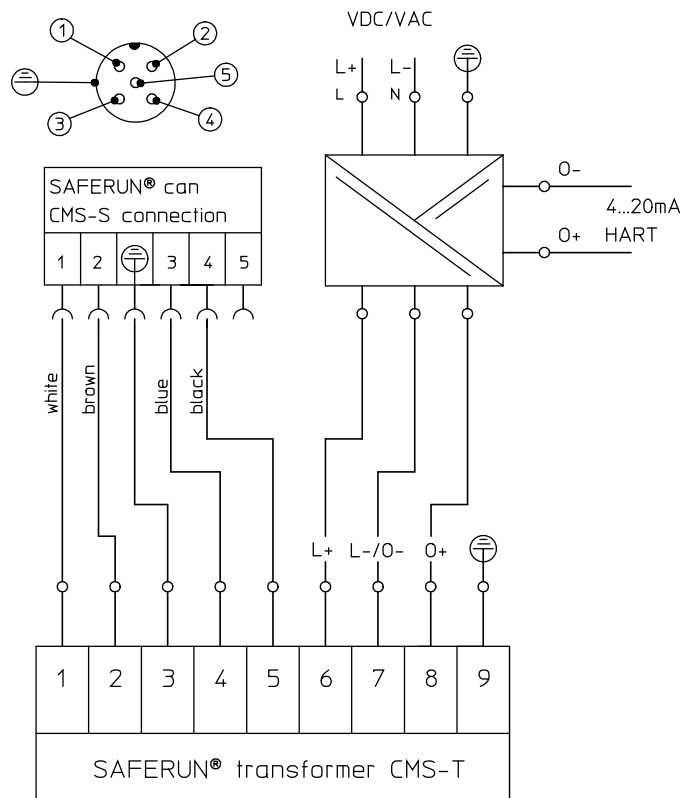
For the intrinsically safe supply of the **SAFERUN**[®] CMS-T transducer a certified feed isolator (3-wire circuit) of the ignition protection class "intrinsic safety" must be used.

Some admissible units are listed in the following table:

Ty Type	EC type test certificate	Manufacturer
KFD2-STC4-Ex1	BAS 99 ATEX 7960	Pepperl+Fuchs
9160/...-11-11	DMT 03 ATEX E 010 X	Stahl
ST500 Ex	TÜV 97 ATEX 1150	Martens

The use of an explosion-protected feed isolator guarantees the safe electrical isolation of the intrinsically safe power or feed and signal circuits from the non-intrinsically safe circuits (e.g. mains and output circuit) to DIN VDE 0106 Part 101 and observance of the protection class II.

	NOTE
	<ul style="list-style-type: none"> ▶ If the SAFERUN[®] CMS-T transducer has been supplied once, even if for only a short time, with a non-intrinsically safe power source, the safety-relevant symbols relating to explosion protection are to be made illegible on the name plate. ▶ Subsequent operation of the SAFERUN[®] CMS-T transducer in an explosive area is no longer permitted for safety reasons regarding the explosion-relevant components which guarantee explosion protection in the Ex i-circuits.





9299-00-5195_en/4-0

Fig. 20 Wiring diagram and pin assignment


6 Control/Operation

6.1 Safety notes

	⚠ DANGER
	<p>Risk to life through non-observance of the safety notes for operation in a potentially explosive environment!</p> <p>Life-threatening situations may arise through the non-observance of the safety notes and action instructions contained in this operating manual.</p> <ul style="list-style-type: none"> ▶ Observe all the warnings and instructions contained here.

	NOTE
	<p>Notes on safety in potentially explosive environments are specially identified with the adjacent symbol.</p>


6.2 Qualifications of the staff

	⚠ DANGER
	<p>Risk to life due to inadequate qualifications of the staff!</p> <p>The work explained here may only be performed by instructed skilled staff.</p> <ul style="list-style-type: none"> ▶ Observe the safety provisions applicable in the working area.

6.3 Commissioning

The system is tested and basically calibrated together with the relevant pump at the works as standard. Mains water is used as the fluid conveyed.

If special details on the pump and the fluid have been made in the order, the parameters of the **SAFERUN**[®] CMS-T transducer are preset accordingly.

	NOTE
	<p>A calibration report which shows the parameters set by the works is enclosed with the SAFERUN[®] CMS-T transducer when dispatched.</p>

If the parameters preset by the works are not the same as the data of the pump or the fluid to be conveyed, it is necessary to reset the parameters (for details, see chapter Setup and programming).

6.4 Switching on and off

The **SAFERUN**[®] CMS-T transducer is switched on and off using the power supply. There is no switch on the **SAFERUN**[®] CMS-T transducer.

6.4.1 Self-test

After being switched on or after a warm start or parameterisation the **SAFERUN**[®] CMS-T transducer conducts a self-test. The sensors connected and the internal memory as well as the parameters are checked in this test.

During the self-test all LEDs of the **SAFERUN**[®] CMS-T transducer are switched on for 5 seconds (warm start or after parameterisation = 3 seconds).

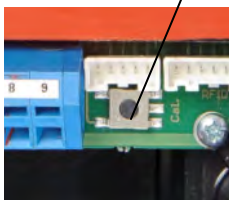
If errors are discovered during the self-test, this is shown by the flashing of the appropriate LEDs.

i	NOTE
	Chapter 8.4 Error displays contains an exact description of the possible error codes.

6.4.2 Warm start



Fig. 21



A warm start of the **SAFERUN**[®] CMS-T transducer can be activated with the RESET button (1) located in the **SAFERUN**[®] CMS-T transducer. After brief activation (approx. 0.2 seconds) of the RESET button, the self-test is conducted just as after the power supply has been switched on.

i	NOTE
	The cover of the housing must be opened to be able to perform a warm start of the SAFERUN [®] CMS-T transducer.

6.5 Status display



Fig. 22

The status display of the **SAFERUN**[®] CMS- transducer T is provided by coloured LEDs on the **SAFERUN**[®] CMS-T transducer.

The following information is shown:

- 1 Error display temperature sensor
- 2 Direction of rotation display
- 3 Load cycle, drive stoppage
- a – g Current operating point of the pump (as per performance curve)

6.5.1 Error display after self-test

If an error is detected after the self-test, the LEDs 1 to 3 come on. The flashing LEDs a – g provide information on the cause of the error.

i	NOTE
	Chapter 8.4 error displays contains an exact description of the possible error codes.

6.5.2 Operating display

Pump operation is shown on the operating display.

The following table explains the possible displays:

LED	Status	Meaning
2	Green LED comes on	Operation
2	Red and green LEDs come on	Pump not in operation
2	Red and green LEDs flash	Sensor error (see chapter 8.4 Error displays)

6.5.3 Display "Load cycle"

The display "Load cycle" visualises the writing of the measurements into the RFID. The measurements are stored in the RFID after the internal threshold values have been exceeded or undershot. The 4-20mA and HART signal always provide the current actual value.

The following table explains the possible displays:

LED	Status	Meaning
3	Comes on for 1 – 2 sec.	Load cycle (see NOTE box under the table)

i	NOTE	
	The threshold value for detecting the load cycle can be set using the parameters 91 - 93 (see also parameter table in the Annex).	

6.5.4 Display "Magnetic drive stoppage"

The risk and the magnetic drive stoppage are visualised by LED 3.

The following table explains the possible displays:

LED	Status	Meaning
3	Flashes	80 % of the magnetic drive nominal torque is exceeded
3	Flashes quickly	Magnetic drive has stopped (see chapter 8.4 Error displays)

6.5.5 Display "Operating point of the pump"

In normal operation the current operating point of the pump is shown by the LEDs a – g.

The performance curve can be adapted with the parameter settings.

i	NOTE
	See chapter 7.4 Parameterisation for more details on adapting the performance curve and assigning it to the output signal.

The following diagram explains the operating point display of the **SAFERUN**[®] CMS-T transducer using the standard performance curve set at the works:

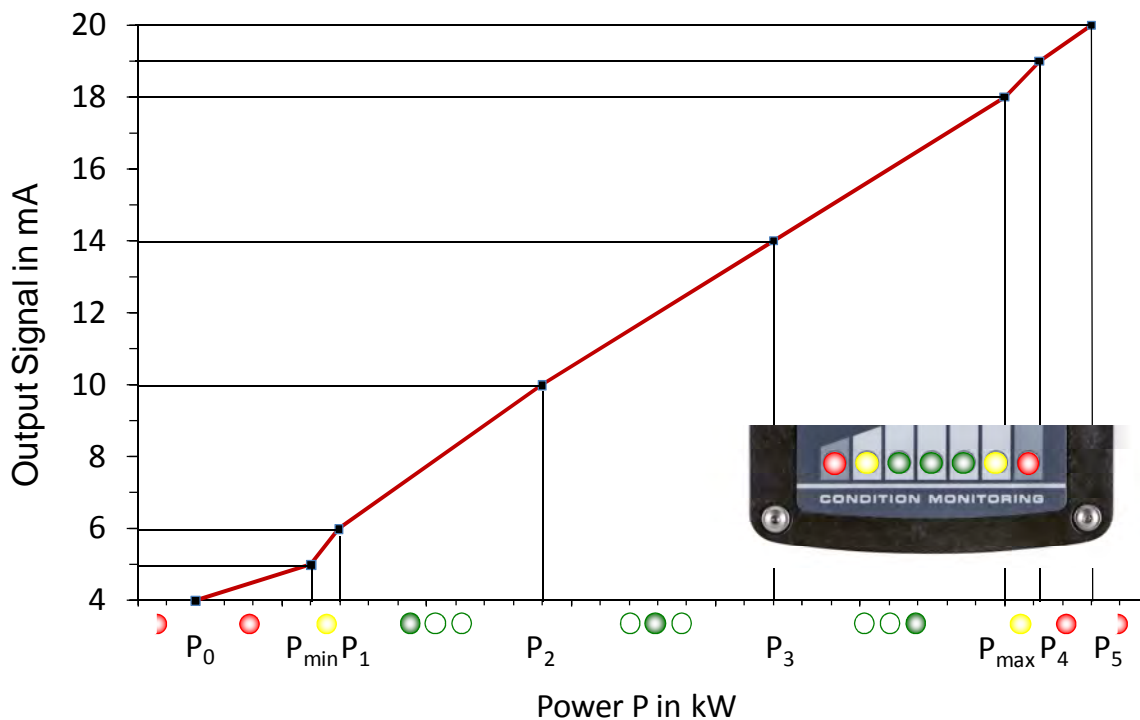


Fig. 23

The 4-20mA output signal as well as the LED display on the **SAFERUN**[®] CMS-T transducer are shown as a function of the parameters P₀, P_{min} and P_{max}, as in the above diagram.

6.6 Operation

The following functions are performed with and on the **SAFERUN[®]** CMS-T transducer:

Operation step	Note
Warm start	See chapter 6.4.2
Visual condition monitoring	Using the operating point display of the SAFERUN[®] CMS-T transducer
Electronic condition monitoring	Using process control technology
	Using evaluation of the History Log
Read out parameters	Via PDA with RFID reader (see chapter 7)
Read out data log	Via PDA with RFID reader (see chapter 7)
Set parameters	Via PDA with RFID reader (see chapter 7)
Save parameters	Via PDA with RFID reader (see chapter 7)
Cloning of transducer data SAFERUN[®] CMS-T	Via PDA with RFID reader (see chapter 7)
Update of the firmware	Only to be performed by the manufacturer

6.6.1 Pump condition monitoring

The main function of the **SAFERUN**[®] CMS-T transducer is to monitor the condition of the pump connected. For this purpose, the current measurements are continuously compared with the performance curve stored in the **SAFERUN**[®] CMS-T transducer and can be read out at any time via the LEDs on the **SAFERUN**[®] CMS-T transducer.

At the same time, a signal analogue to the LED display is emitted via the 4...20 mA output signal of the **SAFERUN**[®] CMS-T transducer.

This signal can be monitored and evaluated by the process control technology.

At the same time, other characteristic data can be transmitted which are available for evaluation by an appropriate signal converter via the 4...20 mA output signal using the HART protocol.

This characteristic data are:

Temperature on the **SAFERUN**[®] CMS-S can in °C

Speed of the pump in rpm

Power in kW

Flow rate in m³/h (only if the substance data are known)

Operating point in mA

Operating point in % analogous to the operating point display

With the optionally available PDA with RFID reader the current measurements can also be read out and stored (actual log).

Furthermore, if the characteristic data change, the **SAFERUN**[®] CMS-T transducer also stores the current measurements in the internal memory (History Log) if the threshold values stipulated in the parameters are exceeded. This History Log can also be read out with the PDA and evaluated with external software.

Moreover, the accumulated operating cycles (parameter 135), energy consumption (parameter 138), flow rate (parameter 139), duty hours (parameter 130), standstill times (parameter 131) and fault times (parameter 132) can be determined by reading out the parameters using the PDA.

i	NOTE
	See chapter 7 for further information on the PDA with RFID reader and the SAFERUN [®] software.

7 PDA software SAFERUN®

Data is exchanged from and to the **SAFERUN®** CMS-T transducer by means of the PDA software **SAFERUN®**. The PDA software **SAFERUN®** must be installed on a PDA with the Windows operating system and an RFID reader.

SAFERUN® CMS-T can be parameterised both with and without current.

7.1 Starting the program

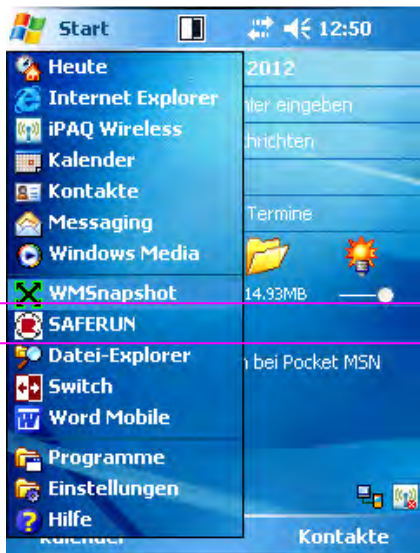


Fig. 24

The program can be started with the menu point "SAFERUN" in the start menu of the PDA.



Fig. 25

Alternatively, you can search for and call up the **SAFERUN®** program using the menu "Start", then "Programs".

7.2 Logon

Four users with different authorisations are available to select:

User	Password on delivery	Authorisations
User	user	Authorisation to read the pump and History Log and Actuallog files.
Master	master	Authorisation to read and write the pump parameters and to read the History Log and Actuallog files.
Service	service	Cloning from the SAFERUN [®] CMS-T transducer, section 7.5. Authorisation to read and write the pump parameters and authorisation to read the History Log and Actuallog files
Admin	(only known to the manufacturer)	All rights (only manufacturer)

i	NOTE
	The parameter list in the Annex provides information on which user may edit which parameters.



Fig. 26

Proceed as follows to log on:

- Select the user you want from the selection list under “Username”.
- Enter the relevant password in the field “Password”.

i	NOTE
	Display the on-screen keyboard of the PDA to be able to enter the password.

- Confirm entry by clicking the “Login” button.

After you have logged on, the program changes to the main menu.

7.3 The main menu

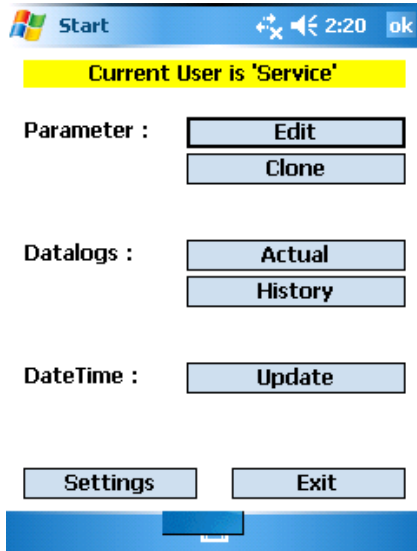


Fig. 27

In the main menu, the individual functions of the software can be called up by clicking the relevant button.

The menu points and their function:

- Parameter:** Read out and write parameters
Read and write parameter file
Clone parameters
- Datalogs:** Read out History Log
Read and write History Log file
Read out Actual Log
Read and write Actual Log file
Trigger measurement
- DateTime** Update date and time
- Settings:** Administration of system settings and passwords
- Exit:** Quit the main menu and return to the login mask (Fig. 26).

i	NOTE
	The user who is logged on is displayed in the header of the program. The cloning function is only visible in the Service mode.

7.3.1 Parameter

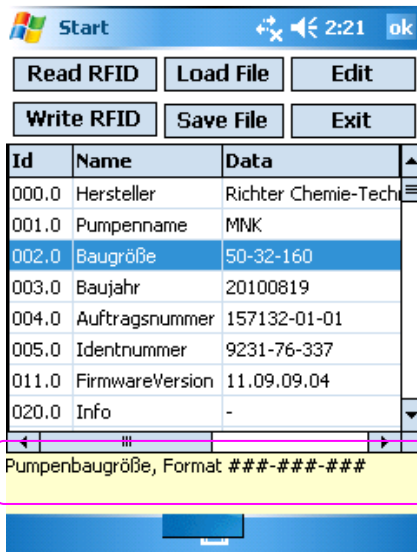


Fig. 28

The following functions can be called up in the submenu **Parameter**:

- Read RFID:** Read out current parameters of the SAFERUN® CMS-T transducer
- Write RFID:** Write current parameters into the SAFERUN® CMS-T transducer
- Load File:** Load parameters from file
- Save File:** Write parameters in file
- Edit:** Edit parameters
- Exit:** Back to the main menu

i	NOTE
	When a parameter line is selected, a brief description of this parameter appears in the yellow field.

i	NOTE
	The complete parameter list is contained in the Annex. Parameters described in this operating manual are listed with the relevant parameter number.

i	NOTE
	The "Id" in the list is the parameter number.

7.3.1.1 Read/Write RFID – Read/Write parameters


Fig. 29

Proceed as follows to read or write the parameters of the SAFERUN® CMS-T transducer:

Select menu point **Read RFID** or **Write RFID**

- Move PDA with the RFID reader to the antenna interface of the SAFERUN® CMS-T transducer
- Wait for data transmission

7.3.1.2 Load File – Load parameter file


Fig. 30

Proceed as follows to load parameters already stored from a parameter file:

- Select menu point **Load File**
- Select file from list by double-clicking it

i	NOTE
	Parameter files have the file extension par .

The parameter file is loaded.

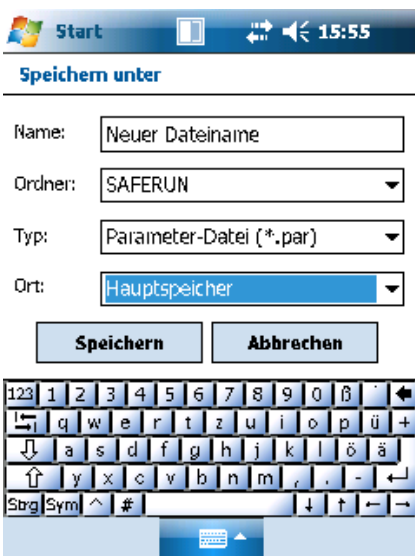
7.3.1.3 Save File – Save parameter file


Fig. 31

Proceed as follows to save the current parameters in a parameter file:

- Select menu point **Save File**
- Enter the new file name in the field **Name:**

i	NOTE
	Call up the on-screen keyboard of the PDA to be able to enter the file name.

- Select the folder you want (standard = SAFERUN) from the list
- Click the button **Speichern** to save the file

The parameter file is stored under the specified name in the selected folder.

7.3.1.4 Editing the parameters

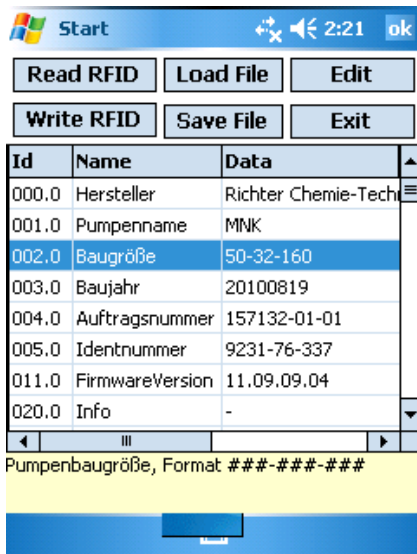


Fig. 32

After loading the parameters from a file or directly from the SAFERUN® CMS-T transducer, the parameters are displayed in tabular form with the corresponding parameter name and its value. The parameters can be edited in the master mode.

- Select the parameter to be edited from the list of parameters displayed.

NOTE	
i	The list can be moved up and down with the scroll bar on the right-hand edge of the screen.

- Click the **Edit** button to change the parameter

NOTE	
i	The editing of certain parameters is not permitted, depending on the authorisation of the user logged on. In this case the Edit button has no function.



Fig. 33

After activation of the **Edit** button, the selected parameter is displayed in a new window with its name and the original value.

Proceed as follows to change the parameter value:

- Enter the new value of the parameter in the input field

NOTE	
i	Call up the on-screen keyboard of the PDA to be able to enter the value.

- Click the **Update Data** button to save the new value

NOTE	
i	After editing all the parameters to be changed, save the parameter list so that the changes are not lost.

7.3.1.5 Exit –Back to the main menu

Back to the main menu by clicking the **Exit** button.

7.3.2 History Log

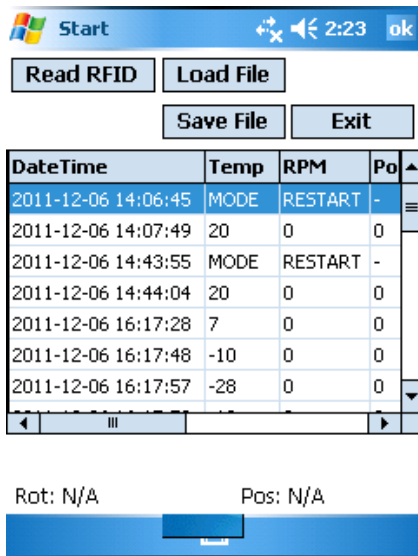


Fig. 34

The following functions can be called up with the submenu **History Log**:

- Read RFID:** Read out log data of the SAFERUN® CMS-T transducer
- Load File:** Load log data from the file
- Save File:** Write log data in the file
- Exit:** Back to the main menu

i	HINWEIS
	The time is converted depending on the GMT settings.

7.3.2.1 Read RFID – Read out History Log



Fig. 35

Proceed as follows to read out the log data of the SAFERUN® CMS-T transducer:

- Select menu point **Read RFID**
- Move the PDA with the RFID reader to the antenna interface of the transducer
- Wait for data transmission

7.3.2.2 Load File – Load History Log from the file

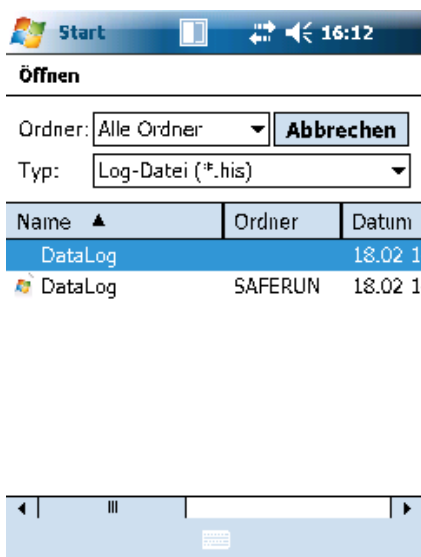


Fig. 36

Proceed as follows to load History Log files already stored:

- Select menu point **Load File**
- Select file from the list by double-clicking it

i	NOTE
	History log files have the file extension his .

The History Log file is loaded.

7.3.2.3 Save File – Save History Log



Fig. 37

Proceed as follows to save the History Log data which have been read out in a file:

- Select menu point **Save File**
- Enter new file name in the field **Name:**
(The order number is proposed as the file name)

i	NOTE
	Call up the on-screen keyboard of the PDA to be able to enter the file name.

- Select the folder you want (standard = SAFERUN) from the list
- Click the field **Speichern** to save the file
- The History Log file is stored under the specified name in the folder selected.

7.3.2.4 Exit – Back to the main menu

Back to the main menu by clicking the **Exit** button.

7.3.3 Actual Log

The current temperature, speed, torque and power are measured with the menu point **Actual Log**.

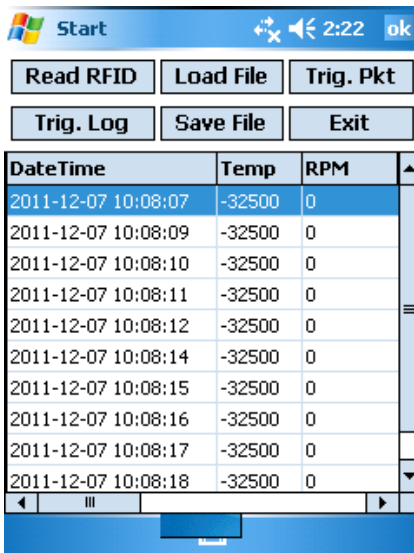
The power value measured is converted to the speeds entered in the parameter set as a function of the density and other parameterised material data. The converted power values can be used for the parameters P_0 , P_{min} or P_{max} .

Two different measuring procedures are available:

Trig. Pkt A The SAFERUN® CMS-T transducer measures 3 current operating design points and writes the mean value in the RFID memory.

Trig. Log B The SAFERUN® CMS-T transducer measures 11 current operating design points and writes these in the RFID memory.

The measurements must be triggered by the operating company and can be read out after completion of measurement.



DateTime	Temp	RPM
2011-12-07 10:08:07	-32500	0
2011-12-07 10:08:09	-32500	0
2011-12-07 10:08:10	-32500	0
2011-12-07 10:08:11	-32500	0
2011-12-07 10:08:12	-32500	0
2011-12-07 10:08:14	-32500	0
2011-12-07 10:08:15	-32500	0
2011-12-07 10:08:16	-32500	0
2011-12-07 10:08:17	-32500	0
2011-12-07 10:08:18	-32500	0

The following functions can be activated in the submenu **Actual Log**:

Trig. Pkt: Trigger measuring procedure A in the SAFERUN® CMS-T transducer

Trig. Log: Trigger measuring procedure B in the SAFERUN® CMS-T transducer

Read RFID: Read out data of the last measurement

Load File: Load log data from file

Save File: Save log data in file

Exit: Back to the main menu

i	HINWEIS
	The time is converted depending on the GMT setting.

Fig. 38

7.3.3.1 Trig. Pkt – Trigger measuring procedure A



Fig. 39

With this measuring procedure, the SAFERUN® CMS-T transducer measures 3 current operating design points and writes the mean value in the RFID.

Proceed as follows to trigger measurement A:

- Select menu point **Trig. Pkt**
- Move the PDA with the RFID reader to the antenna interface of the SAFERUN® CMS-T transducer

i	NOTE
	The green LED of the direction of rotation display flashes while the SAFERUN® CMS-T transducer is determining the current measurement data and writing them in the Actual Log.

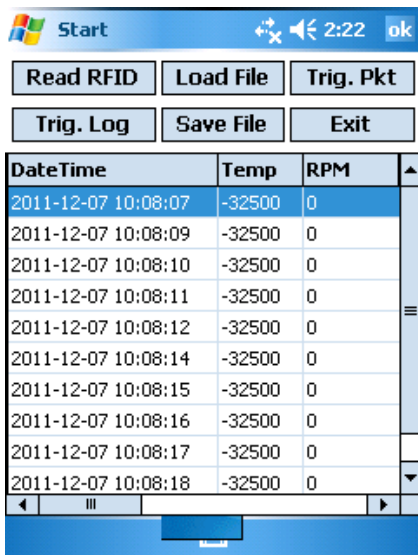


Fig. 40

On completion of the measurement the measured values can be read out as described under **Read RFID – Actual Log from the file**. The measured values are displayed in tabular form as illustrated in the adjacent diagram.

i	NOTE
	The list can be moved to the right and left with the scroll bar at the bottom of the screen.

7.3.3.2 Trig. Log – Trigger measuring procedure B

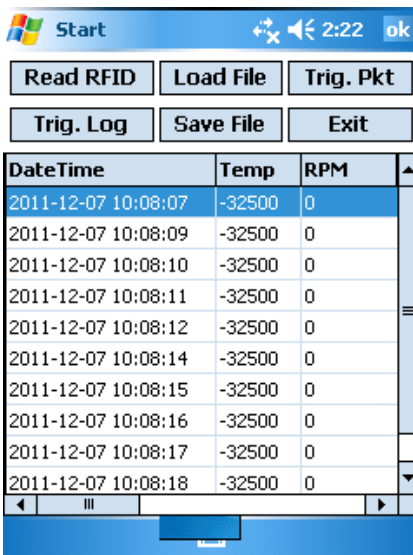

Fig. 41

With this measuring procedure, the SAFERUN® CMS-T transducer measures 11 current operating design points and writes the values in the RFID.

Proceed as follows to trigger measurement B:

- Select menu point **Trig. Log**
- Move the PDA with the RFID reader to the antenna interface of the SAFERUN® CMS-T transducer

<i>NOTE</i>	
i	The green LED of the direction of rotation display flashes while the SAFERUN® CMS-T transducer is determining the current measurement data and writing them in the Actual Log.



Start		
Read RFID	Load File	Trig. Pkt
Trig. Log	Save File	Exit
DateTime	Temp	RPM
2011-12-07 10:08:07	-32500	0
2011-12-07 10:08:09	-32500	0
2011-12-07 10:08:10	-32500	0
2011-12-07 10:08:11	-32500	0
2011-12-07 10:08:12	-32500	0
2011-12-07 10:08:14	-32500	0
2011-12-07 10:08:15	-32500	0
2011-12-07 10:08:16	-32500	0
2011-12-07 10:08:17	-32500	0
2011-12-07 10:08:18	-32500	0

Fig. 42

On completion of the measurement the measured values can be read out as described under **Read RFID – Actual Log from the file**.

The measured values are displayed in tabular form as illustrated in the adjacent diagram.

<i>NOTE</i>	
i	The list can be moved to the right and left with the scroll bar at the bottom of the screen.

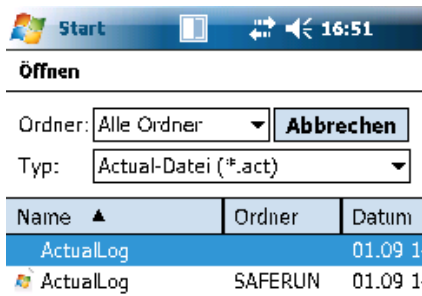
7.3.3.3 Read RFID – Read out Actual Log


Fig. 43

On completion of the measurements the result can be read out of the SAFERUN® CMS-T transducer. Proceed as follows to read out the log data of the SAFERUN® CMS-T transducer:

- Select menu point **Read RFID**
- Move the PDA with the RFID reader to the antenna interface of the SAFERUN® CMS-T transducer
- Wait for data transmission

7.3.3.4 Load File – Load Actual Log from file



Proceed as follows to load Actual Log files already stored:

- Select menu point **Load File**
- Select file from list by double-clicking it

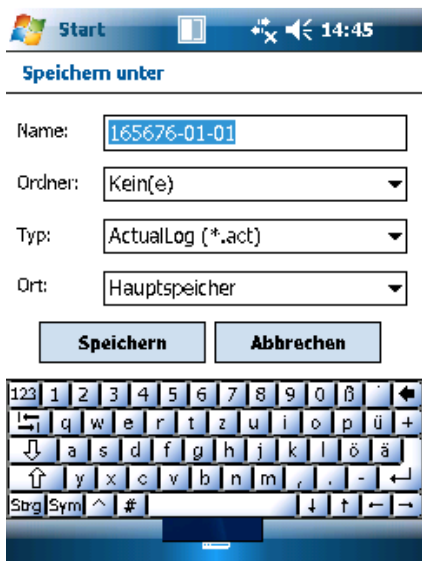
i	NOTE
	Actual Log files have the file extension act .

The Actual Log file is loaded.



Fig. 44

7.3.3.5 Save File – Save Actual Log



Proceed as follows to save the Actual Log data which have been read out in a file:

- Select menu point **Save File**
- Enter the new file name in the field **Name:**

i	NOTE
	Call up the on-screen keyboard of the PDA to be able to enter the file name.

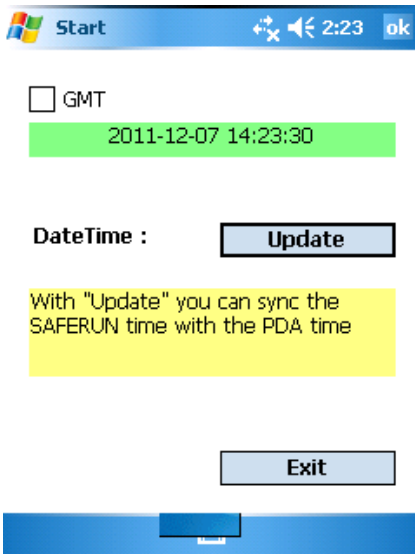
- Select the folder you want (standard = SAFERUN) from the list
- Click the button **Speichern** to save the file
- The Actual Log file is stored under the specified name in the folder selected.

Fig. 45

7.3.3.6 Exit – Back to the main menu

Back to the main menu by clicking the **Exit** button.

7.3.4 DateTime – update SAFERUN time

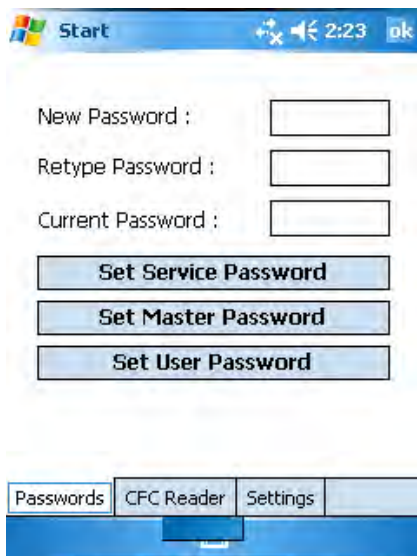


With "**Update**" the time of the **PDA** can be synchronised with the **SAFERUN[®]** time.

You can select whether the **SAFERUN[®]** time is to correspond to GMT or local time.

Fig. 46

7.3.5 Settings



Basic settings of the program can be changed in the menu point **Settings**.

The following settings are available:

- Passwords:** Manage passwords
- CFC Reader:** CFC Reader settings
- Settings:** Set system parameters

Click the appropriate tab to switch over between the setting ranges.

Fig. 47

7.3.5.1 Setting passwords

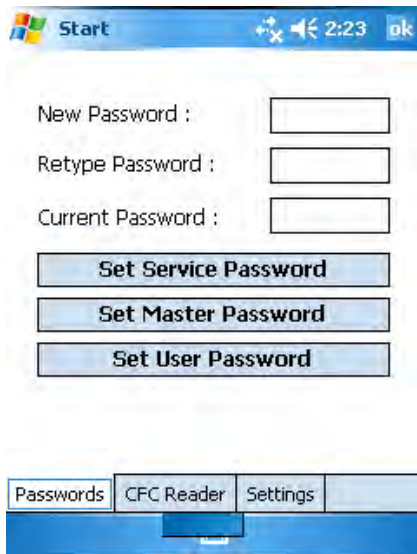


Fig. 48

The log on passwords can be changed in the **Passwords** tab. The following hierarchy is to be observed:

- The user **User** can only change his password
- The user **Master** can change his password and that of the **User**
- The user **Service** can change his password and those of the **User** and **Master**
- The user **Admin** can change all passwords. However, only the manufacturer may log on as **Admin**.

Proceed as follows to change the password:

- Enter the new password in the field New Password
- Enter the new password in the field Retype Password again with the same spelling as confirmation

i	NOTE
	The new password must be at least 4 characters long.

7.3.5.2 CFC Reader settings

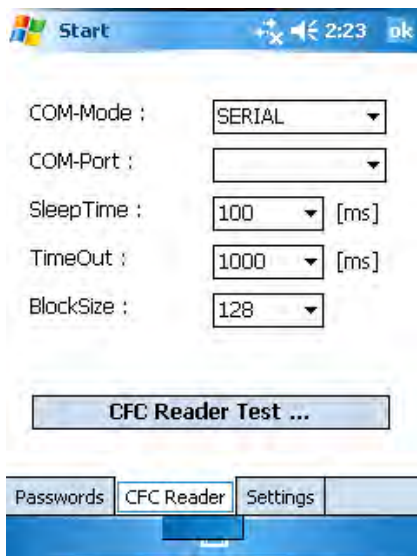


Fig. 49

The following system parameters can be set in the tab **CFC Reader**:

- Serial connection:** Interface where the RFID reader is connected
- Sleep time:** Can only be changed by the manufacturer.
- Time out:** Can only be changed by the manufacturer.
- CFC Reader Test:** Tests whether the connected RFID reader can be addressed at this interface

7.3.5.3 Language and GMT settings



The program language and GMT can be set in the tab **Settings**.

Language: Program language in German or English

GMT: Use either the local time or GMT as a basis

i	NOTE
	The change in language does not become effective until the next program start.

Fig. 50

7.3.6 GMT (Greenwich Mean Time)

GMT Use of GMT

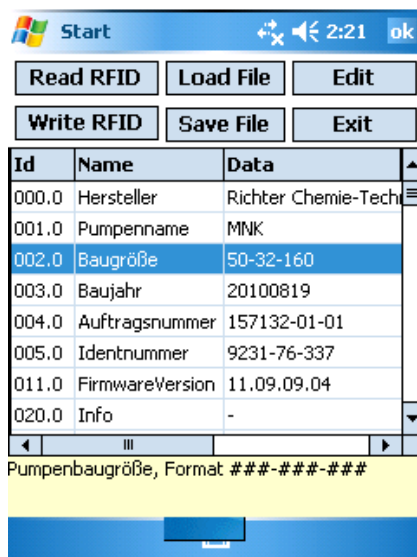
GMT Use of local time which is also currently used in the PDA

When reading out the History or Actual Log data from the transducer **SAFERUN® CMS-T**, the times are converted directly to GMT or to the local time, depending on the activation of GMT.

7.4 Parameterisation

The **SAFERUN®** CMS-T transducer can be adapted to suit the application conditions by means of the parameters. The parameters are divided into the following logical blocks:

- Data of the manufacturer
- Pump data
- Material data (density/viscosity of the fluid)
- Monitoring parameters
- Accumulated values (duty hours, power, flow rate, ...)
- Calibration data
- Threshold values for data logging



Id	Name	Data
000.0	Hersteller	Richter Chemie-Tech
001.0	Pumpenname	MNK
002.0	Baugröße	50-32-160
003.0	Baujahr	20100819
004.0	Auftragsnummer	157132-01-01
005.0	Identnummer	9231-76-337
011.0	FirmwareVersion	11.09.09.04
020.0	Info	-

Pumpenbaugröße, Format ###-###-###

Fig. 51

The data of the manufacturer and some of the pump data are shown in the adjacent diagram. In the field Info (parameter 20) the operating company may enter pump-specific information (TAG No. or similar).

NOTE	
i	<ul style="list-style-type: none"> ▶ The SAFERUN® CMS-T transducer is pre-parameterised at the works on the basis of the data sheet of the pump and the maximum possible range of operation. ▶ When a SAFERUN® CMS-T transducer is ordered for a SAFERUN®-ready pump, the complete commission number must be indicated. ▶ The complete parameter list is contained in the Annex. Parameters described in this operating manual are listed with the relevant parameter number.

7.4.1 Pump power

The monitoring parameters are entered on the basis of the water performance curve. The threshold values are calculated in proportion to the density of the fluid.

With a constant density of the fluid the same values are entered in the fields DichteMin (parameter 191) and DichteMax (parameter 192). With a variable density of the fluid entries are made as described in the case examples in chapter 7.4.7.

The power threshold values (P_0 , P_{min} and P_{max}) are stored as a function of the speed.

Par.-#	Parameter name	Unit	Meaning
200	KennlDrehz_x	rpm	Speed for the monitoring parameters 1 - 4
201	KennlPNull_x	kW (water)	Power P_0 at zero flow rate
202	KennlPMin_x	kW (water)	Power P_{min} at min. admissible flow rate
203	KennlPMax_x	kW (water)	Power P_{max} at max. admissible flow rate
190	DichteMin	kg / dm ³	Minimum density of the fluid
191	DichteMax	kg / dm ³	Maximum density of the fluid
192	Viskosität	mm ² /s	Viscosity of the fluid

The power threshold value is converted to the actual speed from the parameterised speed (KennlDrehz_x). If only one speed is entered in the monitoring parameters KennlDrehz_1 to KennlDrehz_4 (parameter 200), the affinity law $P \sim n^3$ is applied.

NOTE	
i	Power values should be entered for all 4 speed points in the case of variable speeds and to obtain greater accuracy.

7.4.2 Flow rate

The SAFERUN® CMS-T transducer **calculates** the flow rate using the actual power measured, the material data (viscosity and density), and the linearisation of P_{min} / Q_{min} and P_{max} / Q_{max} on the pump test bed. In order to draw a direct conclusion from the power determined to the flow rate, the appropriate parameters must be set on the SAFERUN® CMS-T transducer for all 4 speeds (see chapter 7.4.1 Pump power).

The accuracy of the material data of the fluid has a direct influence on the accuracy of the flow rate figure.

i	NOTE
	The calculated flow rate only serves to estimate the flow rate.

Possibilities of improving the entry of the material data are explained below:

7.4.2.1 Temperature dependence of the density of the fluid

This section is applied to fluids with a **constant** density at room temperature and a significant change in density at high or low temperatures. The threshold power value must in this case be calculated as a function of the density **and** the temperature of the fluid.

The same value for 20°C is entered in the parameter fields DichteMin (parameter 191) and DichteMax (parameter 192).

The change in density at temperature is described in the following formula:

$$\rho_{(t)} = \rho_{20^{\circ}C} + (\rho_{(t)} - \rho_{(20^{\circ}C)})$$

The term $\rho_{(t)} - \rho_{(20^{\circ}C)}$ is described with a polynomial function (up to the 3rd degree). The coefficients of the polynomial are determined using an appropriate program (e.g. Excel) and entered in the parameter fields FluidTemp_x (parameter 180).

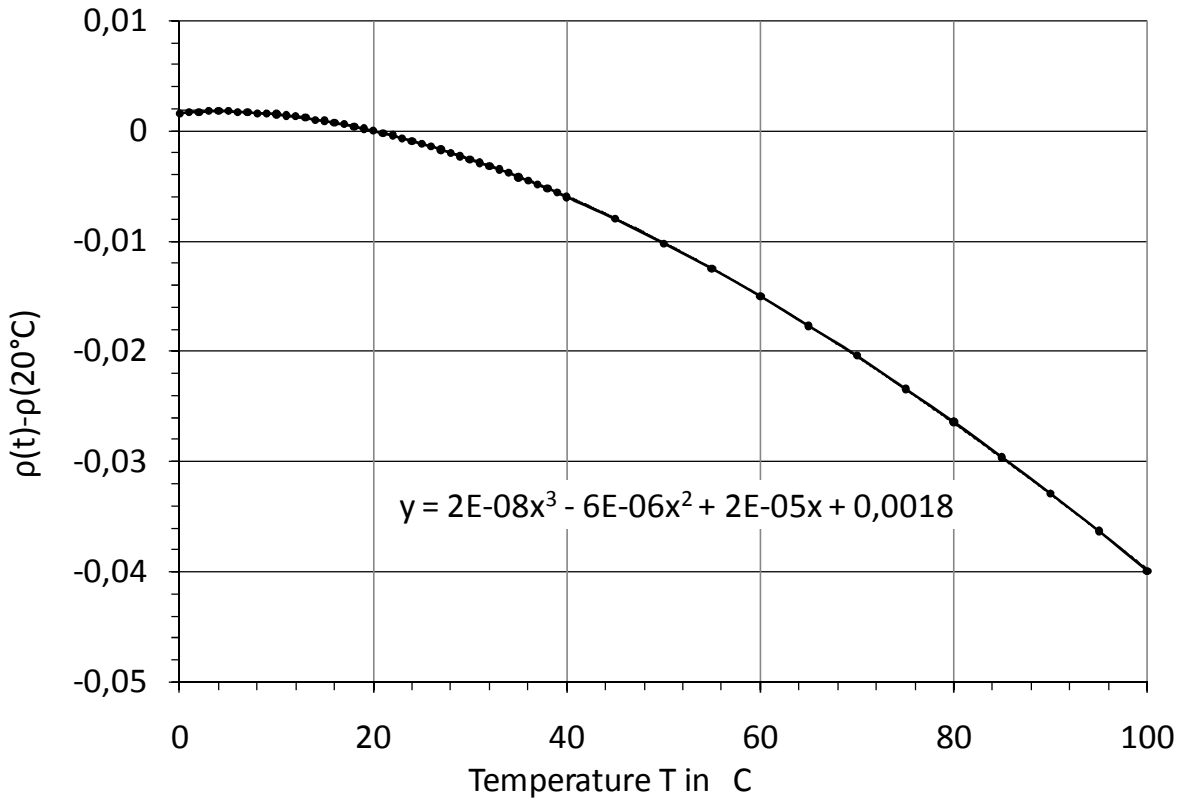


Fig. 52 Example: Density of water as a function of the temperature

Par.-#	Parameter name	Value	Unit
180	FluidTemp_1	0,0018	1
180	FluidTemp_2	0,00002	1
180	FluidTemp_3	-0,000006	1
180	FluidTemp_4	0,00000002	1
191	DichteMin	0,998	kg/dm ³
192	DichteMax	0,998	kg/dm ³

SAFERUN[®] calculates the current flow rate from the actual power, the fluid temperature and the density.

7.4.2.2 Constant viscosity $\nu \neq 1 \text{ mm}^2/\text{s}^3$

If a pump is used with SAFERUN® at a viscosity $L > 1 \text{ mm}^2/\text{s}$, the viscosity must be entered in the parameter field Viskosität (parameter 193) and the influence of viscosity on the pump power in the parameter fields PumpenViskosität[1] to PumpenViskosität[5] (parameter 185). In order to calculate the flow rate in this way, the power is back-calculated according to the following formula for the power for viscosity = 1 mm^2/s .

$$f(\nu) = \frac{P_{\nu}}{P_{\nu=1}}$$

$P_{\nu=1}$ = Power of the pump according to the performance curve.

P_{ν} = Power of the pump at the corresponding viscosity

$f(\nu)$ = Function to describe the viscosity dependence of the pump

As a standard feature, the following equation

$$f(\nu) = -0.00011961x^2 + 0.01394580x + 0.99037785$$

is stored for all MNK sizes, impeller diameters, speeds and flow rates in the parameter fields. As the equation was developed for all pumps, it is relatively inaccurate, especially at higher viscosities.

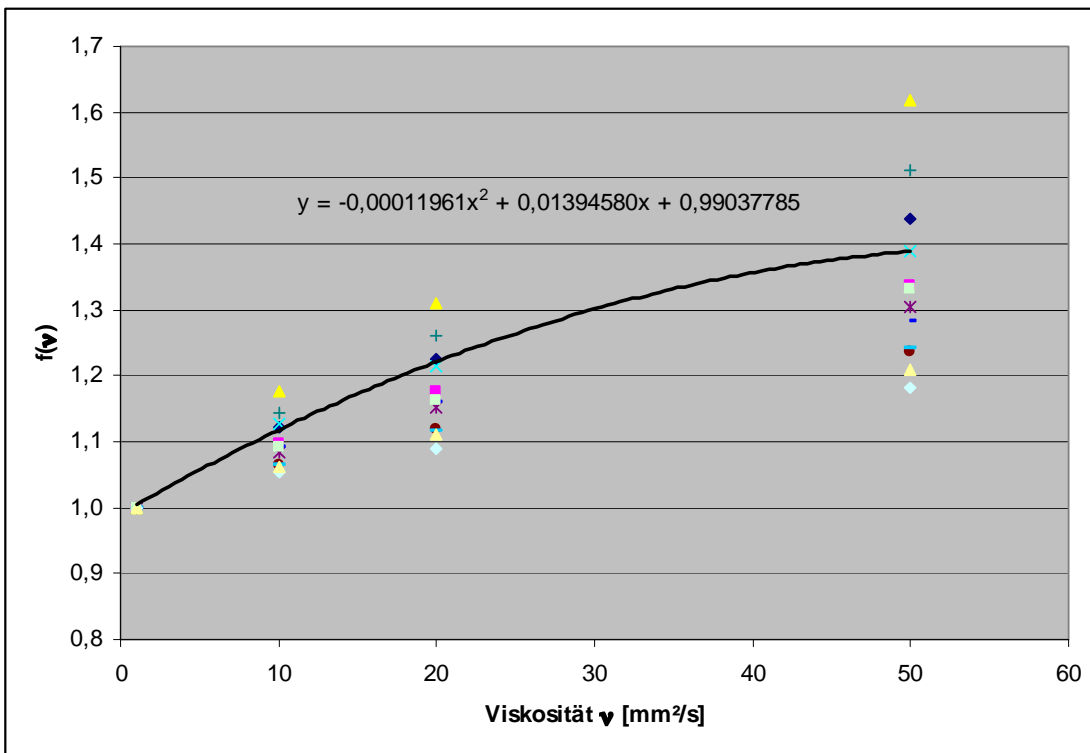


Fig. 53 Function $f(\nu)$ for all MNKs

If the pump size, the impeller diameter, the speed and the flow rate are known, the correction can be performed with considerably more accuracy. For this purpose, the defined pump is calculated with various viscosities in the pump design program SPAIX and a compensating curve drawn through the points calculated.

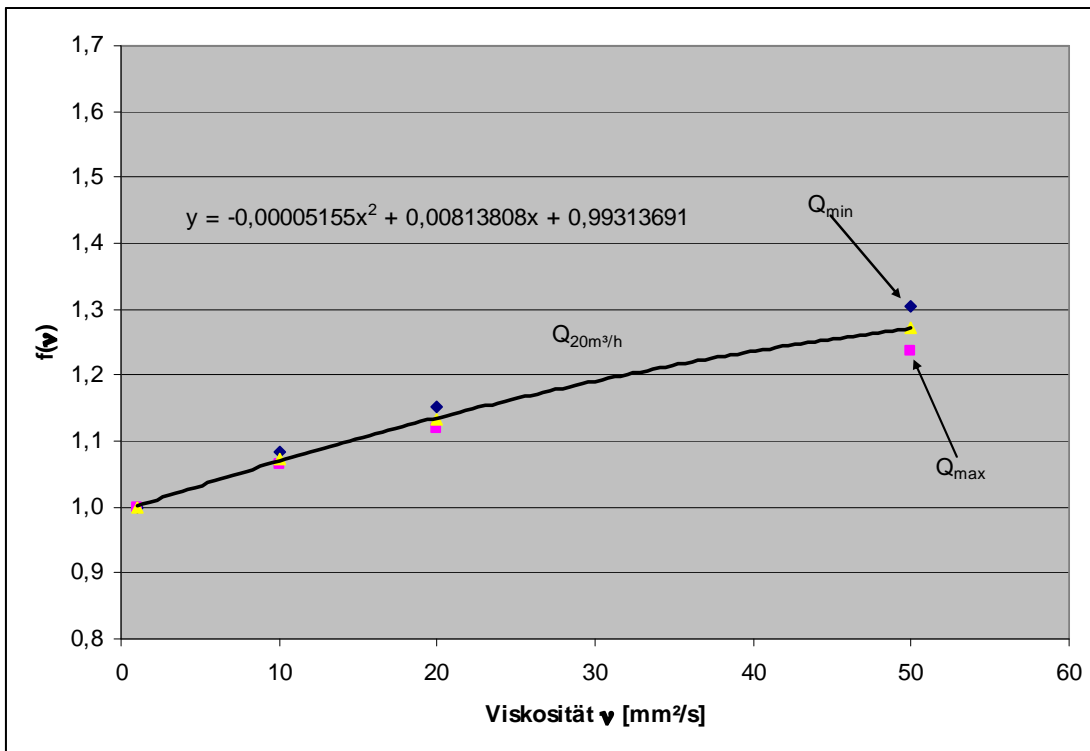


Abb. 54 Function $f(v)$ for MNK 50-32-160, impeller $\varnothing = 165$ mm, $n=2900$ rpm, Q_{min} , $Q = 20$ m³/h, Q_{max}

These material data parameters are entered in the parameter list:

$$P_{v=1} = \frac{P_v}{f(v)}$$

Par.-#	Parameter name	Value	Unit
185	ViskosPump_1	0.99313691	1
185	ViskosPump_2	0.00813808	1
185	ViskosPump_3	-0.00005155	1

The threshold power is calculated as a function of these values and the values entered in the parameter field Viskosität (parameter 193) and the flow rate calculated from the actual power.

7.4.2.3 Temperature dependence of the viscosity

If the viscosity changes with the temperature, the curve can be indicated. For this purpose, the viscosity of the fluid at 20°C is entered in the parameter field Viskosität.

For other temperatures, the viscosity can be corrected according to the following formula:

$$V_{(t)} = V_{20^{\circ}C} + (V_{(t)} - V_{(20^{\circ}C)})$$

$(V_{(t)} - V_{(20^{\circ}C)})$ can be described with a polynomial function (up to the 4th degree). The coefficients of the polynomial are entered in the parameter list ViskosTemp_x (parameter 184).

Example: heat transfer oil:

t [°C]	v [mm ² /s]	$(V_{(t)} - V_{(20^{\circ}C)})$
20	18	0
40	8.2	-9.8
60	4.7	-13.3
80	3.1	-14.9
100	2.2	-15.8
160	1.03	-16.97

Table 2.5.6.1: Viscosity of heat transfer oil Avia Thermofluid as a function of the temperature

The necessary coefficients can be determined with a corresponding program (e.g. Excel).

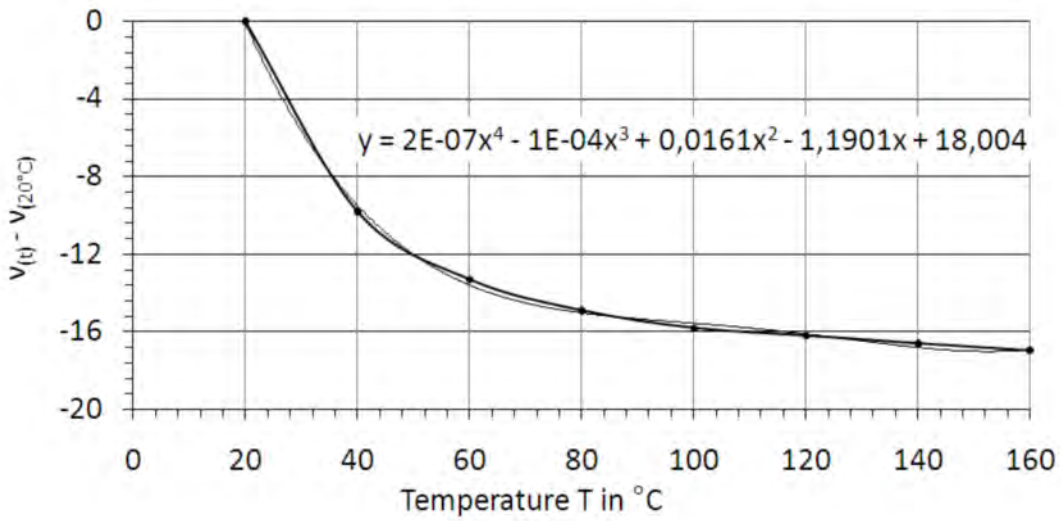


Fig. 55 *Temperature dependence of the viscosity*

The coefficients determined in this way are then entered in the parameter list ViskosTemp_x.

For heat transfer oil, e.g.:

Par.-#	Parameter name	Value	Unit
184	ViskosTemp_1	18.004	1
184	ViskosTemp_2	-1.1901	1
184	ViskosTemp_3	0.0161	1
184	ViskosTemp_4	-0.00001	1
184	ViskosTemp_5	0.0000002	1

The program calculates the current viscosity from the fluid temperature and computes the power correction and flow rate.

7.4.3 Parameterisation output signal

The current operating point of the pump is illustrated as a function of the 4 – 20 mA output signal of the SAFERUN® CMS-T transducer. Special events can be assigned to certain flows entered.

7.4.3.1 Power performance curve

The power performance curve is set using the parameters P_0 , P_{min} and P_{max} . The output signal as well as the operating point display of the SAFERUN® CMS-T transducer follow the pump power determined in accordance with the following performance curve.

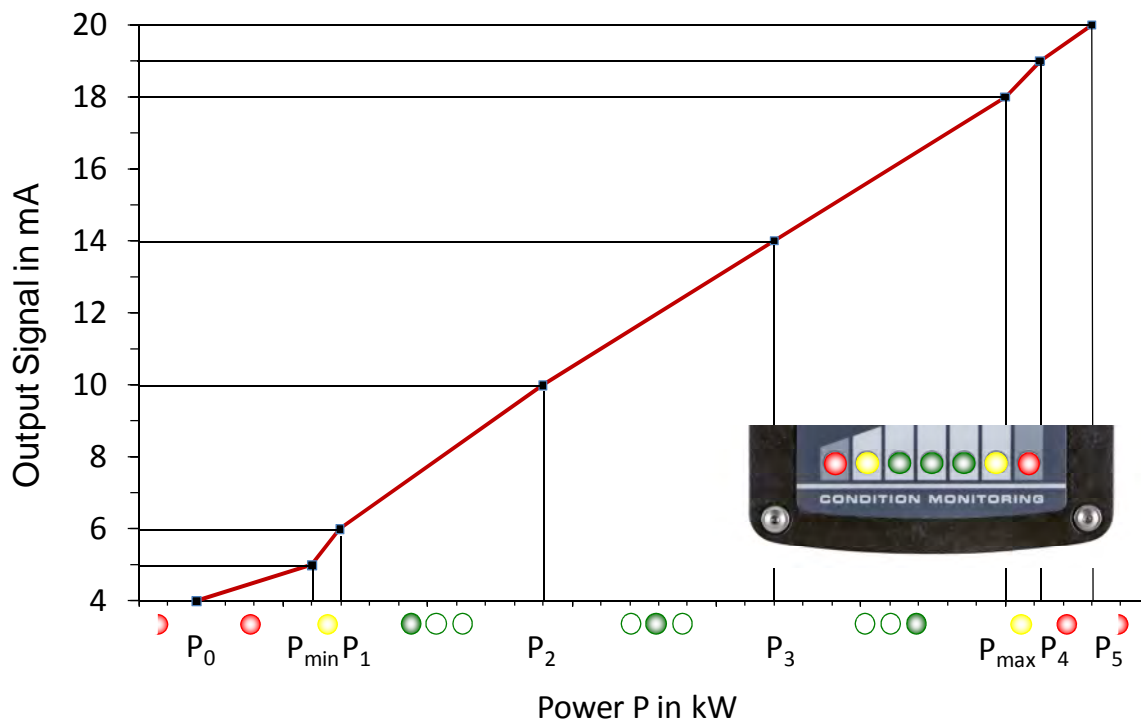


Fig. 56

The specific power stages of the performance curve are defined as follows:

P_0	Parameter 201
P_{min}	Parameter 202
P_1	$P_{min} \cdot 1,04$
P_2	$P_1 + (P_{max} - P_1) \cdot 1/3$
P_3	$P_1 + (P_{max} - P_1) \cdot 2/3$
P_{max}	Parameter 203
P_4	$1.04 \cdot P_{max}$
P_5	$1.1 \cdot P_{max}$

The following table illustrates the connection between power range, operating point display and output signal of the **SAFERUN[®] CMS-T** transducer:

LED	Colour	Status	Power range		Output signal	
			Min	Max	mA	%
A	red	flashes	0	P_0	4	<0 – 0%
a	red	comes on	P_0	P_{min}	4 – 5	0 – 6.25%
b	yellow	comes on	P_{min}	P_1	5 – 6	6.25 – 12.5%
c	green	comes on	P_1	P_2	6 – 10	12.5 – 37.5%
d	green	comes on	P_2	P_3	10 – 14	37.5 – 62.5%
e	green	comes on	P_3	P_{max}	14 – 18	62.5 – 87.5%
f	yellow	comes on	P_{max}	P_4	18 – 19	87.5 – 93.75%
g	red	comes on	P_4	P_5	19 – 20	93.75% - 100%
g	red	flashes	> P_5		20	>100%

7.4.3.2 Output signal events

Special conditions of the pump can be assigned to fixed flows using the output signal of the **SAFERUN®** CMS-T transducer. These fixed flow values can, for example, be used for detecting errors in the process control technology.

The following parameters are provided for special events:

ID.-#	Parameter name	Event	Standard value mA ²⁾
260	iErrorStop	Pump standstill	3.0
261	iErrorTemp ¹⁾	Error temperature sensor	21.0
262	iErrorSensor	Error magnetic sensor	2.5
263	iErrorKupplungsabriss	Drive stoppage/overload	21.5
265	iErrorKupplungMax	Rated torque exceeded	21
267	IErrorDrehzMin	Speed too low for a sensible evaluation	3.5
268	IErrorDrehzMax	Speed too high for a sensible evaluation	20.5
269	IErrorClock	Error date/time	-1.0

- 1) If the temperature is output via the 4-20 mA signal (output mode =10, ID.# 210), the event "Error temperature sensor" (IError Temp, ID.# 201) cannot be deactivated with -1.0. In case of an event of -1.0, 21.0 mA is output for this event.
- 2) The admissible value range is from 0-4 mA and 20-21.5 mA. The value -1.0 deactivates the event.

In normal mode (ID.# 210, output mode =0) a temperature sensor error is not output as an event (unless at least one of the parameters 180 to 184 is in use).

7.4.4 Parameters monitored


The following power data are monitored by the unit:

- Power
- Temperature
- Speed
- Drive stoppage

7.4.5 Detection of inadmissible modes of operation

The following inadmissible modes of operation can be determined on the basis of the values provided by the unit:

Mode of operation	Condition
Dry running/inadequate lubrication	$P \ll P_0$
Closed discharge valve	$P \leq P_0$
Flow rate too low	$P \leq P_{min}$
Pump stoppage due to gas	$P \ll P_0$
Pump stoppage due to cavitation (only with complete cavitation)	$P \ll P_0$
Risk of cavitation through too high a flow rate (P_{max} must be specified)	$P > P_{max}$
Plain bearing damage	$P > P_{max}$
Vessel run empty	$P \ll P_0$
Drive stoppage	$P \gg P_{max}$

	ATTENTION
	<p>In the case of flushing with an external or the pump fluid, dry running or a lack of lubrication of the plain bearings in the pump cannot be detected.</p>

7.4.6 Case studies

7.4.6.1 Fluid with a constant density

Application: production of hydrofluoric acid HF:
Heating of calcium fluoride with concentrated sulphuric acid
Density 1.35 kg/dm³
Speed 2900 rpm

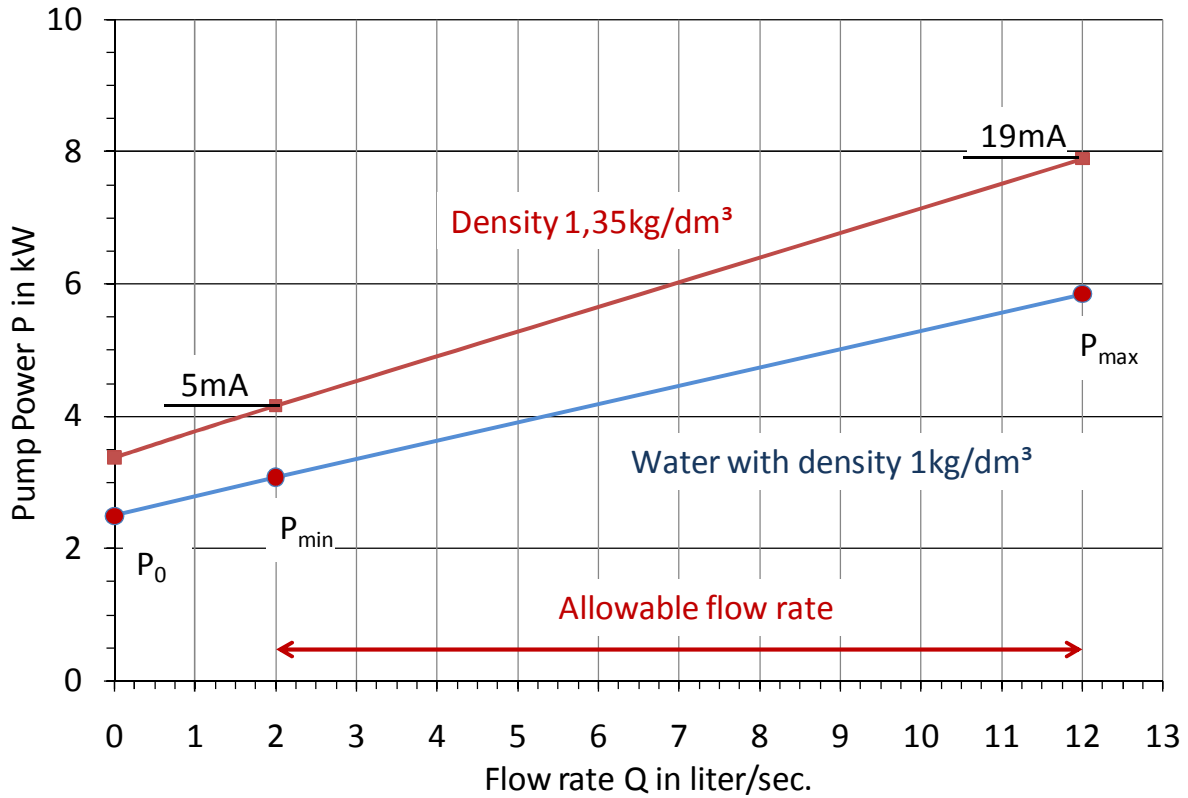


Fig. 57 MNK 50-32-160, impeller diameter 151mm, speed 2900 rpm

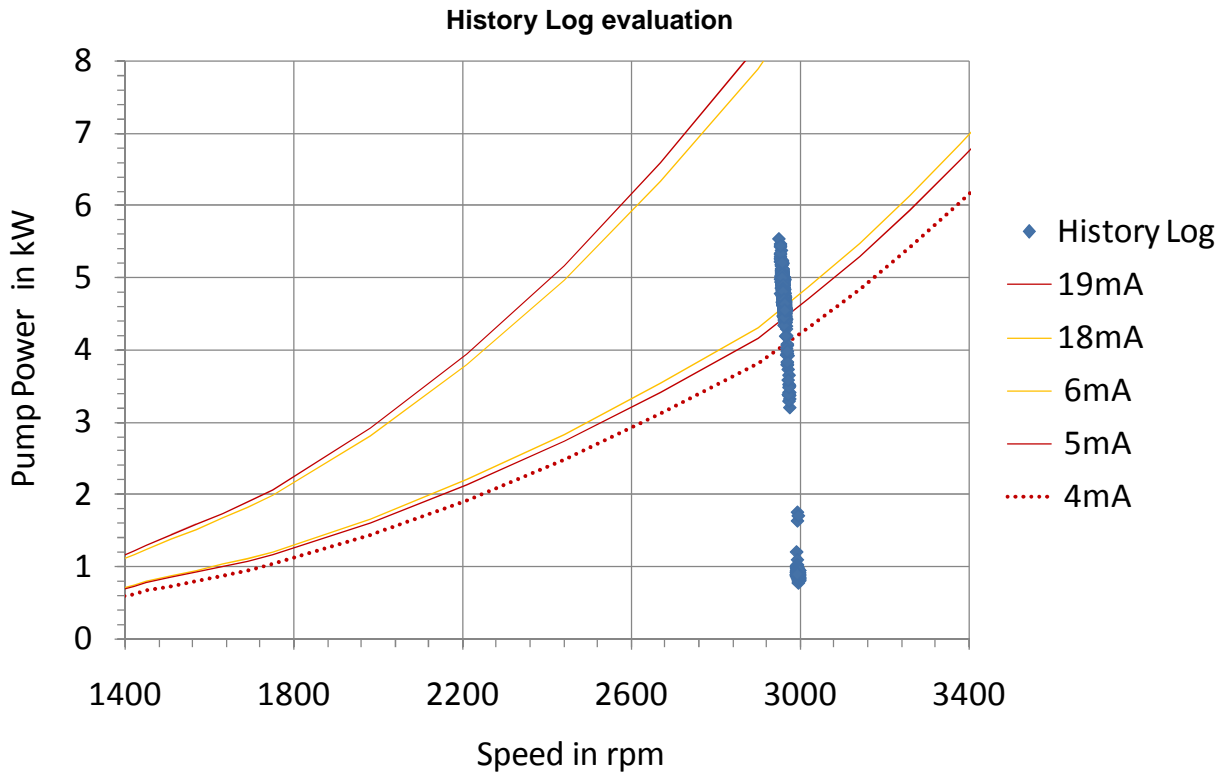


Fig. 58 Measurements from History Log

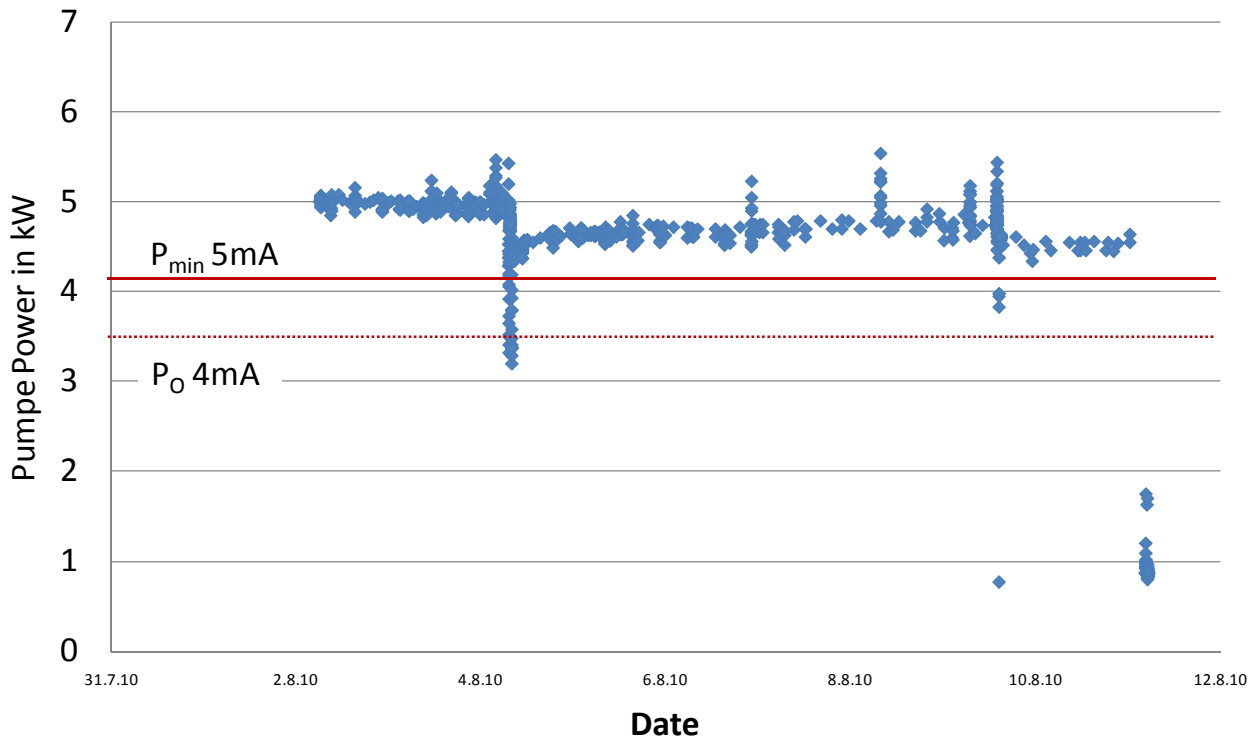


Fig. 59 Power as a function of time

7.4.6.2 Fluid with a variable density

Application case esterification of thioglycolic acid C₂H₄O₂S:
 Density 0.9 – 1.15kg/dm³

Speeds 2900 rpm, alternatively 1450 rpm

The power consumption of the centrifugal pump is proportional to the density of the fluid. The transducer **SAFERUN®** CMS-T transducer cannot measure the density of the fluid and therefore cannot calculate the flow rate using the power consumption.

In the case of a variable density the lower power threshold P_{min} is calculated from the highest density and the higher power threshold P_{max} from the smallest density of the fluid.

As a result of this action, both the minimum and the maximum admissible flow rate are safeguarded, irrespective of the current density. At the same time, the admissible flow range is reduced.

The power values necessary for parameterisation relate to water.

The ratio of the minimum to the maximum maximum density should not exceed approx. 30%. An error message is output in the case of parameterisation of too large density ratios (see section 8.4).

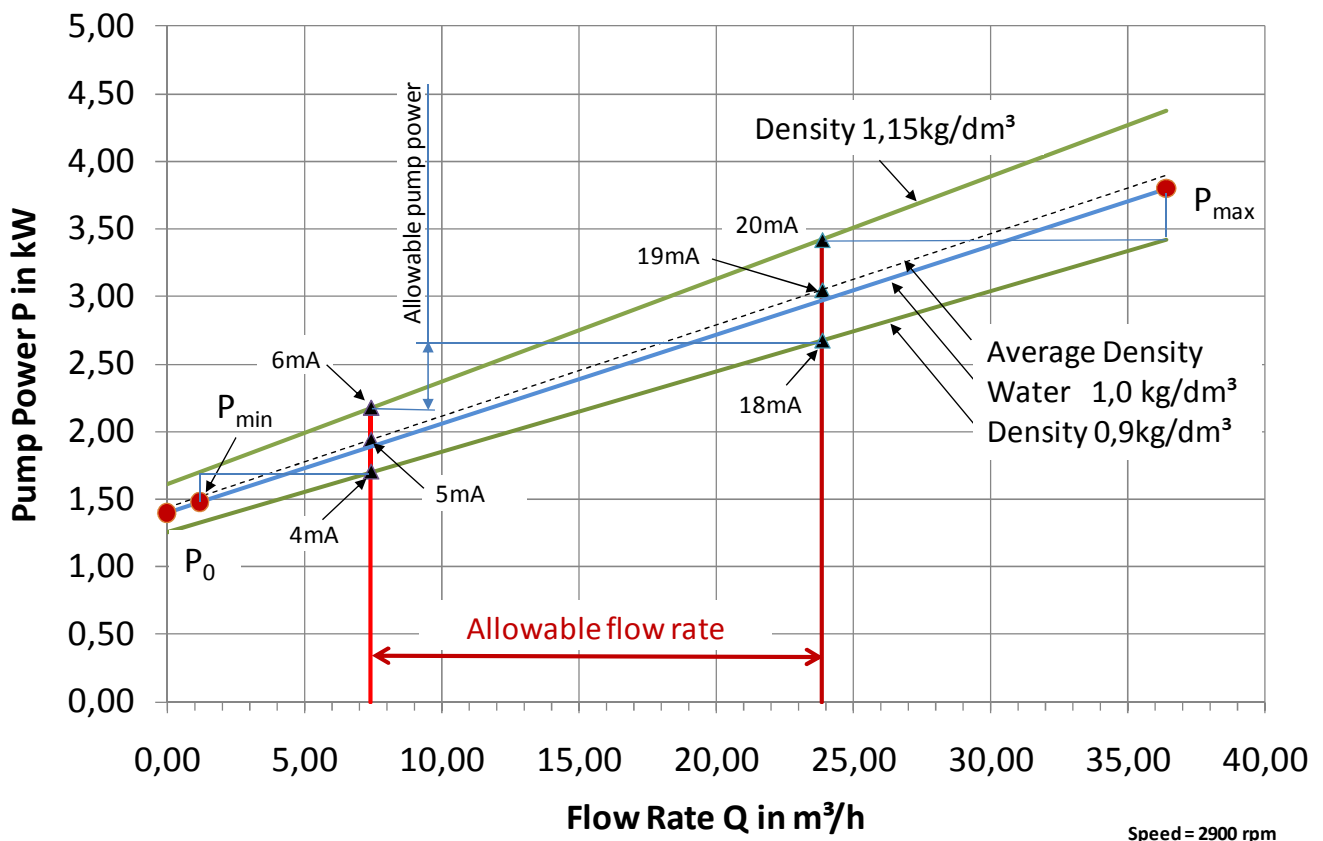


Fig.. 60 Variable densities

The LED display on the SAFERUN® CMS-T is equal to the output signal at constant density (see section 7.4.3.1):

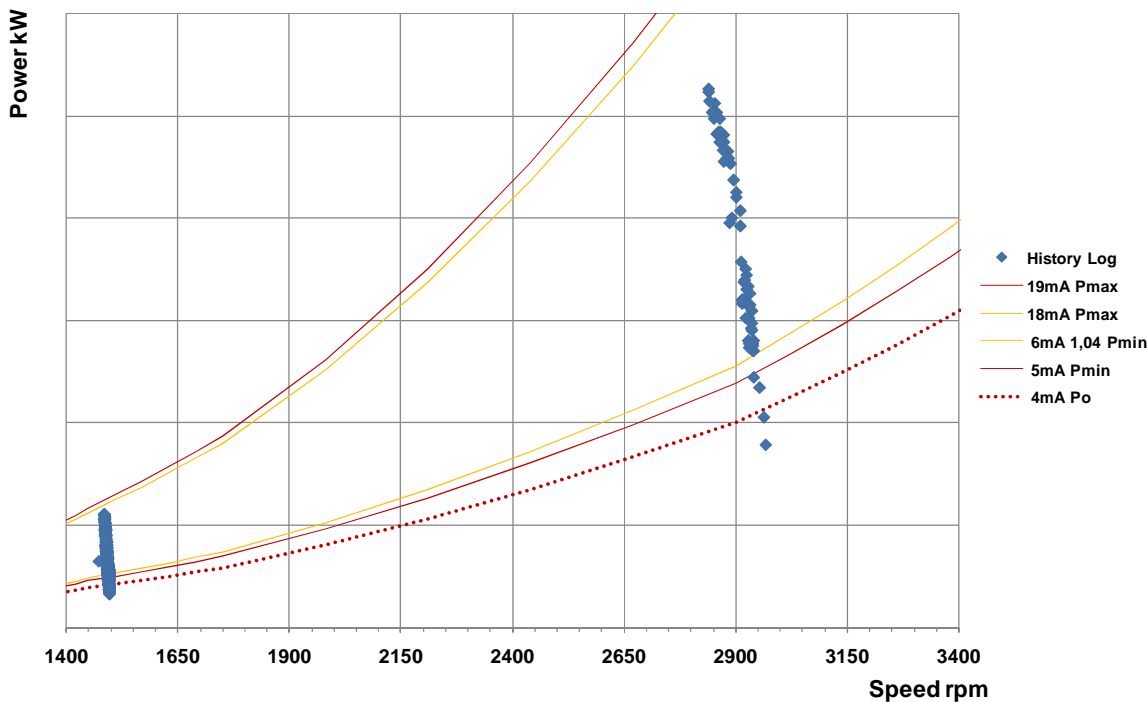


Fig. 61 Powers over speed at 1450 rpm and 2900 rpm in the parameter channel

7.4.6.3 Fluid with a large variable density and viscosity

In the case of highly fluctuating material data the admissible flow rate range cannot be calculated with the power consumption and density_{min}, density_{max} and viscosity. In this case, the value 1 is entered for the parameters Dichte_{min} (Par#), Dichte_{max} (Par#) and viscosity.

The pump is operated, for example for one week or one batch with SAFERUN. During this time the pump should run in operation as intended. The current power is stored as a function of time in the SAFERUN® CMS-T transducer.

After the introduction phase, the History Log must be read out using the PDA and evaluated in the Excel spreadsheet.

The parameters P_0 , P_{min} , P_{max} are to be set in the register "Parameters" so that the History Log measurements are within the enveloping curve P_{min} and P_{max} .

Then the values determined for P_0 , P_{min} , P_{max} , as described in section 7.3.1.1, have to be updated in the SAFERUN® CMS-T transducer.

7.5 Cloning SAFERUN® CMS-T transducer data

If a **SAFERUN®** CMS-T transducer on a pump has to be replaced or a second **SAFERUN®** CMS-T transducer is to be used, there is the possibility of transferring (cloning) all parameters from one **SAFERUN®** CMS-T transducer to another.

Proceed as follows to clone the **SAFERUN®** CMS-T transducer data:

- Log in on the PDA as User Service
- Use the button "Cloning"
- Load parameters of the **SAFERUN®** CMS-T transducer to be cloned into the PDA
- Save the parameters as a backup
- Save the loaded parameters in the second **SAFERUN®** CMS-T transducer.

7.6 Installing SAFERUN PDA software on the PDA

Proceed as follows if the operating system and the **SAFERUN®** software have to be loaded again onto the PDA:

Copy and install the corresponding .NET framework onto the PDA using ActiveSync, depending on the type of PDA

Copy and install the corresponding driver using ActiveSync, depending on the RFID reader

Copy and install the **SAFERUN** PDA software onto the PDA using ActiveSync.

7.7 Evaluation of the History log files

The data read out from the SAFERUN[®] CMS-T transducer can be evaluated with the Excel sheet developed by Richter.

Proceed as follows to evaluate the data read out:

Load current parameters and the History Log from the SAFERUN[®] CMS-T transducer into the PDA and store on the PDA.

Transfer the current parameter file and the current History Log file onto a PC.

Rename the 2 files in *.csv.

Open Richter Excel sheet with Excel.

Copy History Log into the tab **History Log** of the Excel sheet.

Copy parameter file into tab **Parameter PDA** of the Excel sheet.

If necessary, modify the diagram scales of the axes.

Various evaluations of the data are available:

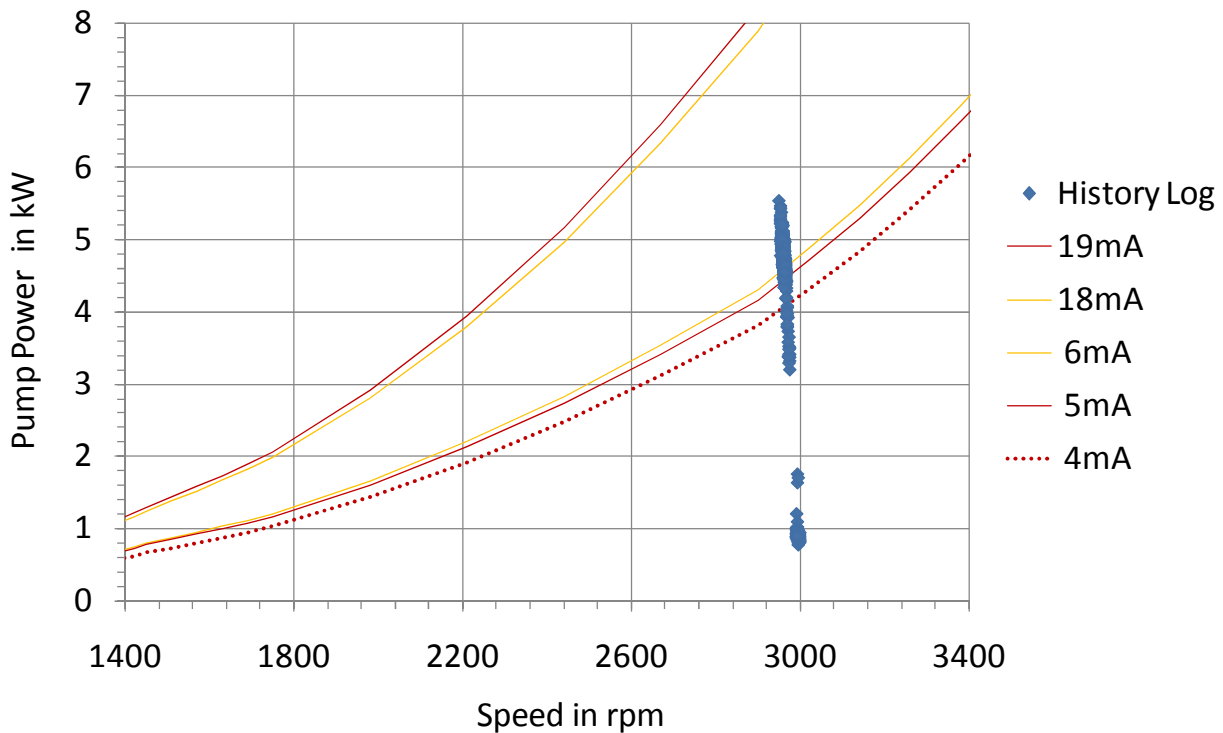


Fig. 62 Power as a function of the speed in the parameter channel

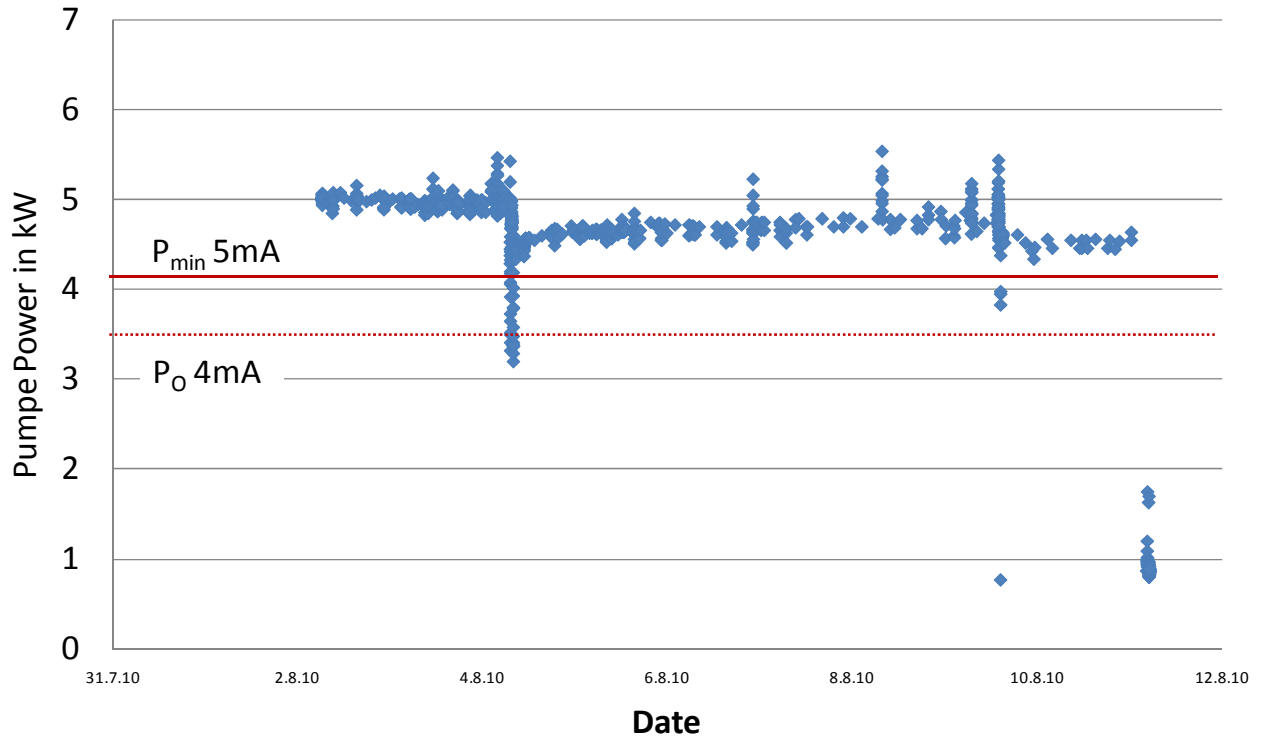




Fig. 63 Power as a function of time to adjust with operating company data


8 Maintenance and troubleshooting

8.1 Safety notes

Observe the following safety notes when installing the unit:

	⚠ DANGER
	<p>Danger from electricity!</p> <p>There is a risk to life if you come into contact with live wires or components!</p> <ul style="list-style-type: none"> ▶ Before the start of work switch off electricity supply and secure against being switched on again.
	⚠ WARNING
	<p>Risk of injury due to improper maintenance!</p> <p>Improper maintenance can result in serious personal injury or property damage.</p> <ul style="list-style-type: none"> ▶ Before the start of work ensure there is enough assembly space. ▶ Pay attention to orderliness and cleanliness at the workplace! Components and tools which are loosely stacked or lying around are sources of accidents. ▶ Assemble components correctly. ▶ Wear the protective clothing prescribed by the operating company for the place of use of the unit.

8.2 Qualifications of the staff

	⚠ DANGER
	<p>Risk to life from inadequate qualifications of the staff!</p> <p>Maintenance may only be performed by specially trained and skilled staff.</p> <ul style="list-style-type: none"> ▶ Work on the electric system may only be performed by qualified electricians. ▶ Observe the safety provisions applicable to the working area.

8.3 Customer service / Hotline

For information, see chapter 1.6 Customer service

8.4 Error displays



Fig. 64

Errors are displayed on the unit by coloured LEDs on the **SAFERUN® CMS-T** transducer.

The following error information is shown:

- 1 Temperature sensor error
- 2 Power sensor error
- 3 Drive stoppage
- a – g Error display after self-test (see table below)

8.5 Fault rectification

Fault	Possible cause	Rectification
No display	Power supply switched off	Switch on power supply
Self-test		
LED a flashes after self-test	The main memory defective	Replace SAFERUN® CMS-T transducer
LED b flashes after self-test	Error in firmware	Replace SAFERUN® CMS-T transducer
LED c flashes after self-test	System time is not correct	Set system time
LED d flashes after self-test	FRAM memory data loss or fault	Replace SAFERUN® CMS-T transducer
LED e flashes after self-test	RFID error data loss or connection fault	Replace SAFERUN® CMS-T transducer
LED f flashes after self-test	Version conflict between SAFERUN® and PDA	Reset parameters ¹⁾
LED g flashes after self-test	Parameter value error	Check and correct values ²⁾
Temperature sensor		
LED 1 flashes	Connection plug to the can SAFERUN® CMS-S not inserted	Insert the connection plug into the can SAFERUN® CMS-S
	Temp. sensor cable breakage	Replace cable or sensor
LED 1 flashes fast	Short circuit Temperature sensor	Replace cable or sensor
LED 1 comes on	Time has stopped	De-energise SAFERUN for 5 seconds
Magnetic sensor		
LED 2 flashes red/green	Connection plug to the can SAFERUN® CMS-S not inserted	Insert the connection plug into the can SAFERUN® CMS-S
	Cable breakage	Replace cable

Magnetic drive		
LED 3 comes on for 1 – 2 seconds	Load change	Check medium
LED 3 flashes	Max. admissible torque exceeded	Throttle pump or minimise speed
LED 3,a,b,f,g flash fast, e comes on red/green	Magnetic drive stoppage	Switch off pump immediately
LED 2 comes on red/green, a,b,c flash	Speed is too low	Contact manufacturer
LED 2 comes on red/green, e,f,g flash	Speed is too high	Contact manufacturer

- 1) Contact the manufacturer and reconcile firmware version of **SAFERUN®** with the PDA software version. The **SAFERUN®** firmware version is contained in the parameter list. The PDA software version is shown as a date in the login mask.
- 2) Using the PDA, the parameters are to be read from the **SAFERUN®** CMS-T transducer: The parameters with the inadmissible value are contained in the field #ERRPARAM. All parameters can be seen in the Annex . Should several parameter values display inadmissible values, the procedure is to be repeated.

8.5.1 Error information

In addition to the LED information, error information can be read out via Parameter Read RFID. The parameter #ERRCODE indicates the sum of the error description.

Decimal	Type	Error description
0		No error
256	Hardware	Time wrong
512	Hardware	Temperature sensor short-circuit or cable breakage or not connected
1024	Hardware	Magnetic sensor cable breakage or not connected
2048		Unknown output mode (ID.# 210)
32	Condition	Pump standstill
1	Condition	Speed too low (parameter #052)
2	Condition	Speed too high (parameter #053)
4	Condition	Rated torque magnetic drive exceeded (parameter #101)
8	Condition	Drive has stopped

Note: Combinations are possible, e.g. (512 + 1024) = 1536, that means: the temperature sensor is defective or not connected and the magnetic sensor has a cable breakage or is not connected. That could ultimately mean that the cable from the SAFERUN to the can is not connected.

8.6 Cleaning

If dirty, clean the **SAFERUN®** CMS-T transducer and the display panel with a damp cloth . Do not use any cleaning agents containing solvents.

8.7 Maintenance

The unit is maintenance-free.

The internal battery may only be replaced by the manufacturer. Service life approx. 10 years according to the manufacturer.

8.8 Repairs


The **SAFERUN®** components may only be repaired by the manufacturer.


If it is necessary to replace individual electronic components, e.g. housing cover or ribbon cable, this may only be performed in exchange for original parts from Richter Chemie-Technik; recalibration may perhaps be necessary.

9 Dismantling, storage and disposal


9.1 Safety notes

Observe the following safety notes when installing the unit:

	⚠ DANGER
	<p>Danger from electricity!</p> <p>There is a risk to life if you come into contact with live wires or components!</p> <ul style="list-style-type: none"> ▶ Before the start of work switch off electricity supply and secure against being switched on again!

	⚠ WARNING
	<p>Risk of injury due to improper dismantling!</p> <p>Improper dismantling can result in serious personal injury or property damage.</p> <ul style="list-style-type: none"> ▶ Before the start of work ensure there is enough space for dismantling. ▶ Pay attention to orderliness and cleanliness at the workplace! Components and tools which are loosely stacked or lying around are sources of accidents. ▶ Dismantle components correctly. <p>Wear the protective clothing prescribed by the operating company for the place of use of the unit.</p>

9.2 Qualifications of the staff

	⚠ DANGER
	<p>Risk to life if qualifications of the staff are insufficient!</p> <p>Dismantling may only be performed by specially trained skilled staff.</p> <ul style="list-style-type: none"> ▶ Work on the electric system may only be performed by qualified electricians. ▶ Observe the safety provisions applicable to the working area.

9.3 Dismantling

Perform dismantling of the **SAFERUN®** CMS-T transducer as follows:

Switch off power supply and secure against being switched on again.

Disconnect supply cable, secure open ends against short-circuit and insulate.

Detach sensor cable.

Screw **SAFERUN®** CMS-T transducer off the holding plate.

9.4 Storage

If the unit is not required for a prolonged period, clean the **SAFERUN®** CMS-T transducer as described in the chapter Cleaning.

Keep the **SAFERUN®** CMS-T transducer and/or accessories in a dry, clean and frost-free location.

9.5 Return of the **SAFERUN®** CMS-T transducer

If the **SAFERUN®** CMS-T transducer is returned for repair or inspection, enclose as detailed a description as possible of the fault in the unit.

9.6 Disposal

This unit is subject to the WEEE directive 2002/96/EC and national law. Take the unit direct to a specialised recycling company and do not use the municipal collection points for this.


Proper disposal avoids negative impacts on people and the environment and permits the recycling of valuable raw materials.

Materials: see chapter "Technical data"

10 Annex

10.1 Technical data

10.1.1 SAFERUN® CMS-T transducer

Type	CMS-T
Technical documentation	BTA 9230-020-en-
Firmware version	from 11.07.28.01
IP protection class (EN 60529)	IP 65
Housing material	ABS, modified (service resistance $\leq 10^6 \Omega$)
Spring-cage terminals	max. line cross-section 1.5 mm ²
Cable connection	3-core, with shield
Sensor cable	0.3m optionally 5m
Ambient temperature	-20°C to +60°C
Ignition protection class: category 2G (gas) category 2D (dust)	 II 2 G Ex ib IIC T4...T6 II 2 D Ex ibD 21 T 130 °C
Ambient temperature range	Category 2G (gas) T6: - 20 °C \leq T _a \leq +40 °C T4: - 20 °C \leq T _a \leq +60 °C Category 2D (dust) - 20 °C \leq T _a \leq +60 °C
Power supply	With separator (3-line circuit) in the ignition protection class "Intrinsic safety ia or ib"
Input voltage U _i	28 VDC
Input amperage I _i	50 mA – 120 mA
Maximum input power P _i	750 mW
Maximum internal capacity C _i	38 nF
Maximum internal inductivity L _i	negligible
RFID antenna (transponder passive)	
Working frequency	13.56 MHz
Standard	ISO14443B / 106kbaud data rate
System	iID-3000
HistoryLog	
DateTime	Date and time at the time of measurement
Temp	Temperature in °C
RPM	Speed in rpm
Power	Pump power in kW
Percent	Percentage of the output signal 4-20mA (0-100%)
Flowrate	Flow rate in m ³ /h ¹⁾


1) If the parameters DichteMin (Par# 190) and DichtMax (Par# 191) are different, the value -1 is output.

10.1.2 Outputs

Analog	4 ... 20 mA
HART	Temperature, speed, power, flow rate ¹⁾ , mA, %
HART driver	Generic HART DTM
HART subordinate commands	Universal commands
HART supported boards	<ul style="list-style-type: none"> Point-to-point Multidrop (output fixed at 4 mA, max. 15 in series)
HART variables	<ul style="list-style-type: none"> Primary: Temperature [°C] Secondary: Speed [rpm] Tertiary: Power [kW] Fourth: Flow rate [m³/h]

1) If the parameters DichteMin (Par# 190) and DichtMax (Par# 191) are different, the value -1 is output.

10.1.3 SAFERUN® CMS-S can

Type	CMS-S
Ignition protection class: category 2G (gas) category 2D (dust)	 II 2 G Ex ib IIC T1...T6 II 2 D Ex ibD 21 T**

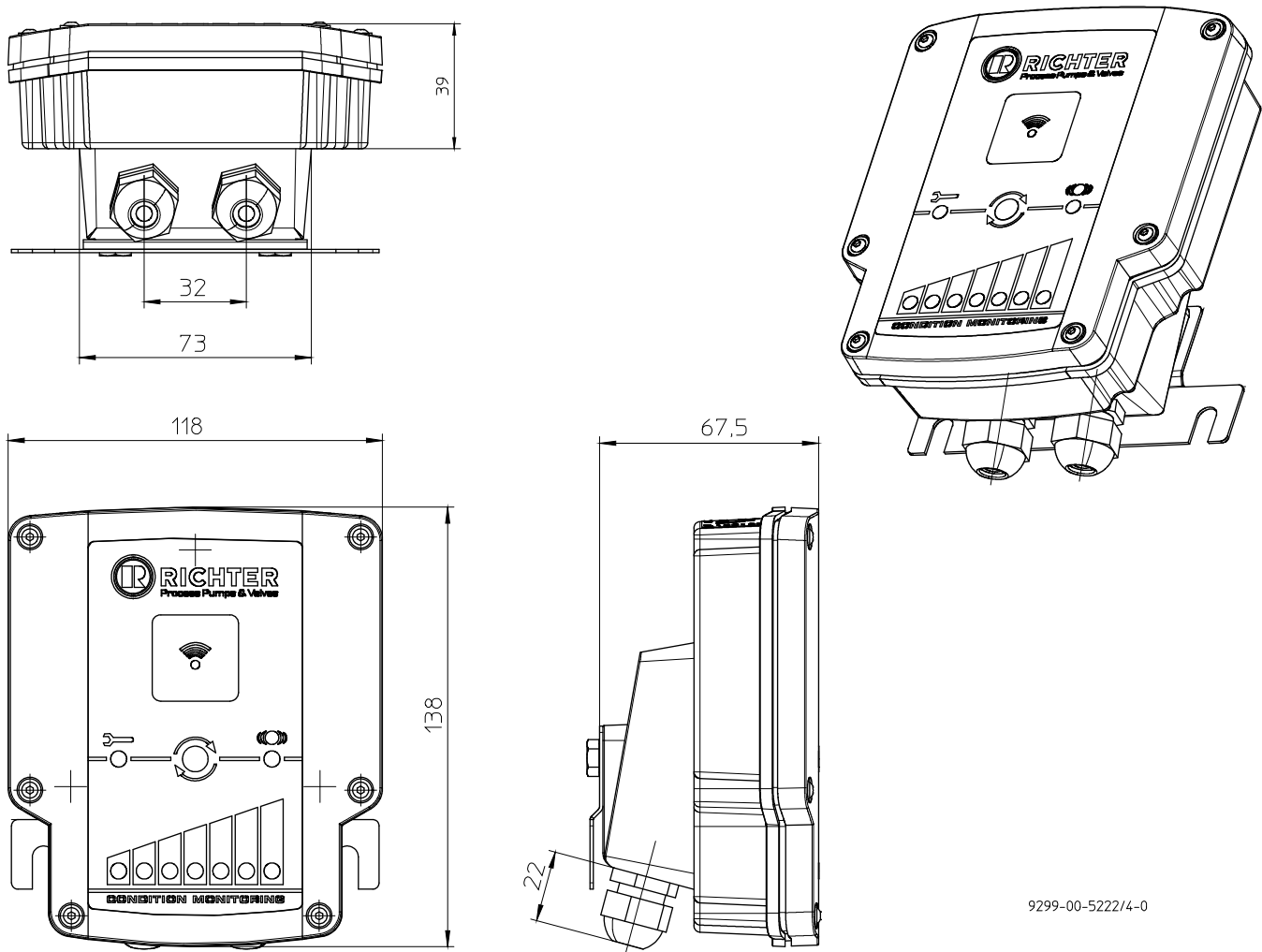
** Temperature class and maximum surface temperature as a function of the maximum fluid temperature at the place of installation and the ambient temperature

Temperature class	Maximum surface temperature (T ^{**})	Ambient temperature	Maximum fluid temperature at the place of installation
T6	80 °C	- 20 °C ≤ Ta ≤ +40 °C	75 °C
T5	95 °C		90 °C
T4	130 °C		125 °C
T3, T2, T1	185 °C		180 °C

10.1.4 PDA Software

Version No.	from 2011-09-09
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10.1.5 Dimensions



9299-00-5222/4-0

Fig. 65