KRIWAN
INT69 PYF DIAGNOSE

Operating instructions

KRIWAN

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List of abbreviations

Abbreviation	Meaning
Fig.	Figure
or.	respectively
chap.	Chapter
mat. no.	Material Number
no.	Number
e.g.	for example

1 General information

1.1 Principles

The operating instructions TB810.00125.0 are valid for:

Mat No.	Product	Description
20 A 721 P081	INT69 PYF Diagnose	24 V ~/⎓ 50/60 Hz
22 A 721 P081	INT69 PYF Diagnose	100-240 V ~ 50/60 Hz

The operating instructions are used for the proper and safe use of the INT69 PYF Diagnose. It contains safety instructions that must be observed as well as information on transport, storage and disposal. It describes the functions and contains information on installation or assembly, commissioning, operation, disassembly or device replacement and maintenance. The operating instructions are available for download at https://www.kriwan.com/en/products/protection-relay/multifunctional-relays-for-machines/int69-pyf-diagnose-premium. It is not available in printed form. A missing document or pages must be replaced immediately.

1.2 Manufacturer

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1.3 Target group

The operating instructions are for technically trained specialists who are familiar with installation or assembly, commissioning, operation, disassembly or device replacement and maintenance and who have the appropriate qualifications and knowledge for their work.

1.4 Applicable documents

In addition to these operating instructions, the following documents must be observed:

Document	Content
Brief instructions	Quick start guide with installation instructions and safety instructions
Data sheet	Description of the application, functions, safety instructions, accessories, order details, flashing code and technical data

Document	Content
Parameter table	Contains the parameters that can be set via the INTspector App and separately available accessories or via Modbus RTU, as well as the default values that are set from the factory.
Modbus table	Contains the Modbus addresses that can be read via the Modbus interface of the INT69 PYF Diagnose or via the INT600 DM Gateway.

These documents are available for download at https://www.kriwan.com/en/products/protection-relay/multifunctional-relays-for-machines/int69-pyf-diagnose-premium.

1.5 List of applied standards and guidelines

The standards and guidelines used for INT69 PYF Diagnose can be found in the EU Declaration of Conformity, which is available for download under https://www.kriwan.com/en/products/protection-relay/multifunctional-relays-for-machines/int69-pyf-diagnose-premium.

1.6 Liability and warranty

In principle, the manufacturer's "General Terms and Conditions of Sale and Delivery (GTC)" apply. These are available to the customer at the latest when the contract is concluded.

The manufacturer excludes warranties and liability claims for personal injury and property damage if they are due to one or more of the following causes:

- Improper use
- Improper assembly, commissioning and application
- Operation in the event of improperly installed or non-functional safety devices
- Failure to comply with the safety instructions and instructions in these instructions for use and in the data sheet
- Unauthorized constructive conversions and changes
- Maintenance work not performed properly and on time
- Accessories, spare parts and additives that are the cause of damage and for which no approval has been given by the manufacturer
- Disasters caused by foreign bodies and force majeure

1.7 Updating

This document is not subject to the manufacturer's alteration service. Changes to this document may be made without further notice. The latest version is available from the manufacturer.

1.8 Copyright

2 Safety

2.1 Symbolism and marking of warnings

Symbols and warnings are used in the operating instructions:

Symbol	Meaning
NOTICE	Note that a safety symbol can never replace the text of a safety warning - the text of a safety warning must therefore always be read in full!

The symbols and warnings in this operating manual are intended to protect persons from injury and to prevent damage to property and must therefore be observed. The safety instructions are highlighted by a signal board with a warning triangle and a signal word defined according to ANSI Z535.6-2006: A1.2. The signal words are classified ANSI Z535.6-2006: C4.2. Depending on the degree of danger, the information is presented as follows:

Symbol	Meaning
DANGER	**Danger** Indicates an imminent, high-risk hazard that results in death or serious bodily injury if not avoided.
WARNING	**Warning** Indicates a possible hazard with a medium degree of risk, which can result in death or serious bodily injury if not avoided.
CAUTION	**Caution** Indicates a low-risk hazard that may result in minor or moderate bodily injury or property damage if not avoided.
NOTICE	**Hint** Includes further information or application tips

2.2 General

The operating instructions contain basic information on installation or assembly, commissioning, operation, disassembly or device replacement and maintenance. If these instructions are observed, safe handling is guaranteed and personal injury and property damage is avoided.

The safety instructions in all chapters must be taken into account.

Before installation, assembly and commissioning, the operating instructions must be read and understood.

The instructions and markings affixed to the product must be observed and kept in a fully legible condition, e.g.:

- Front label
- Type label

The operator is responsible for complying with any location-based regulations that are not taken into account.

2.3 General information

The product described here is part of an overall system and performs certain functions.

The manufacturer of an installation has the responsibility to ensure that the overall functioning of an overall installation is correct. KRIWAN cannot guarantee all the characteristics of a complete system that were not designed by KRIWAN.

The user must validate the overall concept of the control system in which the product described here is integrated. On the basis of the following description, no new guarantee, warranty or liability claims can be derived beyond the general KRIWAN terms of delivery. The INTspector App is available free of charge as a download in all official stores or alternatively on our website under https://www.kriwan.com/en/connectivity/gateways/intspector-app for the iOS, Android and Windows operating systems and can be used on a smartphone, tablet or PC.

2.4 Intended use

The INT69 PYF Diagnose is a universal and versatile protection relay. It primarily monitors the intended operation of pumps and agitators. The parameterization and viewing of the diagnostic data is done via the INTspector App and separately available accessories (USB or Bluetooth gateway) or via Modbus RTU.

The INT69 PYF Diagnose must not be operated beyond the supply voltage and ambient temperature values specified in the data sheet, as well as instructions contained in the operating instructions or in the applicable documents.

The INT69 PYF Diagnose must not be used in hazardous areas.

The INT69 PYF Diagnose may only be operated in the areas of application described in the applicable documents.

The respective details can be found in chapter 4.7 Technical data.

Any other or more than this use is considered to be not in accordance with its intended purpose.

2.5 Requirements for staff

Persons must have the appropriate qualifications and knowledge for installation or assembly, commissioning, operation, dismantling or device replacement and maintenance. On the basis of their training, knowledge and experience, as well as knowledge of the relevant standards, they must be able to assess the work assigned to them and to identify possible hazards.

The operator must precisely regulate the area of responsibility, authority and supervision of personnel during installation or assembly, commissioning, operation, dismantling or equipment replacement and maintenance.

Lack of knowledge on the part of the staff must be eliminated by training and instruction by sufficiently trained specialist personnel.

Training for the product described herein must only be performed under the supervision of technical personnel.

2.6 Consequences and dangers of non-compliance with the operating instructions

⚠ WARNING Failure to follow the operating instructions may result in failure or destruction of the product and injury.

NOTICE Failure to follow the operating instructions will result in the loss of warranty and compensation claims.

2.7 Security-conscious work

In addition to the safety instructions and intended use listed in these operating instructions, the following safety regulations must be observed:

- General or application-specific operating instructions within the meaning of the Occupational Health and Safety Act and the Work Equipment Ordinance
- Accident prevention regulations
- Legal requirements
- Local regulations

2.8 Safety instructions for the operator

The operator must ensure that:

- the product is only used for its intended purpose.
- protective equipment is available and used for staff.
- the operating instructions are carefully read and understood by the user.
- only sufficiently qualified and trained specialist personnel operate the product.
- the staff is regularly instructed in occupational safety and environmental protection.
- the staff knows the operating instructions and the safety instructions contained therein.

2.9 Safety instructions for maintenance

NOTICE The INT69 PYF Diagnose is maintenance-free and therefore not required for fixed inspection intervals.

2.10 Inadmissible modes of operation

NOTICE This product must never be operated outside the limits specified in the data sheet or operating instructions.

NOTICE The operational safety of the product is only guaranteed when used as intended.

2.11 Software changes

The software has been specially developed and tested for this product. Changes to the software or software parts or adding software or software parts are not permitted.

3 Transport, storage and disposal

3.1 Check delivery condition

When the goods are handed over, the packaging must be checked for damage. In the case of transport damage, the exact damage must be determined and documented. Contact KRIWAN or the supplying dealer and the insurer immediately in writing.

3.2 Transport

The product should only be transported in its original packaging or in a suitable individual package.

Knocks and bumps must be avoided during transport.

3.3 Storage

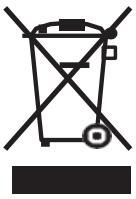
The product should only be stored in its original packaging or in a suitable individual package. During storage, the environmental conditions of chapter 4.7 Technical data must be observed in order to protect the function of the product even after prolonged storage.

3.4 Disposal

All associated components must be disposed of in accordance with the country-specific disposal regulations.

For the EU, the WEEE Directive according to 2012/19/EU applies:

Electronic waste



The equipment marked with this symbol is subject to the WEEE Directive according to 2012/19/EU. All electronic and electrical waste equipment must not be disposed of in household waste and must be disposed of professionally in accordance with national regulations and laws.

4 Product

4.1 System overview

KRIWAN's protection system for pumps and agitators consists of the following individual components:

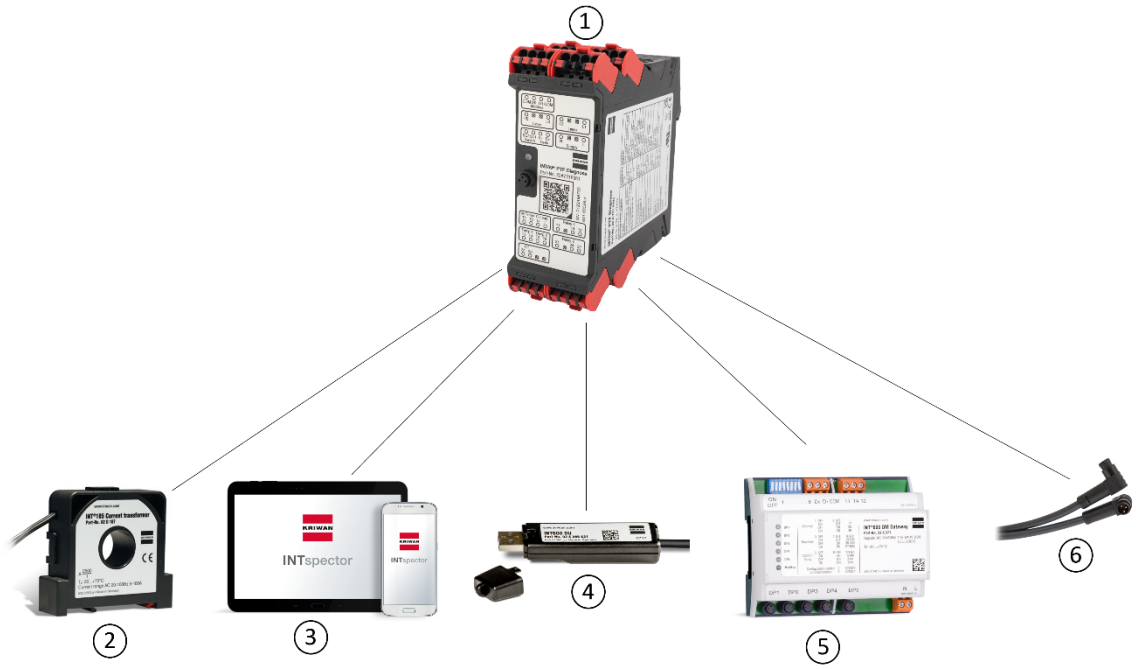


Figure 1 System overview

No.	Mat No.	Product	Description
1	20 A 721 P081	INT69 PYF Diagnose	24 V ~/⎓ 50/60 Hz
	22 A 721 P081		100-240 V ~ 50/60 Hz
2	02 D 187	INT185 Current Transformer	5-100 A ~ 20-100 Hz, is needed for current measurement, to determine power and cosφ, as well as for the energy meters
	02 D 188	INT185 Current Transformer	12.5-250 A ~ 20-100 Hz, is needed for current measurement, determination of power and cosφ, as well as for the energy meters

No.	Mat No.	Product	Description
3	-	INTspector App	app, is needed for the parameterization and diagnosis of the INT69 PYF Diagnose
4	02 S 365 S21	INT600 DU Gateway	USB gateway, direct connection between INT69 PYF Diagnose and PC, smartphone or tablet
	02 S 377 S021	INT600 DB Gateway	Bluetooth gateway, direct connection between INT69 PYF Diagnose and PC, smartphone or tablet
5	22 S 371	INT600 DM Gateway	115-240 V ~ 50/60 Hz, Modbus RTU Gateway, can alternatively be used instead of the integrated Modbus interface of the INT69 PYF Diagnose to network the INT69 PYF Diagnose into the plant control system
6	FK02098062	DP cable, angled-angled plug; length 0.3 m	Cable for connecting the INT69 PYF Diagnose to the INT600 DM Gateway
	FK02098077	DP cable, angled-angled plug; length 1.0 m	Cable for connecting the INT69 PYF Diagnose to the INT600 DM Gateway

4.2 General description

The INT69 PYF Diagnose with Modbus interface, current monitoring and power monitoring is a universal and versatile protection relay. The following inputs and outputs are available for monitoring electrical components:

Clamp	Inputs and outputs
L/L+, N/L-	Supply voltage
T1, T2	Motor temperature (PTC, Pt100, Pt1000, bimetal, external relay contact)
T3, T4	Temperature 1 (PTC, Pt100, Pt1000)
T5, T6	Temperature 2 (PTC, Pt100, Pt1000)
E+, E-	Leakage (resistance measurement)
SC1, SC2	Switching input (float switch, external reset)
I+, I-	Analog input 0/4-20mA
FE	Functional earth
L1, L2, L3	Phase monitoring with phase sequence, phase failure, phase asymmetry, undervoltage and overvoltage
S1, S2	Current Transformer INT185
11, 14, 12	Relay 1
21, 24, 22	Relay 2
COM, D1, D0, COM	RS485, Modbus RTU

In addition, current, cosφ, underload, overload, service interval, switching frequency, short circuit and interruption of the sensors can be monitored. Recorded apparent, active and reactive power are determined in the device and active and reactive energy are counted. Parameterization allows protection functions and behavior to be flexibly adjusted to the application. The INT69 PYF Diagnose stores operational and fault data in a non-volatile memory. This data can be read out and evaluated for diagnosis. Parameterization and diagnostics are possible via the built-in diagnostic port (DP) with the help of the INTspector App and with separately available accessories or via Modbus RTU.

For the full range of functions (current monitoring and power monitoring), the INT185 current transformer is also required.

4.3 Construction

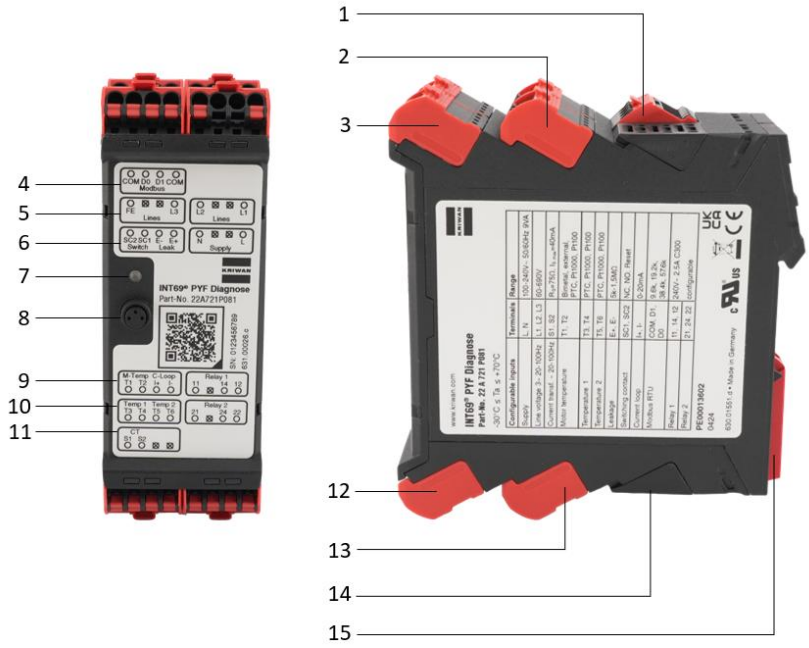
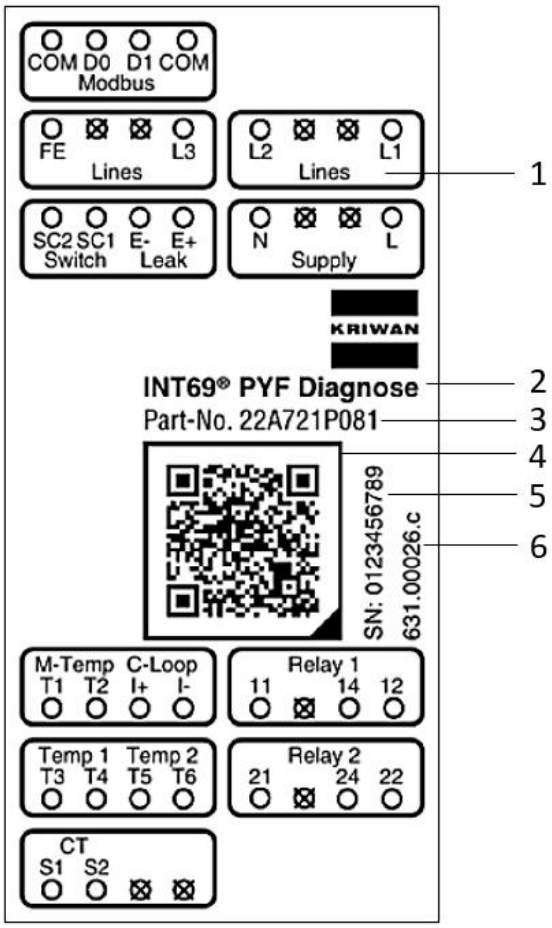


Figure 2 Construction

No.	Designation
1	Connection terminals above, 3rd level
2	Connection terminals above, 2nd level
3	Connection terminals above, 1st level
4	Designation of the connection terminals above, 3rd level
5	Designation of the connection terminals above, 2nd level
6	Designation of the connection terminals above, 1st level
7	LED
8	Diagnostic Port (DP)
9	Designation of the connection terminals below, 1st level
10	Designation of the connection terminals below, 2nd level
11	Designation of the connection terminals below, 3rd level
12	Connection terminals below, 1st level
13	Connection terminals below, 2nd level
14	Connection terminals below, 3rd level
15	Red release lever

4.4 Front and type label

Figure 3 INT69 PYF Diagnose



No.	Designation
1	Terminals
2	Product name
3	Material number
4	QR-Code
5	Serial number
6	Front label number

Figure 4 Front label (example)

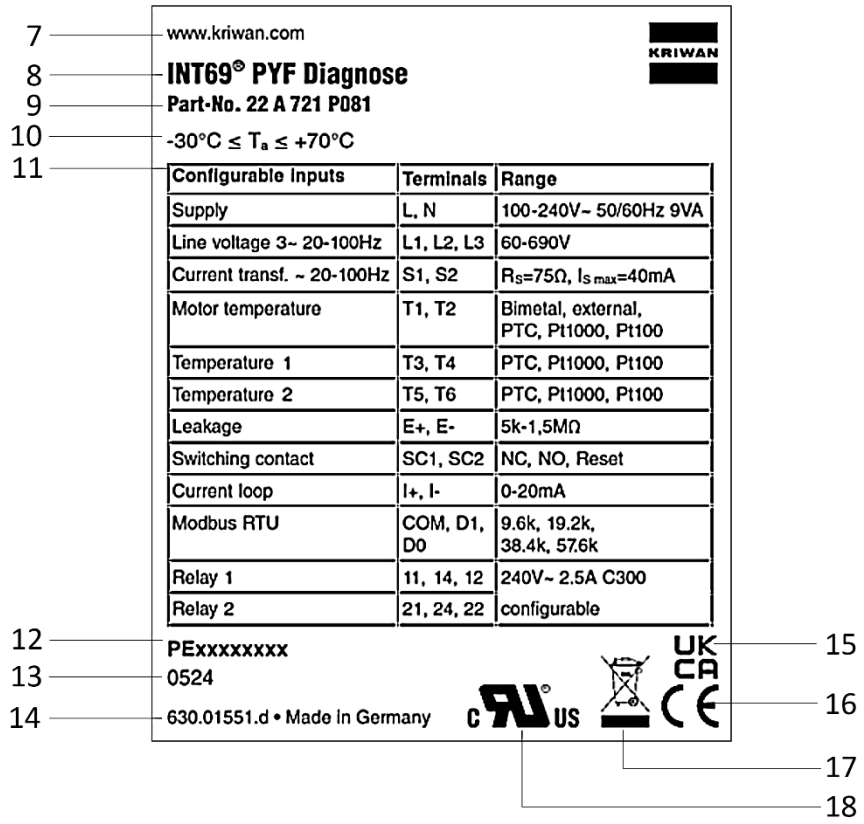


Figure 5 Type label (example)

No.	Designation
7	Website
8	Product name
9	Material number
10	Operating temperature
11	Table with configurable inputs, terminals and range
12	Parameter file number
13	Manufacture date
14	Type label number
15	UKCA
16	EU Declaration of Conformity
17	WEEE Directive
18	UL

4.5 Drawing

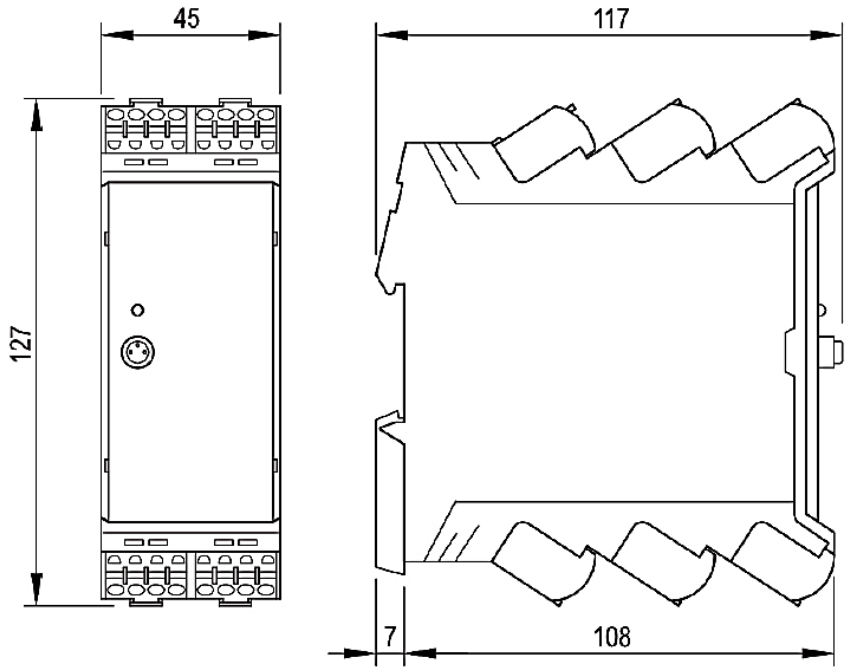


Figure 6 Dimensions in mm

4.6 Description

By parameterizing the protection functions and their behavior, the INT69 PYF Diagnose can be flexibly adjusted to the application.

NOTICE The protection functions and their behavior are described below. You can find out more about the parameterization in chapter 6.4.

NOTICE The individual parameters of the protection functions are explained in the help texts in the INTspector App. The protection functions switch off after the parameterized trip delay (exception: temperature monitoring using PTC or bimetal).

NOTICE All protection functions can be deactivated via parameterization.

4.6.1 Device

The INT69 PYF Diagnose offers the possibility to parameterize a password. The parameterization of a password serves to protect the performed parameterization, e.g. against unwanted changes or against external influence.

Password parameterization:

For the INT69 PYF Diagnose, the password can be set from 0 to 65535. The password you set is the device password and not the Modbus password from chap. 4.6.14. The device password cannot be changed via Modbus.

If the device password is not required, this must be deactivated by parameterizing "0" as the password. If the device password is required, a number from "1" to "65535" must be set as the password.

4.6.2 Motor temperature (T1, T2), temperature 1 (T3, T4) and temperature 2 (T5, T6)

The motor temperature input monitors the PTC, Pt100, Pt1000 sensors or bimetal switches built into the motor winding. Alternatively, an external relay contact can be connected.

The temperature 1 and temperature 2 inputs monitor the PTC, Pt100 or Pt1000 sensors installed in the pump. These two inputs are mainly used to monitor bearing temperatures.

Below are the parameters that can be set for the motor temperature input, temperature 1 input and temperature 2 input:

- Sensor type
- Designation
- Trip point temperature
- Warning temperature
- Hysteresis
- Trip delay
- Reset delay
- Line correction
- Designation external relay contact (only for motor temperature input)

Sensor type:

The temperature sensor must be selected that is connected to the motor temperature input, temperature 1 input or temperature 2 input. Selectable sensor types are PTC, Pt100, Pt1000, bimetal (motor temperature input only) and external relay contact (motor temperature input only). If the motor temperature input, temperature 1 input or temperature 2 input is not used, it must be parameterized to "Disabled".

Designation:

A designation of 0 to 40 characters can be parameterized for the motor temperature input, temperature 1 input or temperature 2 input. The parameterized designation is displayed in the diagnostic data, but is not transmitted via Modbus.

Trip point temperature:

For Pt100 or Pt1000 sensors, the trip point temperature can be parameterized as -100 to +300°C. When the trip point temperature is reached, relay 1 (for motor temperature) or the parameterized relay (for temperature 1 and temperature 2) is switched off after the trip delay has expired.

With PTC sensors, the trip point temperature is specified by the PTC sensor. When the nominal response temperature is reached, the PTC sensors become high-impedance and relay 1 (for motor temperature) or the parameterized relay (for temperature 1 and temperature 2) is switched off immediately.

In the case of bimetal switches, the trip point temperature is specified by the bimetal switch. The bimetal switch opens its contact when the nominal response temperature is reached and relay 1 (for motor temperature) is switched off immediately.

In the case of an external relay contact, the contact of an external protection relay can be read in for documentation, e.g. the auxiliary contact of an ATEX relay used in EX pumps. When the external relay switches, it opens its contact and relay 1 (for motor temperature) is switched off immediately.

Warning temperature:

For Pt100 or Pt1000 sensors, the warning temperature can be parameterized from -100 to +300 °C. When the warning temperature is reached, the parameterized relay is switched off after the trip delay has expired. When the alarm area starts, the warning area ends and the parameterized relay switches on again.

For PTC sensors, bimetal switches and the external relay contact, the warning temperature does not exist.

Hysteresis:

The hysteresis applies to warnings and alarms and is only possible for Pt100 and Pt1000 sensors. The hysteresis is the difference between the trip point temperature or warning temperature and the switch-on temperature.

For Pt100 or Pt1000 sensors, the hysteresis can be parameterized from 0 to 300 K.

Trip delay:

The trip delay applies to warnings and alarms and is only possible for Pt100 and Pt1000 sensors. The trip delay is the time from the detection of the fault to the shutdown of relay 1 (for alarms for motor temperature) or the parameterized relay (for warnings for motor temperature or for alarms and warnings for temperature 1 and temperature 2). The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted each time the temperature within the set trip delay exceeds the parameterized limit, then returns to the normal operating state and then exceeds the parameterized limit again. On the other hand, a continuous exceedance without a temporary return to the normal operating state will cause the trip delay to run out normally and then relay 1 (for alarms for motor temperature) or the parameterized relay (for warnings for motor temperature or for alarms and warnings for temperature 1 and temperature 2) is switched off.

For PTC sensors, bimetal switches and the external relay contact, relay 1 (for motor temperature) or the parameterized relay (for temperature 1 and temperature 2) is switched off without delay.

Reset delay:

For Pt100, Pt1000 and PTC sensors as well as for bimetal switches and the external relay contact, the reset delay only applies to alarms and is the time after the error has been corrected until the relay 1 (for motor temperature) or of the parameterized relay (for temperature 1 and temperature 2) is switched on again. A reset delay from 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the case of a locked shutdown, relay 1 (for motor temperature) or the parameterized

relay (for temperature 1 and temperature 2) only switches back into operation after a reset. The requirement for switching on again (after the reset delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set reset delay, the reset delay will be start anew. If no error occurs within the set reset delay, the reset delay runs out normally and then the relay 1 (for motor temperature) or the parameterized relay (for temperature 1 and temperature 2) switches back into operation.

Line correction:

The line correction is the value by which the line resistance is corrected. As a line correction, 0 to 100 Ω can be parameterized. Line correction is only possible for Pt100 and Pt1000 sensors.

With PTC sensors, bimetal switches and the external relay contact, the line correction does not exist.

Designation external relay contact:

A designation of 0 to 40 characters can be parameterized for the external relay contact.

Short circuit or interruption:

For Pt100, Pt1000 and PTC sensors, a short circuit or an interruption of the temperature sensors leads to a locked shutdown of relay 1 (for motor temperature) or of the parameterized relay (for temperature 1 and temperature 2). The trip delay in the event of a short circuit is 2 s and 30 minutes in the event of an interruption. Relay 1 (for motor temperature) or the parameterized relay (for temperature 1 and temperature 2) only switches back into operation after the fault has been corrected and after a reset.

4.6.3 Leakage (conductance measurement) (E+, E-)

The leakage input monitors the pair of electrodes installed in the pump with a conductance measurement for penetrating medium (falling below resistance) or for dry running (exceeding resistance). The pair of electrodes consists of an electrode and a machine housing or two insulated electrodes.

NOTICE When measuring between the electrode and the machine housing, the grounded electrode must be connected to E-. Usually, the machine housing is grounded, which is why the machine housing is connected to E-.

NOTICE A measurement between two electrodes is an isolated measurement, so it doesn't matter which electrode is connected to E- and which to E+.

Below are the parameters that can be set at the leakage input:

- Operating mode
- Designation
- Trip point value
- Warning value
- Hysteresis
- Trip delay
- Reset delay

Operating mode:

The operating modes are "exceed resistance" and "resistance below". When monitoring for intruding medium, the operating mode must be parameterized to "resistance below". When monitoring for dry running, the operating mode must be parameterized to "exceed resistance". If the leakage input is not used, it must be parameterized to "Disabled".

Designation:

A designation of 0 to 40 characters can be parameterized for the leakage input.

Trip point value:

The trip point value can be parameterized from 5 kΩ to 1.5 MΩ. The conductance value is measured between the electrode pair and in case the conductance value falls below or exceeds the trip point value (depending on the parameterization of the operating mode), the parameterized relay is switched off after the trip delay has expired.

Warning value:

As a warning value, 5 kΩ to 1.5 MΩ can be parameterized. If the conductance value falls below or exceeds the warning value (depending on the parameterization of the operating mode), the parameterized relay is switched off after the trip delay has expired. When the alarm area starts, the warning area ends and the parameterized relay switches on again.

Hysteresis:

The hysteresis applies to warnings and alarms and is the difference between the trip point value or warning value and the restart value. The hysteresis can be parameterized from 1 to 999 kΩ.

Trip delay:

The trip delay applies to warnings and alarms and is the time from the detection of the fault to the shutdown of the parameterized relay. The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted each time the conductance value within the set trip delay falls below or exceeds the parameterized limit value (depending on the parameterization of the operating mode), then returns to the normal operating state and then falls below or exceeds the parameterized limit value again. On the other hand, a continuous falling below or exceedance without a temporary return to the normal operating state will cause the trip delay to run out normally and then the parameterized relay is switched off.

Reset delay:

The reset delay only applies to alarms and is the time after the error has been corrected until the parameterized relay is switched on again. A reset delay from 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the case of a locked shutdown, the parameterized relay only switches back after a reset. The requirement for switching on again (after the reset delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set reset delay,

the reset delay will start anew. If no error occurs within the set reset delay, the reset delay runs out normally and then the parameterized relay switches back into operation.

4.6.4 Switching input (SC1, SC2)

The switching input monitors a potential-free switching contact (NC, NO or reset). The main application is the monitoring of a float switch (NC). Alternatively, a reset button can also be connected with a normally open contact.

Below are the parameters that can be set at the switching input:

- Operating mode
- Designation
- Reset delay

Operating mode:

The operating modes are "Normally Closed", "Normally Open" and "Reset". If the operating mode "Normally closed" (e.g. float switch) is parameterized, the parameterized relay will be switched off immediately when the NC contact is switched. If the operating mode "Normally Open" (e.g. float switch) is parameterized, the parameterized relay is switched off immediately when the normally open contact switches. If "Reset" (e.g. reset button) is parameterized as the operating mode, pressing the reset button for 5 s resets a reset delay or locked shutdown attached to the parameterized relay if there is no longer any error. Another reset is possible after a waiting time of 10 s has elapsed. If the switching input is not used, it must be parameterized to "Disabled".

Designation:

A designation of 0 to 40 characters can be parameterized for the switching input.

Reset delay:

In the case of a normally closed or normally open contact, the reset delay only applies to alarms and is the time until the parameterized relay is switched on again after switching back the normally closed or normally open contact. As a reset delay, 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the event of a locked shutdown, the parameterized relay only switches back to operation after a reset. The requirement for switching on again (after the reset delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set reset delay, the reset delay will start anew. If no error occurs within the set reset delay, the reset delay runs normally and then the parameterized relay switches back into operation. If "Reset" has been parameterized as the operating mode, the reset delay does not apply.

4.6.5 Analogue input (I+, I-)

The analog input monitors a 0/4-20 mA measurement signal from a sensor and provides the power supply to the connected external sensor. The main application is the monitoring of vibration and pressure sensors.

Below are the parameters that can be set for the analog input:

- Operating mode
- Designation
- Base current
- Trip point value
- Warning value
- Hysteresis
- Trip delay
- Reset delay
- Conversion value min
- Conversion value max
- Conversion unit
- Time to surveillance

Operating mode:

The operating modes are "Exceed" and "Falling below". When parameterizing the operating mode to "Exceed", the 0/4-20 mA measurement signal of the sensor is set to exceed the trip point value and warning value monitored. If the operating mode is parameterized to "Falling below", the 0/4-20 mA measurement signal of the external sensor is monitored for falling below the trip point value and warning value. If the analog input is not used, it must be parameterized to "Disabled".

Designation:

A designation of 0 to 40 characters can be parameterized for the analog input.

Base current:

The base current is the minimum value of the measurement signal of the external sensor. For example, if it is a pressure sensor with a measurement signal of 4-20 mA, 4 mA is the minimum value of the measurement signal and must be parameterized as the base current. If the base current falls below the threshold, a sensor error (e.g. interruption) is detected and leads to a locked shutdown of the parameterized relay. The base current can be parameterized from 0.0 to 19.9 mA. The parameterized relay only switches on again after the error has been corrected and after a reset. If the monitoring of the base current is not required, it must be parameterized to "Disabled".

Trip point value:

The trip point value can be parameterized from 0.1 to 19.9 mA. If the value falls below or exceeds the trip point value (depending on the parameterization of the operating mode), the parameterized relay is switched off after the trip delay has expired.

Warning value:

The warning value can be parameterized from 0.1 to 19.9 mA. If the value falls below or exceeds the warning value (depending on the parameterization of the operating mode), the parameterized relay is

switched off after the trip delay has expired. When the alarm area starts, the warning area ends and the parameterized relay switches on again.

Hysteresis:

The hysteresis applies to warnings and alarms and is the difference between the trip point value and the restart value. The hysteresis can be parameterized from 0.1 to 19.9 mA.

Trip delay:

The trip delay applies to warnings and alarms and is the time from the detection of the fault to the shutdown of the parameterized relay. The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted each time the mA value falls below or exceeds the parameterized limit within the set trip delay, then returns to the normal operating state and then falls below or exceeds the parameterized limit value again. On the other hand, a continuous falling blow or exceeding without a temporary return to the normal operating state will cause the trip delay to run out normally and then the parameterized relay is switched off.

Reset delay:

The reset delay only applies to alarms and is the time after the error has been corrected until the parameterized relay is switched on again. As a reset delay, 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the event of a locked shutdown, the parameterized relay only switches back to operation after a reset. The requirement for switching on again (after the reset delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set reset delay, the reset delay will be restarted. If no error occurs within the set reset delay, the reset delay runs out normally and then the parameterized relay switches back into operation.

Conversion value min:

"Conversion value min" is required to output the measurement data of the sensor in its desired unit (e.g. in bar for a pressure sensor). When converting to minimum value, the minimum value is parameterized from the measuring range of the sensor. The minimum value can be parameterized from -500.0 to 5999.9. For example, if it is a pressure sensor with a measuring range of 0-16 bar, 0 bar is the minimum value of the measuring range and must be parameterized as conversion value min.

Conversion value max:

"Conversion value max" is required to output the measurement data of the sensor in its desired unit (e.g. in bar for a pressure sensor). When converting to maximum value, the maximum value is parameterized from the measuring range of the sensor. The maximum value can be parameterized as -499.9 to 6000.0. For example, if it is a pressure sensor with a measuring range of 0-16 bar, 16 bar is the maximum value of the measuring range and must be parameterized as conversion value max.

Conversion unit:

In the case of the conversion unit, the unit of the measuring range of the sensor is parameterized. As a conversion unit, 0 to 5 characters can be parameterized. For example, if it is a pressure sensor, bar is the unit of the measuring range and must be parameterized as a conversion unit.

Time to surveillance:

Time to surveillance is the time after the protection relay is switched on or after a reset until the start of the monitoring to avoid shutdowns when the sensor has a high inrush current. The time to surveillance can be parameterized from 0.5 s to 49 min 13.5 s.

4.6.6 Phase monitoring (L1, L2, L3)

The phase monitoring is active from 2 s after the motor start and includes the monitoring of phase sequence, phase failure, phase asymmetry, undervoltage and overvoltage. The main application is the monitoring of three-phase motors or machines.

Below are the parameters that can be set in phase monitoring:

- Operating mode
- Attitude

Operating mode:

The operating mode is "Monitoring three phases" and "Disabled". If "Monitoring three phases" is selected, the three phases L1, L2 and L3 are monitored. If the phase monitoring is not used, it has to be parameterized to "Disabled".

Attitude

The settings are "Sinusoidal operation" and "FC operation". If a frequency converter is already in use at the application, "FC operation" must be selected. If no frequency converter is used in the application, "Sinusoidal operation" must be selected.

4.6.6.1 Phase sequence

After starting the phase monitoring, it is monitored for 5 s whether the correct phase sequence is present. The phase sequence determines the direction of rotation of the connected motor. If the phase sequence of L1, L2 and L3 is correct, this results in a right-hand rotation. If there is an incorrect phase sequence, relay 1 is switched off with a locked shutdown. In the event of a locked shutdown, relay 1 only switches back to operation after a reset. The requirement for switching back on is that there is no longer an error.

Below is the parameter that can be set in the phase sequence:

- Phase sequence operating mode

Phase sequence operating mode:

The phase sequence operating mode can either be set to "Active" or "Disabled". If the phase sequence operating mode is parameterized to "Active", the phase sequence is monitored for a right-hand rotating field. If phase sequence monitoring is not required, it has to be parameterized to "Disabled".

4.6.6.2 Phase failure

The phase failure is monitored throughout the entire motor runtime. The phase failure monitors the percentage drop of a phase relative to the mean value of the three phases.

Below are the parameters that can be set in case of the phase failure:

- Missing phase operation mode
- Phase failure reset point value
- Phase failure reset delay

Missing phase operation mode:

The missing phase operation mode can either be set to "Active" or "Disabled". If the missing phase operation mode is set to “Active”, the three phases are monitored for the percentage drop of one phase compared to the mean value of the three phases. If the missing phase operation mode is not required, it must be set to “Disabled”.

Phase failure reset point value:

The phase failure reset point value can be parameterized from 0 to 100 %. If one of the three phases drops by more than the phase failure reset point value compared to the mean value of all three phases, relay 1 is switched off.
Example:

- Mean value of the three phases: (L1 + L2 + L3) / 3 = (20 V + 230 V + 230 V) / 3 = 160 V
- Phase failure reset point value parameterized to 75 %: 160 V – 75 % x 160 V = 40 V
- The shutdown occurs when one of the three phases L1, L2 or L3 is < 40 V.

Phase failure reset delay:

The phase failure reset delay applies only to alarms and is the time until relay 1 is switched on again after the error has been corrected. As a phase failure reset delay, 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the event of a locked shutdown, relay 1 only switches back to operation after a reset. The requirement for switching on again (after the reset delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set reset delay, the reset delay will be restarted. If no error occurs within the set reset delay, the reset delay runs out normally and then relay 1 switches back into operation.

4.6.6.3 Phase asymmetry

The phase asymmetry is monitored throughout the entire motor runtime. The phase asymmetry monitors the percentage deviation of a phase from the mean value of the three phases.

Below are the parameters that can be set in the phase asymmetry:

- Voltage imbalance operation mode
- Voltage imbalance trip point – alarm
- Voltage imbalance trip point – warning

- Phase asymmetry hysteresis
- Phase asymmetry trip delay
- Phase asymmetry reset delay

Voltage imbalance operation mode:

The voltage imbalance operation mode can either be set to "Active" or "Disabled". If the voltage imbalance operation mode is set to “Active”, the three phases are monitored for the percentage deviation of one phase compared to the mean value of the three phases. If the voltage imbalance operation mode is not required, it must be set to “Disabled”.

Voltage imbalance trip point - alarm:

The voltage imbalance trip point - alarm can be parameterized from 1 to 100 %. If one of the three phases deviates by more than the voltage imbalance trip point alarm value compared to the mean value of the three phases, relay 1 is switched off after the phase asymmetry trip delay has elapsed.

Example:

- Mean value of the three phases: (L1 + L2 + L3) / 3 = (260 V + 230 V + 230 V) / 3 = 240 V
- Voltage imbalance trip point - alarm parameterized to 15%: 240 V ± 15 % x 240 V = 276 V or 204 V
- The shutdown occurs when one of the three phases L1, L2 or L3 is > 276 V or < 204 V.

Voltage imbalance trip point - warning:

The voltage imbalance trip point - warning can be parameterized from 1 to 100 %. If one of the three phases deviates by more than the voltage imbalance trip point warning value compared to the mean value of the three phases, the parameterized relay is switched off after the phase asymmetry trip delay has elapsed. When the alarm area starts, the warning area ends and the parameterized relay switches on again.

Example:

- Mean value of the three phases: (L1 + L2 + L3) / 3 = (260 V + 230 V + 230 V) / 3 = 240 V
- Voltage imbalance trip point – warning parameterized to 10%: 240 V ± 10 % x 240 V = 264 V or 216 V
- The warning occurs when one of the three phases L1, L2 or L3 is > 264 V or < 216 V.

Phase asymmetry hysteresis:

The phase asymmetry hysteresis applies to warnings and alarms and is the percentage voltage difference between the voltage imbalance trip point – alarm and voltage imbalance restart value. As the phase asymmetry hysteresis, 1 to 99 % can be parameterized.

Example:

- Mean value of the three phases: (L1 + L2 + L3) / 3 = (260 V + 230 V + 230 V) / 3 = 240 V
- Voltage imbalance trip point - alarm parameterized to: 20%
- Phase asymmetry hysteresis parameterized to: 5%
- Voltage imbalance restart value: 240 V ± (20 % - 5 %) = 204 V or 276 V
- The restart occurs when the respective phase is > 204 V and < 276 again.

Phase asymmetry trip delay:

The phase asymmetry trip delay applies to warnings and alarms and is the time from the detection of the fault to the shutdown of relay 1 (for alarms for phase asymmetry) or the parameterized relay (for warnings for phase asymmetry). The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted each time a phase within the set trip delay deviates from the mean value of the three phases by more than the set shutdown or warning value, then returns to the normal operating state, and then deviates again from the mean value of the three phases by more than the set shutdown or warning value. A continuous deviation without a temporary return to the normal operating state on the other hand, leads to the fact that the trip delay runs out normally and then relay 1 (for alarms for phase asymmetry) or the parameterized relay is switched off (for warnings for phase asymmetry).

Phase asymmetry reset delay:

The phase asymmetry reset delay applies only to alarms and is the time until relay 1 is switched on again after the fault has been corrected. As the phase asymmetry reset delay, 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the case of a locked shutdown, relay 1 only switches back into operation after a reset. The requirement for switching on again (after the reset delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set reset delay, the reset delay will be restarted. If no error occurs within the set reset delay, the reset delay runs out normally and then relay 1 switches back into operation.

4.6.6.4 Undervoltage

The undervoltage is monitored throughout the entire motor runtime. First, the INT69 PYF Diagnose detects the connected phases. The motor start is then detected within 0.5 seconds. As soon as the motor start is detected, the undervoltage monitoring is active. In undervoltage monitoring, the mean value of the three phases is monitored for falling below a parameterized limit value. Motor running is detected from a voltage limit of 50 V if at least two phases have a voltage above 50 V and the mean value of the three phases is greater than 50 V.

Below are the parameters that can be set during undervoltage monitoring:

- Operating mode
- Undervoltage limit 1
- Undervoltage limit 2
- Undervoltage hysteresis
- Undervoltage trip delay limit 1
- Undervoltage trip delay limit 2
- Undervoltage reset delay

Operating mode:

The operating modes are "Limit 1 warning" and "Limit 1 shutdown". Limit 1 is the first limit value to be reached. Limit 2 is the next limit value to be reached after limit 1. As soon as "only" limit 1 is selected as shutdown, only this is valid and limit 2 is thus deactivated. If the undervoltage monitoring is not

required, it must be parameterized to "Disabled".

Undervoltage limit 1:

Undervoltage limit 1 is the warning or shutdown value. This depends on whether limit 1 is parameterized as a warning or shutdown in the operating mode. The undervoltage limit 1 can be parameterized from 60 to 690 V. If the mean value of the three phases falls below the undervoltage limit 1 value, relay 1 (for alarms for undervoltage) or the parameterized relay (for warnings for undervoltage) is switched off after the trip delay has elapsed.

Undervoltage limit 2:

Undervoltage limit 2 is defined as a shutdown as soon as limit 1 is parameterized as a warning in the "operating mode". The undervoltage limit 2 can be parameterized from 60 to 690 V. If the mean value of the three phases falls below the undervoltage limit 2 value, relay 1 is switched off after the trip delay has elapsed.

Undervoltage hysteresis:

The undervoltage hysteresis applies to warnings and alarms and is the difference between the undervoltage trip point value and the undervoltage restart value. The undervoltage hysteresis can be parameterized from 1 to 600 V.

Example:

- Operating mode parameterized to: Limit 1 shutdown
- Undervoltage limit 1 parameterized to: 195 V
- Undervoltage hysteresis parameterized to: 20 V
- Restart value: 195 V + 20 V = 215 V
- The restart occurs when the mean value of the three phases is > 215 V.

Undervoltage trip delay limit 1:

The undervoltage trip delay limit 1 applies to warnings and alarms and is the time from the detection of the fault to the shutdown of relay 1 (for alarms for undervoltage) or the parameterized relay (for warnings for undervoltage). The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted each time the mean value of the three phases within the set trip delay falls below the parameterized limit, then returns to the normal operating state and then falls below the parameterized limit value again. On the other hand, a continuous undershooting without a temporary return to the normal operating state leads to the fact that the trip delay runs out normally and then relay 1 (for alarms for undervoltage) or the parameterized relay (for warnings for undervoltage) is switched off.

Undervoltage trip delay limit 2:

The undervoltage trip delay limit 2 applies to alarms and is the time from the detection of the fault to the shutdown of relay 1. The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted each time the mean value of the three phases within the set trip delay falls below the parameterized limit, then returns to the normal operating state and then falls below the parameterized limit value again. On the other hand, a continuous undershooting without a temporary return to the

normal operating state leads to the fact that the trip delay runs out normally and then relay 1 is switched off.

Undervoltage reset delay:

The undervoltage reset delay applies only to alarms and is the time until relay 1 is switched on again after the fault has been corrected. As the undervoltage reset delay, 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the event of a locked shutdown, relay 1 only switches back to operation after a reset. The requirement for switching on again (after the reset delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set reset delay, the reset delay will be restarted. If no error occurs within the set reset delay, the reset delay runs out normally and then relay 1 switches back into operation.

4.6.6.5 Overvoltage

The overvoltage of all three phases is monitored throughout the entire motor runtime. First, the INT69 PYF Diagnose detects the connected phases. The motor start is then detected within 0.5 seconds. As soon as the motor start is detected, the overvoltage monitoring is active. In overvoltage monitoring, the mean value of the three phases is monitored for exceeding a parameterized limit value. Motor running is detected from a voltage limit of 50 V if at least two phases have a voltage above 50 V and the mean value of the three phases is greater than 50 V.

Below are the parameters that can be set in the overvoltage monitoring:

- Operating mode
- Overvoltage limit 1
- Overvoltage limit 2
- Overvoltage hysteresis
- Overvoltage trip delay limit 1
- Overvoltage trip delay limit 2
- Overvoltage reset delay

Operating mode:

The operating modes are "Limit 1 Warning" and "Limit 1 Shutdown". Limit 1 is the first limit value to be reached. Limit 2 is the next limit value to be reached after limit 1. As soon as "only" limit 1 is selected as shutdown, only this is valid and limit 2 is thus deactivated. If the overvoltage monitoring is not required, it must be parameterized to "Disabled".

Overvoltage limit 1:

Overvoltage limit 1 is the warning or shutdown value. This depends on whether limit 1 is parameterized as a warning or as a shutdown in the operating mode. As an overvoltage limit 1, 60 to 690 V can be parameterized. If the mean value of the three phases exceed the overvoltage limit 1 value, relay 1 (for alarms for overvoltage) or the parameterized relay (for warnings for overvoltage) is switched off after the trip delay has expired.

Overvoltage limit 2:

Overvoltage limit 2 is defined as a shutdown as soon as limit 1 is parameterized as a warning in the operating mode. As an overvoltage limit 2, 60 to 690 V can be parameterized. If the mean value of the three phases exceed the overvoltage limit 2 value, relay 1 is switched off after the trip delay has expired.

Overvoltage hysteresis:

The overvoltage hysteresis applies to warnings and alarms and is the difference between the overvoltage trip point value and the overvoltage restart value. The overvoltage hysteresis can be parameterized from 1 to 600 V.

Example:

- Operating mode parameterized to: Limit 1 shutdown
- Overvoltage limit 1 parameterized to: 265 V
- Overvoltage hysteresis parameterized to: 20 V
- Restart Value: 265 V - 20 V = 245 V
- The restart occurs when the mean value of the three phases is < 245 V.

Overvoltage trip delay limit 1:

The overvoltage trip delay limit 1 applies to warnings and alarms and is the time from the detection of the fault to the shutdown of relay 1 (for alarms for overvoltage) or the parameterized relay (for warnings for overvoltage). The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted each time the mean value of the three phases within the set trip delay exceeds the parameterized limit, then returns to the normal operating state, and then exceeds the parameterized limit again. On the other hand, a continuous exceedance without a temporary return to the normal operating state leads to the fact that the trip delay runs out normally and then relay 1 (for alarms for overvoltage) or the parameterized relay (for warnings for overvoltage) is switched off.

Overvoltage trip delay limit 2:

The overvoltage trip delay limit 2 applies to alarms and is the time from the detection of the fault to the shutdown of relay 1. The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted each time the mean value of the three phases within the set trip delay exceeds the parameterized limit, then returns to the normal operating state and then exceeds the parameterized limit again. On the other hand, a continuous exceedance without a temporary return to the normal operating state leads to the fact that the trip delay runs out normally and then relay 1 is switched off.

Overvoltage reset delay:

The overvoltage reset delay applies only to alarms and is the time until relay 1 is switched back on again after the fault has been corrected. As the overvoltage reset delay, 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the event of a locked shutdown, relay 1 only switches back to operation after a reset. The requirement for switching on again (after the reset delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set reset delay,

the reset delay will be restarted. If no error occurs within the set reset delay, the reset delay runs normally and then relay 1 switches back into operation.

4.6.7 Current monitoring (S1, S2)

The current monitoring works via a connected current transformer that measures the current of phase L1. In current monitoring, phase L1 can be monitored for overcurrent and undercurrent. In three-phase motors, a symmetry of the motor windings is assumed. The current monitoring is only active when the motor is running, the run detection is implemented via the connected phases L1, L2 and L3.

Below are the parameters that can be set in the current monitoring:

- Operating mode
- Trip point value
- Warning value
- Hysteresis
- Trip delay
- Reset delay
- Transmission ratio transformer
- Windings through transformer
- Start-up delay time

Operating mode:

The operating modes are "Exceed" and "Falling below". "Exceed" must be parameterized for monitoring overcurrent and "Falling below" for undercurrent monitoring. If the current monitoring is not required, it must be parameterized to "Disabled". If current monitoring is deactivated, measured values are still provided via the diagnostic port and via Modbus, provided that a current transformer is connected.

Trip point value:

The trip point value can be parameterized from 1 to 250 A. If the current value exceeds or falls below the trip point value (depending on the parameterization of the operating mode), the parameterized relay is switched off after the trip delay has elapsed.

Warning value:

The warning value can be parameterized from 1 to 250 A. If the current value exceeds or falls below the warning value (depending on the parameterization of the operating mode), the parameterized relay is switched off after the trip delay has elapsed. When the alarm area starts, the warning area ends and the parameterized relay switches on again.

Hysteresis:

The hysteresis applies to warnings and alarms and is the difference between the shutdown value and the restart value. The hysteresis can be parameterized from 0.10 to 50 A.

Trip delay:

The trip delay applies to warnings and alarms and is the time from the detection of the fault to the shutdown of the parameterized relay. The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted each time the current value within the set trip delay falls below or exceeds the parameterized limit, then returns to the normal operating state and then falls below or exceeds the parameterized limit value again. On the other hand, a continuous undershooting or exceedance without a temporary return to the normal operating state leads to the fact that the trip delay runs out normally and then the parameterized relay is switched off.

Reset delay:

The reset delay applies only to alarms and is the time after the fault has been corrected until the parameterized relay is reactivated. As a reset delay, 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the event of a locked shutdown, the parameterized relay only switches back to operation after a reset. The requirement for switching on again (after the reset delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set reset delay, the reset delay will be restarted. If no error occurs within the set reset delay, the reset delay runs out normally and then the parameterized relay switches back into operation.

Transmission ratio transformer:

The transmission ratio transformer is the ratio of the primary rated current to the secondary rated current and is specified in the package insert of the INT185 current transformer. The transmission ratio transformer for the INT185 Current Transformer up to 100 A (mat no. 02D187) is 1:2500 and for the INT185 Current Transformer up to 250 A (mat no. 02D188) is 1:6250.

Windings through transformer:

Windings through transformer refers to the number of primary windings that are inserted through the current transformer. The number of windings can be parameterized from 1 to 10. The measuring range should be selected so that it reaches 20% above the rated current of the motor.

Example:

- Rated motor current: 16 A
- Selected measuring range: 16 A + 20% = 19.2 A
- Max. measuring range of the current transformer 02D187: 100 A
- Number of windings for current transformer 02D187: 100 A / 19.2 A = 5.2083
- This means that 5 windings must be inserted through the current transformer so that the measuring range reaches 20% above the rated current of the motor.

INT185 Current Transformer		
Number of windings	**Measuring range with 02D187**	**Measuring range with 02D188**
1	5…100 A	12.5…250 A
2	2.5…50 A	6.25…125 A
3	1.67…33.33 A	4.17…83.33 A
4	1.25…25 A	3.13…62.5 A
5	1…20 A	2.5…50 A
…	…	…
10	0.5…10 A	1.25…25 A

Start-up delay time:

The start-up delay time is the time after the expiry of the run detection until the start of the current monitoring. It serves to avoid incorrect shutdowns during the start-up process. As a start-up delay time, 0.5 s to 59 min 59.9 s can be parameterized.

4.6.8 Power monitoring

With a current transformer connected to phase L1 and with phases L1, L2 and L3 connected, the power monitoring works automatically. It includes monitoring of underload, overload and cosφ. The active and reactive power are determined from the measured current, the measured voltage and the calculated phase angle φ. The apparent power is also determined. Additionally, the active and reactive energy are output.

4.6.8.1 Underload monitoring

In the case of underload monitoring, the active power is monitored for falling below a parameterizable limit value.

Below are the parameters that can be set during underload monitoring:

- Operating mode underload
- Underload limit 1
- Underload limit 2
- Underload hysteresis
- Underload limit 1 trip delay
- Underload limit 2 trip delay
- Underload limit 1 restart delay
- Underload limit 2 restart delay
- Start-up override for running detection

Operating mode underload:

The operating modes are "Limit 1 warning", "Limit 1 warning, Limit 2 alarm", "Limit 1 alarm, limit 2 alarm" and "Limit 2 alarm". Limit 1 is the first limit value to be reached. Limit 2 is the next limit value to be reached after limit 1. As soon as "Limit 1 warning" or "Limit 2 alarm" is selected as the operating mode, only this is valid and the other limit is thus deactivated. Both limits are active when "Limit 1 Warning, Limit 2 alarm" or "Limit 1 alarm, Limit 2 alarm" is selected. If the underload monitoring is not required, it must be parameterized to "Disabled".

Underload limit 1:

Underload limit 1 is the warning or shutdown value. This depends on whether limit 1 is parameterized as a warning or alarm in the operating mode. The underload limit 1 can be parameterized from 0 to 3276 kW. If the underload limit 1 value is undershot, the parameterized relay is switched off after the trip delay has elapsed.

Underload limit 2:

Underload limit 2 is defined as a shutdown as soon as limit 2 is parameterized as an alarm in the operating mode. As an underload limit 2, 0 to 3276 kW can be parameterized. If the underload limit 2 value is undershot, the parameterized relay is switched off after the trip delay has elapsed.

Underload hysteresis:

The underload hysteresis applies to warnings and alarms and is the difference between the underload trip point value and the underload restart value. The underload hysteresis can be parameterized from 0.05 to 3275.95 kW.

Example:

- Operating mode parameterized to: Limit 2 Alarm
- Underload limit 2 parameterized to: 10 kW
- Underload hysteresis parameterized to: 2 kW
- Restart value: 10 kW + 2 kW = 12 kW
- The restart occurs when the value is > 12 kW.

Underload limit 1 trip delay:

The underload limit 1 trip delay applies to warnings and alarms and is the time from the detection of the fault to the shutdown of the parameterized relay. The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted each time the active power within the set trip delay falls below the parameterized limit, then returns to the normal operating state and then falls below the parameterized limit again. On the other hand, a continuous undershooting without a temporary return to the normal operating state leads to the fact that the trip delay runs out normally and then the parameterized relay is switched off.

Underload limit 2 trip delay:

The underload limit 2 trip delay applies to alarms and is the time from the detection of the fault to the shutdown of the parameterized relay. The trip delay can be parameterized from 0.1 s to 59 min 59.9 s.

The trip delay is restarted each time the active power within the set trip delay falls below the parameterized limit, then returns to the normal operating state and then falls below the parameterized limit again. On the other hand, a continuous undershooting without a temporary return to the normal operating state leads to the fact that the trip delay runs out normally and then the parameterized relay is switched off.

Underload limit 1 restart delay:

The underload limit 1 restart delay applies only to alarms and is the time until the parameterized relay is switched on again after the fault has been resolved. As underload limit 1 restart delay, 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the event of a locked shutdown, the parameterized relay only switches back to operation after a reset. The requirement for switching on again (after the restart delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set restart delay, the restart delay will be restarted. If no error occurs within the set restart delay, the restart delay runs out normally and then the parameterized relay switches back into operation.

Underload limit 2 restart delay:

The underload limit 2 restart delay applies only to alarms and is the time until the parameterized relay is switched on again after the fault has been resolved. As underload limit 2 restart delay, 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the event of a locked shutdown, the parameterized relay only switches back to operation after a reset. The requirement for switching on again (after the restart delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set restart delay, the restart delay will be restarted. If no error occurs within the set restart delay, the restart delay runs out normally and then the parameterized relay switches back into operation.

Start-up override for running detection:

The start-up override for running detection is the time after the expiry of the run detection until the start of the underload monitoring. It serves to avoid incorrect shutdowns during the start-up process. As start-up override for running detection, 0.1 s to 3599.9 s can be parameterized.

4.6.8.2 Overload monitoring

In overload monitoring, the active power is monitored for exceeding a parameterizable limit value.

Below are the parameters that can be set in overload monitoring:

- Operating mode overload
- Overload limit 1
- Overload limit 2
- Overload hysteresis
- Overload limit 1 trip delay
- Overload limit 2 trip delay
- Overload limit 1 restart delay

- Overload limit 2 restart delay
- Start-up override for running detection

Operating mode overload:

The operating modes are "Limit 1 warning", "Limit 1 warning, Limit 2 alarm", "Limit 1 alarm, Limit 2 alarm" and "Limit 2 alarm". Limit 1 is the first limit value to be reached. Limit 2 is the next limit value to be reached after limit 1. As soon as "Limit 1 warning" or "Limit 2 alarm" is selected as the operating mode, only this is valid and the other limit is thus deactivated. Both limits are active when "Limit 1 warning, Limit 2 alarm" or "Limit 1 alarm, Limit 2 alarm" is selected. If the overload monitoring is not required, it must be parameterized to "Disabled".

Overload limit 1:

Overload limit 1 is the warning or shutdown value. This depends on whether limit 1 is parameterized as a warning or alarm in the operating mode. The overload limit 1 can be parameterized from 0 to 3276 kW. If the overload limit 1 value is exceeded, the parameterized relay is switched off after the trip delay has elapsed.

Overload limit 2:

Overload limit 2 is defined as a shutdown as soon as limit 2 is parameterized as an alarm in the operating mode. Overload limit 2 can be parameterized from 0 to 3276 kW. If the overload limit 2 value is exceeded, the parameterized relay is switched off after the trip delay has elapsed.

Overload hysteresis:

The overload hysteresis applies to warnings and alarms and is the difference between the overload trip point value and the overload restart value. As overload hysteresis 0.05 to 3275.95 kW can be parameterized.

Example:

- Operating mode parameterized to: Limit 2 alarm
- Overload limit 2 parameterized to: 20 kW
- Overload hysteresis parameterized to: 5 kW
- Restart value: 20 kW - 5 kW = 15 kW
- The restart occurs when the value is < 15 kW.

Overload limit 1 trip delay:

The overload limit 1 trip delay applies to warnings and alarms and is the time from the detection of the fault to the shutdown of the parameterized relay. The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted each time the active power within the set trip delay exceeds the parameterized limit, then returns to the normal operating state, and then exceeds the parameterized limit value again. On the other hand, a continuous exceedance without a temporary return to the normal operating state leads to the fact that the trip delay runs out normally and then the parameterized relay is switched off.

Overload limit 2 trip delay:

The overload limit 2 trip delay applies to alarms and is the time from the detection of the fault to the shutdown of the parameterized relay. The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted each time the active power within the set trip delay exceeds the parameterized limit, then returns to the normal operating state, and then exceeds the parameterized limit value again. On the other hand, a continuous exceedance without a temporary return to the normal operating state leads to the fact that the trip delay runs out normally and then the parameterized relay is switched off.

Overload limit 1 restart delay:

The overload limit 1 restart delay applies only to alarms and is the time until the parameterized relay restarts after the fault has been resolved. The overload limit 1 restart delay can be parameterized from 0 s to 18 h 12 min 14 s or alternatively a locked shutdown. In the event of a locked shutdown, the parameterized relay only switches back to operation after a reset. The requirement for switching on again (after the restart delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set restart delay, the restart delay will be restarted. If no error occurs within the set restart delay, the restart delay runs out normally and then the parameterized relay switches back into operation.

Overload limit 2 restart delay:

The overload limit 2 restart delay applies only to alarms and is the time until the parameterized relay restarts after the fault has been corrected. As overload limit 2 restart delay, 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the event of a locked shutdown, the parameterized relay only switches back to operation after a reset. The requirement for switching on again (after the restart delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set restart delay, the restart delay will be restarted. If no error occurs within the set restart delay, the restart delay runs out normally and then the parameterized relay switches back into operation.

Start-up override for running detection:

The start-up override for running detection is the time after the expiry of the run detection until the start of the overload monitoring. It serves to avoid incorrect shutdowns during the start-up process. As start-up override for running detection, 0.1 s to 3599.9 s can be parameterized.

4.6.8.3 Cosφ monitoring

In cosφ monitoring, monitoring is performed for exceeding or falling below a parameterizable limit value.

Below are the parameters that can be set during cosφ monitoring:

- Operating mode
- Trip point value
- Warning value
- Hysteresis
- Trip delay

- Reset delay
- Start-up override

Operating mode:

The operating modes are “Exceed” and “Falling below”. For monitoring for exceeding the cosφ value, "Exceed" must be parameterized and for monitoring for falling below the cosφ value, "Falling below" must be parameterized. If the cosφ monitoring is not required, it must be parameterized to "Disabled". If cosφ monitoring is deactivated, the cosφ values are still provided via the diagnostic port and via Modbus, provided that a current transformer is connected.

Trip point value:

The trip point value can be parameterized from 0.01 to 1.00. If the cosφ value has exceeded or fallen below the trip point value (depending on the parameterization of the operating mode), the parameterized relay is switched off after the trip delay has elapsed.

Warning value:

The warning value can be parameterized from 0.01 to 1.00. If the cosφ value has exceeded or fallen below the warning value (depending on the parameterization of the operating mode), the parameterized relay is switched off after the trip delay has elapsed. When the alarm area starts, the warning area ends and the parameterized relay switches on again.

Hysteresis:

The hysteresis applies to warnings and alarms and is the difference between the trip point value and the restart value. The hysteresis can be parameterized from 0.01 to 0.99.

Trip delay:

The trip delay applies to warnings and alarms and is the time from the detection of the fault to the shutdown of the parameterized relay. The trip delay can be parameterized from 0.1 s to 59 min 59.9 s. The trip delay is restarted every time the cosφ value falls below or exceeds the parameterized limit within the set trip delay, then returns to the normal operating state and then falls below or exceeds the parameterized limit value again. On the other hand, a continuous undershooting or exceedance without a temporary return to the normal operating state leads to the fact that the trip delay runs out normally and then the parameterized relay is switched off.

Reset delay:

The reset delay applies only to alarms and is the time until the parameterized relay is switched on again after the fault has been resolved. As a restart delay, 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the event of a locked shutdown, the parameterized relay only switches back to operation after a reset. The requirement for switching on again (after the reset delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set reset delay, the reset delay will be restarted. If no error occurs within the set reset delay, the reset delay runs out normally and then the parameterized relay switches back into operation.

Start-up override:

The start-up override is the time after the expiry of the run detection until the start of the cosφ monitoring. It serves to avoid incorrect shutdowns during the start-up process. As start-up override, 0.5 s to 59 min 59.9 s can be parameterized.

4.6.9 Run detection

The operation of the motor (on / off) is detected via phases L1, L2 and L3. The run detection is used to record the operating time and to determine the operating rate. The operating rate is the quotient of the operating time and the total time. The last operational circuit is stored in the device with a time stamp. The start of the motor is detected from 30 V and the stop from 20 V.

4.6.10 Switching frequency overstepping

In the case of switching frequency overstepping, the switching frequency per parameterized unit of time is monitored. The switching frequency is the quotient of the sum of the operational shutdowns and the unit of time.

Below are the parameters that can be set in switching frequency overstepping:

- Operating mode
- Time window
- Switching per time window
- Reset delay

Operating mode:

"Warning" and "Alarm" are available as operating modes. Depending on the parameterization of the operating mode, a warning or alarm is issued if the maximum permissible number of circuits is exceeded within the parameterized time range and the parameterized relay is switched off. If the switching frequency monitoring is not required, it must be parameterized to "Disabled".

Time window:

The time window is the reference time for the maximum number of circuits allowed. The time window can be parameterized from 1 s to 12 h.

Switching per time window:

The switching per time window is the maximum number of circuits allowed (on/off operation) in the set time range. 2 to 10 circuits can be parameterized per time range.

Reset delay:

The reset delay applies only to alarms and is the time until the parameterized relay is reactivated after the fault has been resolved. As a reset delay, 0 s to 18 h 12 min 14 s or alternatively a locked shutdown can be parameterized. In the event of a locked shutdown, the parameterized relay only switches back to operation after a reset. The requirement for switching on again (after the reset delay or the locked shutdown) is that there is no longer an error. In case an error occurs again within the set reset delay,

the reset delay will be restarted. If no error occurs within the set reset delay, the reset delay runs out normally and then the parameterized relay switches back into operation.

4.6.11 Service intervals

For connected phases L1, L2 and L3, it is possible to parameterize a service interval. Restarting the service interval will load the adjustable interval time. After the time has elapsed, the service is signaled via the built-in LED or additionally by switching off the parameterized relay.

Below are the parameters that can be set for the service interval:

- Status
- Service interval duration

Status:

The status is the operating mode of the service interval. The statuses available are "Paused", “Continue” and “Restart”. If the status is parameterized to “Continue", the service interval time runs out normally. When parameterizing to "Restart", the service interval time starts anew. If the service interval is not needed, the status must be set to “Paused”.

Service interval duration:

The service interval duration is the interval time that is loaded by restarting the service interval. The interval can be parameterized from 100 h to 26280 h.

4.6.12 Relay 1 (11, 14, 12)

Relay 1 is a switching output in the form of a changeover contact. Relay 1 can be set to all recognizable faults or warnings via parameterization. If a fault or warning is detected, an alarm or warning is triggered. Relay 1 works according to the closed-circuit current principle.

Below are the parameters that can be set for relay 1:

- Selection of alarms
- Selection of warnings

Selection of alarms:

When choosing selection of alarms, relay 1 can be set for all detectable faults. Motor temperature monitoring, phase sequence, phase failure, phase asymmetry, undervoltage, overvoltage and self-monitoring are always active as alarms at relay 1 and cannot be deselected at relay 1. If an error is detected, an alarm is triggered.

Selection of warnings:

When choosing selection of warnings, relay 1 can be set to all detectable warnings. If a warning is detected, a warning is issued. A warning is reset when the associated alarms are reached.

4.6.13 Relay 2 (21, 24, 22)

Relay 2 is a switching output in the form of a changeover contact. Relay 2 can be set for all detectable errors or warnings via parameterization. If a fault or warning is detected, an alarm or warning is triggered. Relay 2 works according to the closed-circuit current principle.

Below are the parameters that can be set for relay 2:

- Selection of alarms
- Selection of warnings

Selection of alarms:

When choosing selection of alarms, relay 2 can be set for all detectable faults. Self-monitoring is always active as an alarm at relay 2 and cannot be deselected at relay 2. If an error is detected, an alarm is triggered.

Selection of warnings:

When choosing selection of warnings, relay 2 can be set to all detectable warnings. If a warning is detected, a warning is issued. A warning is reset when the associated alarm is reached.

4.6.14 Modbus RTU (COM, D0, D1, COM)

The INT69 PYF Diagnose has an RS485 interface (screw terminal D0, D1, COM) and can thus provide settings, operating data and recorded measured values via Modbus protocol (RTU) to a higher-level system (master), such as a controller. The INT69 PYF Diagnose works as a slave and sends targeted data values to the master after its query.

Note: Activity on the Modbus is visible via the INTspector App (no dedicated LED available).

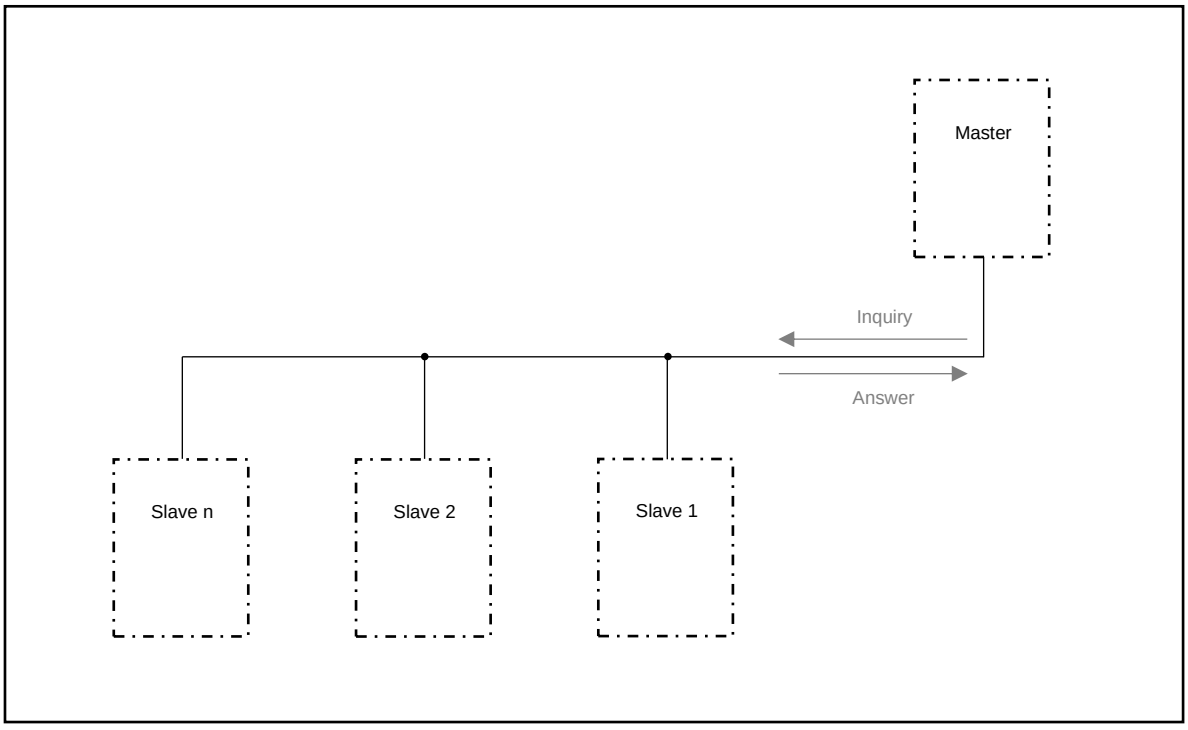


Figure 7 Communication in a Modbus protocol network

Below are the parameters that can be set for Modbus RTU:

- Address
- Baudrate
- Stop bit
- Parity
- Password parameterization via Modbus

Address:

The device address of each participant on the bus must be assigned once, otherwise the master will no longer be able to communicate with all existing slaves on the bus. The address range can be parameterized from 1 to 247.

Baudrate:

The baud rate indicates the transfer speed. The INT69 PYF Diagnose supports the following speeds:

- 9600 bit/s
- 19200 bit/s
- 38400 bit/s
- 57600 bit/s

Stop bit:

The stop bit is placed after a data transfer and informs the master that the transmission has ended. Either “1” or “2” can be parameterized as the stop bit. To ensure a constant length of the data frame, the following parameterization is recommended:

- 2 stop bits with no parity (none)
- 1 stop bit with even parity (even) or odd parity (odd)

Parity:

The parity bit is used to check if there is an error within a byte during transmission. The INT69 PYF Diagnose supports:

- even parity (even)
- odd parity (odd)
- no parity (none)

Password parameterization via Modbus:

The Modbus password is not the device password from chap. 4.6.1. The Modbus password is required to change the parameters via the Modbus function code 0x06 write holding registers. The Modbus password is set to 1968 from the factory. The Modbus password can be changed via parameterization via the INTspector App. The Modbus password can be set from 0 to 65535. If the Modbus password is not required, this must be deactivated by parameterizing "0" as the password. If the Modbus password is required, a number from "1" to "65535" must be set as the password.

Message structure:

The data to be transmitted is always within a fixed frame, which is called frame.

Field 1	Field 2	Field 3	Field 4
Address	Function code	Data	CRC

In the RTU Modbus, this generally consists of the following four elements:

Field 1	Address	Specific device address, valid range 1 to 247
Field 2	Function code	Defines the function to be performed, see the table of function codes supported by the protection relay
Field 3	Data	The data block contains the information to be exchanged based on the register address (from the parameter or Modbus table), which is defined with the function code.
Field 4	CRC	The Cyclical Redundancy Check (CRC) is performed to detect errors in transmission. This information is sent to the last 2 bytes of the frame, it is a 16 bit value and is generated automatically.

The following function codes are supported by the INT69 PYF Diagnose:

Function code	Designation	Meaning
0x03	read holding registers	Reading the set parameters, see parameter table
0x04	read input register	Reading the diagnostic data (actual values), see Modbus table
0x06	write holding registers	Changing the parameters, for this the Modbus password is required
0x2B / 0x0E	read device identification	Reading the Identification Register

Note: For more information on the Modbus protocol, see http://www.modbus.org .

Modbus protocol:

For the specific requests from the master to the slave (e.g. temperature, actual value - temperature 1), the register addresses are required in the data area (field 3). Depending on what is needed, these can be taken from the parameter table (with function code 03) or the Modbus table (with function code 04).

Note: The parameter and Modbus table of the INT69 PYF Diagnose is available for download on the product page under https://www.kriwan.com/en/products/protection-relay/multifunctional-relays-for-machines/int69-pyf-diagnose-premium and is not part of this manual.

In addition to the register addresses (start and end), the tables also show the data type and the description. The data type specifies the format in which the data is to be interpreted. The following data types are distinguished for the INT69 PYF Diagnose:

Data type	Description
U 16bit	Unsigned 16-bit integer value. Occupies 1 parameter address Value range from 0 to 65535
U 32bit	Unsigned 32-bit integer value. Occupies 2 parameter addresses Value range from 0 to 2 147 483 647
S 16offset	Signed 16-bit value, transmitted as an unsigned value Occupies 1 parameter address Number = (Value -32768) / 100 Value range from -327.00...+327.00
Enumeration	Unsigned 16-bit integer value. Occupies 1 parameter address Value range from 0 to 65535 Each entry is assigned a number, starting with 0, first entry=0, second entry=1...

Example 1 – Reading the sensor type at temperature 1 (default):

- Address: 8866
- Data type: Enumeration
- Range: Deactivated; Pt100; Pt1000; PTC

Query to the slave (device address 01) with register address 8866 (parameter table) and function code 3:

Address	Function code	Data				CRC	
		Registered address 8866		Number of values		CRC	
01	03	22	A2	00	01	2F	90

Note: The protection relay uses the MODBUS protocol in RTU mode, e.g. each message byte sent contains two hexadecimal characters (register address 8866 becomes 22 A2).

Slave response to the master:

Address	Function code	Data	Data		CRC	
		Number of bytes	Value: 2		CRC	
01	03	02	00	02	39	85

The mapping of the enumeration (Disabled; Pt100; Pt1000; PTC) starts with 0. This means that the 2 is assigned to the Pt1000. The answer is value 2 (Pt1000).

Example 2 – Reading the resistance actual value at temperature 1:

- Address: 10795
- Data type: unsigned 16bit
- Range: 1… 65535Ω
  0 = not available

Query to the slave (device address 01) with register address 10795 (Modbus table) and function code 4:

Address	Function code	Data				CRC	
		Register address 10795		Number of values		CRC	
01	04	2A	2B	00	01	49	DA

Slave response to the master:

Address	Function code	Data			CRC	
		Number of bytes	Value: 1555		CRC	
01	04	02	06	13	FB	5D

The answer is value 1555. The resistance to actual temperature 1 is 1555 Ω.

Example 3 – Read out temperature actual value at temperature 1:

- Address: 10854
- Data type: signed 16bit offset
- Range: Temperature = (Value - 32768) / 100
  -327,00 °C…+327,00 °C
  65535 = not available

Query to the slave (device address 01) with register address 10854 (Modbus table) and function code 4:

Address	Function code	Data				CRC	
		Register address 10854		Number of values		CRC	
01	04	2A	56	00	01	D9	C2

Slave response to the master:

Address	Function code	Data			CRC	
		Number of bytes	Value: 47183		CRC	
01	04	02	B8	4F	8A	C4

The answer is value 47183. The temperature actual value at temperature 1 is (47183 – 32768) / 100 = 144.15°C

4.6.15 Reset function

The reset function is used to reset a locked shutdown or a restart delay when there is no longer a fault. The following options are available to perform a reset:

- Option 1: Mains reset > 5 s
- Option 2: External reset on the switching input > 5 s
- Option 3: Modbus reset via integrated Modbus RTU interface of the INT69 PYF Diagnose (for the reset, write the address 515 once with the value 1)

4.6.16 Diagnostic Port

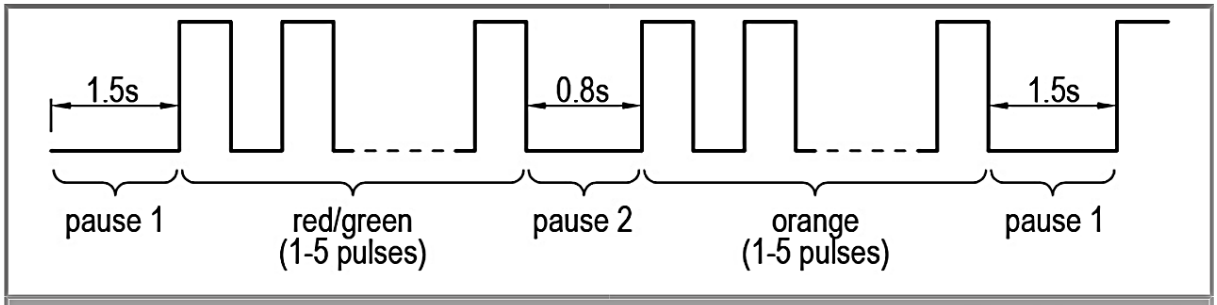
The parameterization and diagnosis of the INT69 PYF Diagnose is possible via Diagnostic Port (DP) with the help of the INTspector App and with the separately available INT600 DU Gateway (mat. no. 02 S365 S21) or INT600 DB Gateway (mat. no. 02 S 377 S021) or via the integrated Modbus interface of the INT69 PYF Diagnose.

Alternatively, the INT600 DM Gateway (mat. no. 22 S 371) can be used as a secure Modbus communication path. The Modbus function code 0x04 read input registers is supported via the diagnostic port and the separately available INT600 DM gateway, which can be used to read out the data of the INT69 PYF Diagnose. The data can be read out via the INT600 DM Gateway, but parameterization is not possible via Modbus.

4.6.17 LED blink code

The LED signals the current status of the protection relay. When operating correctly, the built-in LED lights up green. If warnings are pending or if there is a fault, the LED flashes in a cyclic flashing sequence. The cyclic flashing sequence outputs a flashing code that is used for quick and easy status indication and troubleshooting. If warnings are pending, the flashing sequence consists of green and orange pulses. In the event of a fault, the flashing sequence consists of red and orange pulses.

The following two tables provide an overview of the flashing code and the flashing sequence:



Flashing code

Condition	Description
Steady green	Machine ready for operation
Green flashing	Machine running
Steady orange	Machine ready for operation, service due
Orange flashing	Machine running, service due
Green / Orange flashing	Warning, description see below
Red / Orange flashing	Error, see description below

LED	1. Flashing sequence	2. Flashing sequence	Description
Warning Fault	1x Green 1x Red	1x Orange 1x Orange	Motor temperature: Switch-off/Warning, permissible winding temperature exceeded
Error	1x Red	4x Orange	Motor temperature: Switch-off, sensor input detected an open or short circuit
Fault	2x Red	1x Orange	Phase monitoring: Switch-off, incorrect phase sequence
Warning Fault	2x Green 2x Red	2x Orange 2x Orange	Phase monitoring: Switch-off/Warning, phase failure/asymmetry
Warning Fault	2x Green 2x Red	3x Orange 3x Orange	Phase monitoring: Switch-off/Warning Undervoltage/Overvoltage

LED	1. Flashing sequence	2. Flashing sequence	Description
Fault	2x Red	4x Orange	Phase monitoring: Restart delay after phase monitoring error
Warning Fault	3 Green 3x Red	1x Orange 1x Orange	Temperature input 1: Switch-off/warning, permissible temperature exceeded
Warning Fault	3x Green 3x Red	2x Orange 2x Orange	Temperature input 2: Switch-off/warning, permissible temperature exceeded
Fault	3x Red	4x Orange	Temperature input 1: Switch-off, sensor input detected an open or short circuit
Fault	3x Red	5x Orange	Temperature input 2: Switch-off, sensor input detected an open or short circuit
Warning Fault	4x Green 4x Red	1x Orange 1x Orange	Leakage input 1: Switch-off/Warning, permissible limit value exceeded/undershot
Fault	4x Red	3x Orange	Switching input 1: Switch-off
Fault	5x Red	1x Orange	General: Device error
Warning Fault	5x Green 5x Red	3x Orange 3x Orange	General: Analog input 1 Switch-off/Warning, permissible limit exceeded/fallen below
Fault	5x Red	4x Orange	General: Analog input 1 Sensor fault detected, closed current fallen below

LED	1. Flashing sequence	2. Flashing sequence	Description
Warning Fault	5x Green 5x Red	5x Orange 5x Orange	General: Switching frequency switch-off/warning, permissible switches exceeded
Warning Fault	6x Green 6x Red	1x Orange 1x Orange	Current transformer input 1: Switch-off/warning permissible limit exceeded/undershot
Fault	6x Red	2x Orange	Current transformer input 1: Switch-off, sensor error detected
Warning Fault	6x Green 6x Red	3x Orange 3x Orange	Cosφ monitoring: Switch-off/warning permissible limit exceeded/fallen below
Warning Fault	6x Green 6x Red	4x Orange 4x Orange	Underlaod/overload: Switch-off/warning permissible limit exceeded/fallen below

4.7 Technical data

Supply voltage 20 A 721 P081 22 A 721 P081	24 V~/⎓ 50/60 Hz ±20% 7 VA 100-240 V~ 50/60 Hz ±10 % 9 VA
Permissible ambient temperature T_a	-30 °C ≤ Ta ≤ +70 °C
Permissible humidity	0-95% r.h., non-condensing
Maximum usage height	2000 m
Temperature measuring circuit bimetal/external relay contact	
– Type	for an N.C. contact
– Contact suitable for	24 V⎓ 20 mA
– Max. line length	100 m
PTC temperature measuring circuit	
–Type	1-9 PTC sensors according to DIN VDE V 0898-1-401 in series
– $R_{25, total}$	<1.8 kΩ
– $R_{triggering, static}$	4.5 kΩ ±20%
– R_{reset}	2.75 kΩ ±20%
– Short-circuit monitoring	<20 Ω
– Break monitoring	>20 kΩ
– Applied voltage	
– Motor temperature	24 V⎓
– Temperature 1	5 V⎓
– Temperature 2	5 V⎓
– Max. line length	100 m
Pt100 temperature measuring circuit	
– Measuring range	-50...+300 °C
– Resolution	1 K
– Accuracy	5 % of the ohmic value
– Short-circuit monitoring	<20 Ω
– Break monitoring	>400 Ω
– Voltage provided	
– Motor temperature	24 V⎓
– Temperature 1	5 V⎓
– Temperature 2	5 V⎓
– Max. line length	100 m
Pt1000 temperature measurement circuit	
–Measuring range	-50...+300 °C
–Resolution	1 K
–Accuracy	5 % of the ohmic value
– Short-circuit monitoring	<20 Ω
– Break monitoring	>2.3 kΩ
– Applied voltage	
– Motor temperature	24 V⎓
– Temperature 1	5 V⎓
– Temperature 2	5 V⎓
– Max. line length	100 m

Leakage measurement circuit	
– Type	Resistance measurement between electrode pairs
– Measuring range	5 kΩ - 1.5 MΩ
– Resolution	1 kΩ
– Accuracy	±(1 kΩ +10 % of MV)
– Applied voltage	Approx. 24 V~
– Max. line length	100 m
Switching input	
–Type	For a floating NC or NO contact (e.g. reset button)
– Contact suitable for	24 V⎓ 20 mA
– Max. line length	100 m
Analog Input	
– Type	0-20 mA / 4-20 mA current signal
– Applied voltage	24 V⎓ +5 % / -25 %
–Measuring range	0-20 mA
–Resolution	0.1 mA
–Accuracy	±2.5 % of MV
–Current limitation	30 mA, short-circuit proof
– Max. line length	100 m
Phase measurement	
– Operation with FC	Suitable
– Measuring range phase-phase	20-100 Hz~, 60-690 V~ ±10%
– Resolution	1 V
– Clock frequency range	2-16 kHz
– Typical clock frequency	8 kHz
– Precision, sinus operation	±(1 V +2.5 % of MV)
– Precision, FC operation	±(1 V +5 % of MV)
– Max. line length	3 m
Frequency measurement	
– Resolution	1 Hz
– Accuracy	±1 Hz
Current measurement	
– Type	For a current transformer
– Load	R=75 Ω, I_{max} =40 mA
– Measuring range with 02 D 187 / 02 D 188	1~ 20-100 Hz
– For 1 winding	5-100 A / 12.5-250 A
– For 10 windings	0.5-10 A / 1.25-25 A
– Precision, sinus operation	±2.5 % of MV
– Precision, FC operation	±5 % of MV
– Resolution	0.01 A
– Max. line length	1 m
Cosφ measurement	
– Measuring range	0-1
– Resolution	0.01

Performance measurement with 02 D 187 / 02 D 188	
– Measuring range	20-100 Hz~ 120 kVA / 300 kVA
– Resolution	1 VA/W/var
– Accuracy at cosφ >0.4	
– Active power, apparent power	±5%
– Reactive power	±10%
Energy meter	
– Measuring range	Ca. 43 GWh/Gvarh
– Resolution	0.01 kWh/kvarh
Modbus	
– Protocol	Modbus RTU (TwoWire)
– Address range	1-247
– suitable cables	Twisted pair, e.g. cable LiYCY (TP) 2x2x0.25 mm^2
– Safety	Potential-isolated, basic insulated
– Specification	Application protocol Specification V1.1b3 of Modbus-IDA
– Interface	RS485, bidirectional
– Baud rate	9.6 k, 19.2 k, 38.4 k or 57.6 k
– Parity	Even, odd or none
– Stopp Bit	1 or 2
– Function codes	– 0x03 read holding registers – 0x04 read input register – 0x06 write holding registers – 0x43 device identification
– Terminal resistance	No internal terminal resistance, 150 Ω required between D0-D1, see scope of delivery
Interface	Diagnostic Port (DP)
– Max. line length	10 m
Reset of lock or restart delay	
– Option 1	Mains reset >5 s
– Option 2	External reset on switching input >5 s
– Option 3	Modbus reset via integrated Modbus interface of the INT69 PYF Diagnose (write the value 1 to address 515 once for the reset) Only possible once any errors have been rectified

Relay 1, relay 2 1 changeover contact, floating	
– Contact	Min. 24 V~/⎓ 20 mA
– Rating data (UL/CSA)	Max. 240 V~ 2.5 A C300
– Nominal load (ohmic)	250 V~ 10 A
– Mechanical service life	Approx. 1 million cycles
Protection class according to EN 60529	IP20
Connection type	
– General	Tension spring connection (push-in) 0.2-2.5 mm^2
– Modbus	Screw/type terminal 0.2-2.5 mm^2
Housing material	PA 66 GF 30
Fixing	Control cabinet housing (basic grid 45 mm), clippable on to 35 mm standard rail according to EN 60715
Dimensions	See dimensions in mm
Weight	
– 22 A 721 P081	350 g
– 20 A 721 P081	350 g
Test regulations	EN 61000-6-2 EN 61000-6-3 EN 61010-1 Overvoltage category III Degree of pollution 2
Approval	UL File Nr. E473026 UL File Nr. E75899

5 Installation / Assembly

5.1 Safety regulations

DANGER

Assembly, maintenance and operation must be performed by a qualified electrician.

DANGER

The applicable European and country-specific standards for the connection of electrical equipment must be complied with.

DANGER

Connected sensors and connection cables that leave the terminal box must have at least one basic insulation.

DANGER

The integrated Modbus RTU interface of the protection relay is an open communication interface. Therefore, the protection relay must always be operated in a network environment protected against cyber attacks (gateway). Therefore, take appropriate further protective measures against unauthorized network attacks (e.g. firewalls or virtual networks (VPN) for remote maintenance access, etc.) for your area of application.

DANGER

Alternatively, use the INT600 DM Gateway as a secure Modbus communication path and connect it to the DP interface of the INT69 PYF Diagnose. Please note that the INT600 DM Gateway can only be used to read data via Modbus, but parameterization via Modbus is not possible.

DANGER

Contact of live parts

Danger to life due to electric shock!

Perform all work on the device only when it is deenergized.

DANGER

Improper electrical installation

Danger to life due to electric shock!

The device may only be used for the applications provided for in the package insert, data sheet and operating instructions. The instructions in the associated documentation must be observed. The permissible environmental conditions must be observed.

The electrical connection must be performed only by a qualified electrician.

Observe the technical conditions of local and national energy supply companies.

CAUTION

Improper electrical installation

Slight risk of injury or property damage.

Protection relays that show visible transport damage must not be used.

Opening the housing or unauthorized modifications void any warranty.

5.2 Installation of the protection relay

Clip on the protection relay in the control cabinet or control box on a 35 mm standard rail. To detach the device from the DIN rail, use a flat-head screwdriver to pull out the red release lever at the foot of the device.

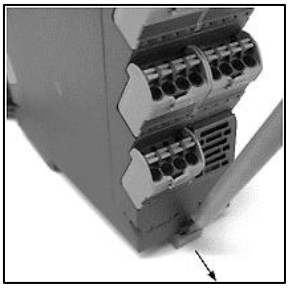


Figure 8 Red Release Lever

5.3 Electrical connection

5.3.1 General

The supply voltage and the sensors must be connected according to the connection diagrams.

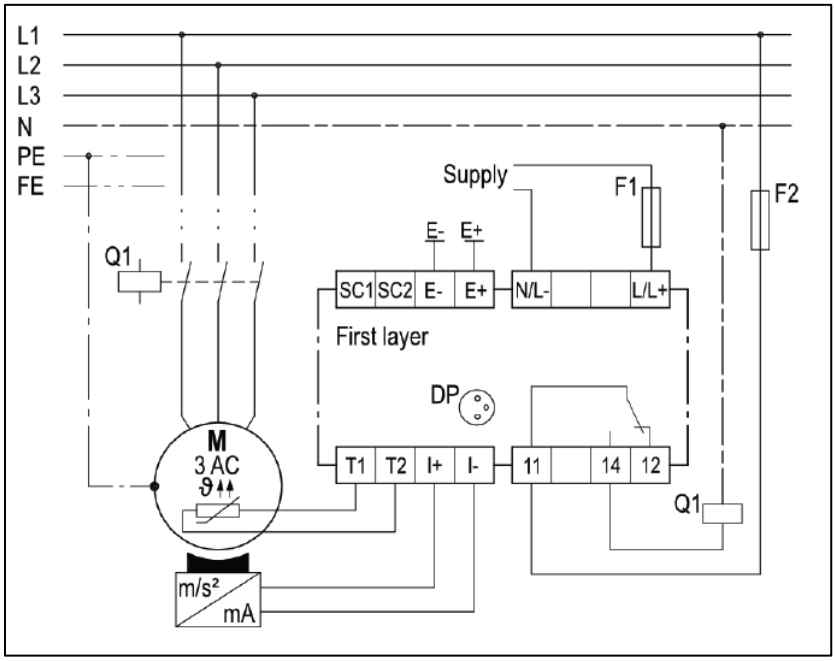


Figure 9 Connection diagram first layer

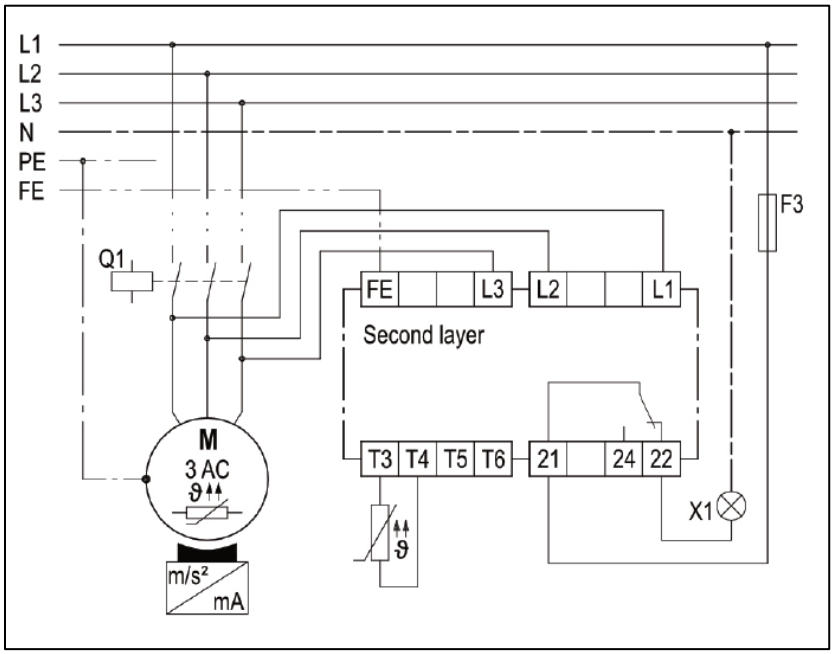


Figure 10 Connection diagram second layer

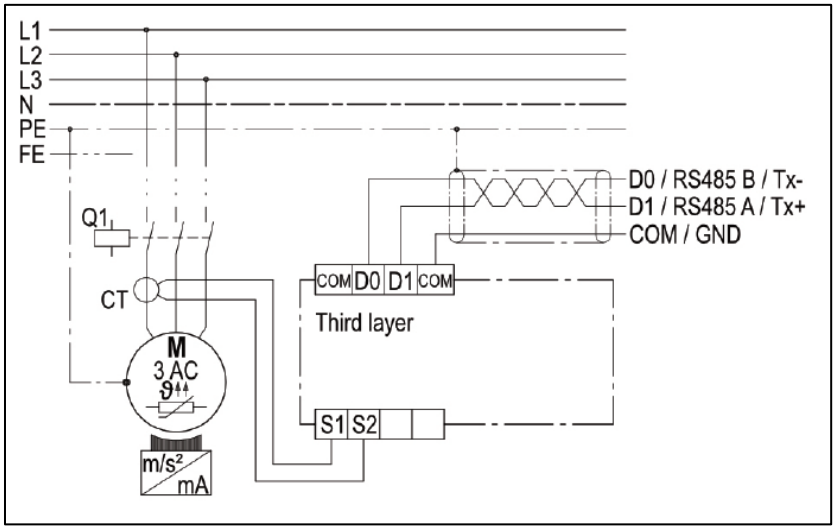


Figure 11 Connection diagram third layer

NOTICE

The application of the supply voltage without connected sensors is detected as a fault and stored in the internal memory of the protection relay.

NOTICE

For proper operation, the functional earth (FE) must be connected and the supply voltage must be permanently present.

NOTICE

The sensor cables must be routed separately from the supply lines of the motor. If extreme inductive or capacitive coupling by parallel power lines is to be expected, shielded cables must be used.

5.3.2 Connecting the spring terminals

The terminals (with the exception of the integrated Modbus RTU interface) are push-in spring terminals with a possible cross-section of 0.2-2.5 mm².

To connect to the push-in terminals, press the cable firmly into the opening so that it is held in place by the spring clamp. Check that the cables are tightly fitted. To loosen the cable, use a narrow flat-head screwdriver to release the cable and pull the cable out.

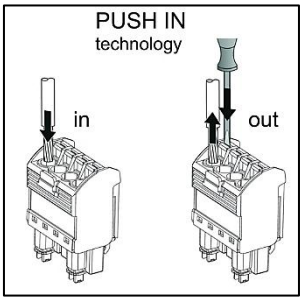


Figure 12 Connecting and disconnecting cables to push-in terminals

For easier installation, the terminal blocks can be removed individually from the protection relay housing. To do this, press the red bracket down and remove the complete clamp. Then wire and snap the terminal block back into the corresponding slot.

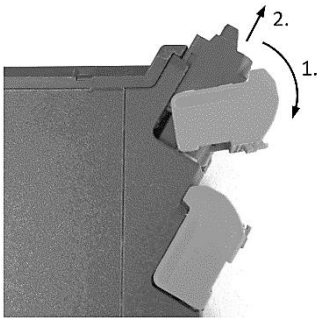


Figure 13 Removing and snapping terminal blocks

5.3.3 Encoding spring clamps

Once the terminal blocks have been removed from the protection relay housing, these terminal blocks can be individually coded to prevent a future failure when reconnecting (e.g. after maintenance). To do this, pull the corresponding cones out of the device with fine pliers. Then insert the pins into the designated areas of the terminal block.

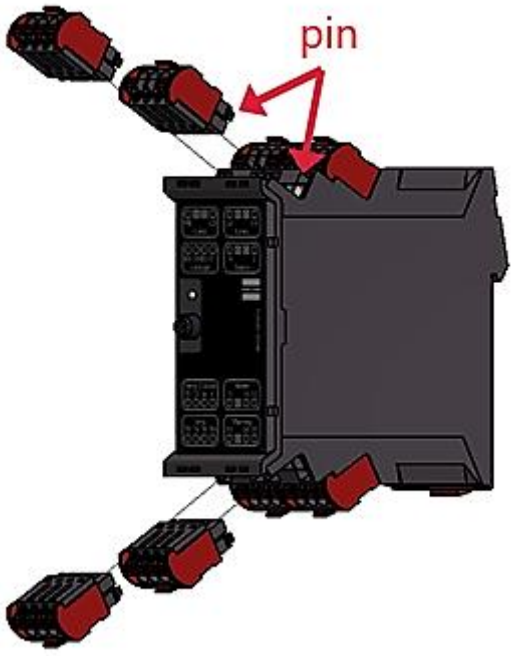


Figure 14 Inserting the pins into the terminal block

Subsequently, each pin can be coded separately together with its counterpart in the terminal block. To do this, use a flat-head screwdriver to bring the pin now stuck in the terminal block into one of the four possible positions.

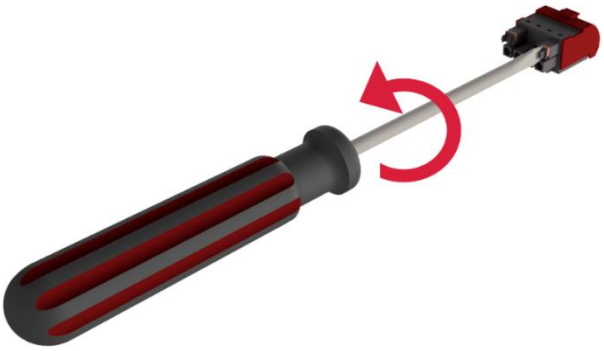


Figure 15 Coding of the pins in the terminal block

When the terminal block is reattached to the protection relay, the pins are automatically clicked back into place in the device. The coding of the terminal block is complete. It is recommended to code each terminal block as described above.

5.3.4 Clamps with common potential

The terminals FE, T2, T4, T6, E-, SC2 and S1 of the protection relay have a common potential. This common potential can be exploited, for example, by connecting two PTC sensors connected to temperature inputs 1 (T3, T4) and 2 (T5, T6).

With the standard connection, each PTC sensor has two wires. PTC sensor 1 is connected at temperature input 1 to terminals T3 and T4. PTC sensor 2 is connected at temperature input 2 to terminals T5 and T6.

However, if the common potential of the terminals is used, the two sensors share a common line. The individual line of PTC sensor 1 is connected to terminal T3 at temperature input 1 and the individual line of PTC sensor 2 is connected to terminal T5 at temperature input 2. The common line of both PTC sensors is connected to terminal T4, as T4 has a common potential with terminals FE, T2, T6, E-, SC2 and S1.

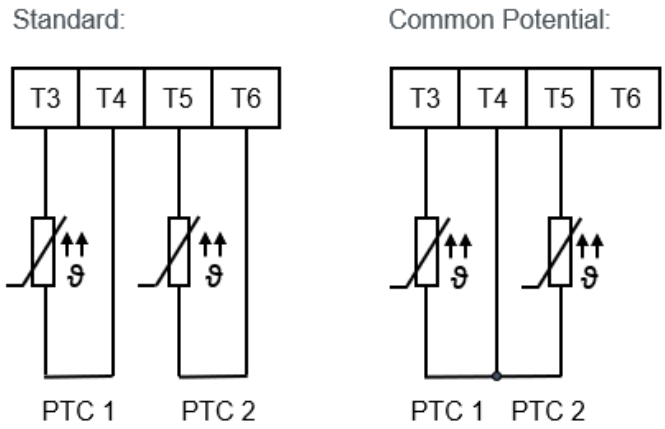


Figure 16 Standard Connection and Connection at Common Potential

5.3.5 Current monitoring (S1, S2)

The strands of the current transformer are connected to the current transformer input at the terminals S1 and S2. Polarity does not have to be taken into account.

The correct number of windings for the current transformer can be found in the table below. Ensure that there is a sufficient measuring range reserve of at least 20% for overcurrent detection. In addition, the parameterized alarm and warning thresholds must be within the measuring range.

Range rated current motor [A]	**Current transformer INT185 (02D187)** **Number of windings**
1.0-10.0	10
10.1-20.0	5
20.1-33.3	3
33.4-50.0	2
50.1-100.0	1

Example 1: Rated current motor = 16.0 A → 16.0 A + 20% = 19.2 A → Number of windings = 5

Example 2: Rated current motor = 19.5 A → 19.5 A + 20% = 23.4 A → Number of windings = 3

Range rated current motor [A]	**Current transformer INT185 (02D188)** **Number of windings**
12.5-25.0	10
25.1-50.0	5
50.1-83.3	3
83.4-125.0	2
125.1-250.0	1

Example 3: Rated current motor = 30.0 A → 30.0 A + 20% = 36.0 A → Number of windings = 5

Example 4: Rated current motor = 45.0 A → 45.0 A + 20% = 54.0 A → Number of windings = 3

The line of phase L1 of the motor must be passed through the opening of the current transformer by the number of determined windings. The direction of insertion does not have to be taken into account.

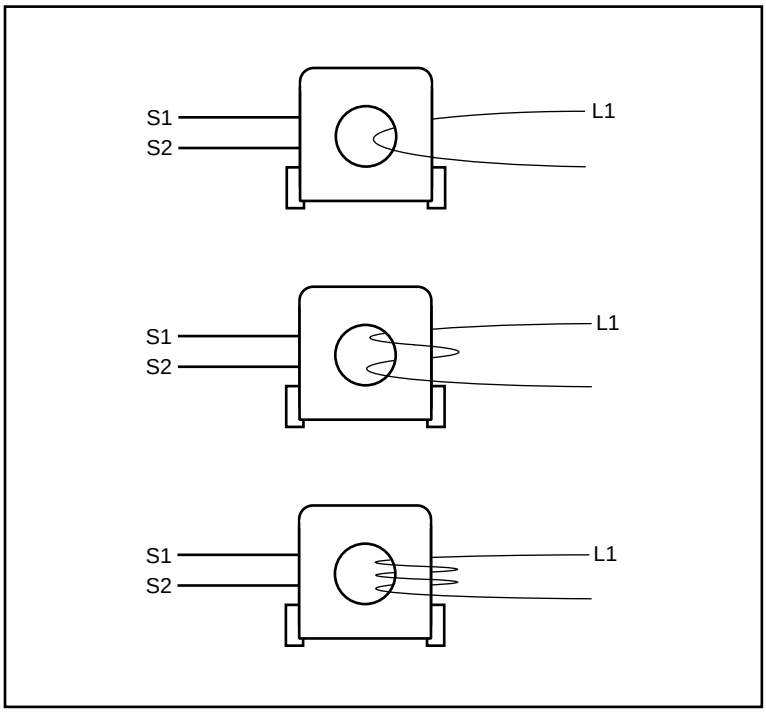


Figure 17 INT185 current transformer with 1, 2 and 3 windings

5.3.6 Modbus RTU (COM, D0, D1, COM)

The electrical connection to the INT69 PYF Diagnose is made via the screw terminals (COM, D0, D1, COM). The assignment of the terminals between the INT69 PYF Diagnose and the master can be found in the following table:

INT69 PYF Diagnose (terminals Modbus)	Master (terminals Modbus)
D0	RS485 B / Tx-
D1	RS485 A / Tx+
COM	GND

If there are several INT69 PYF Diagnose (slave participants) connected to a bus, it is possible to daisy-chain them via the screw terminals COM, D0, D1, COM. At the last device on the bus, the included terminating resistor (150 Ω) must be connected between D0 and D1.

Note: The COM connector on the terminal is duplicated and has the same potential. Both COM ports can be used.

The GND (COM) must be grounded centrally to a point. This is preferably done on the master system.

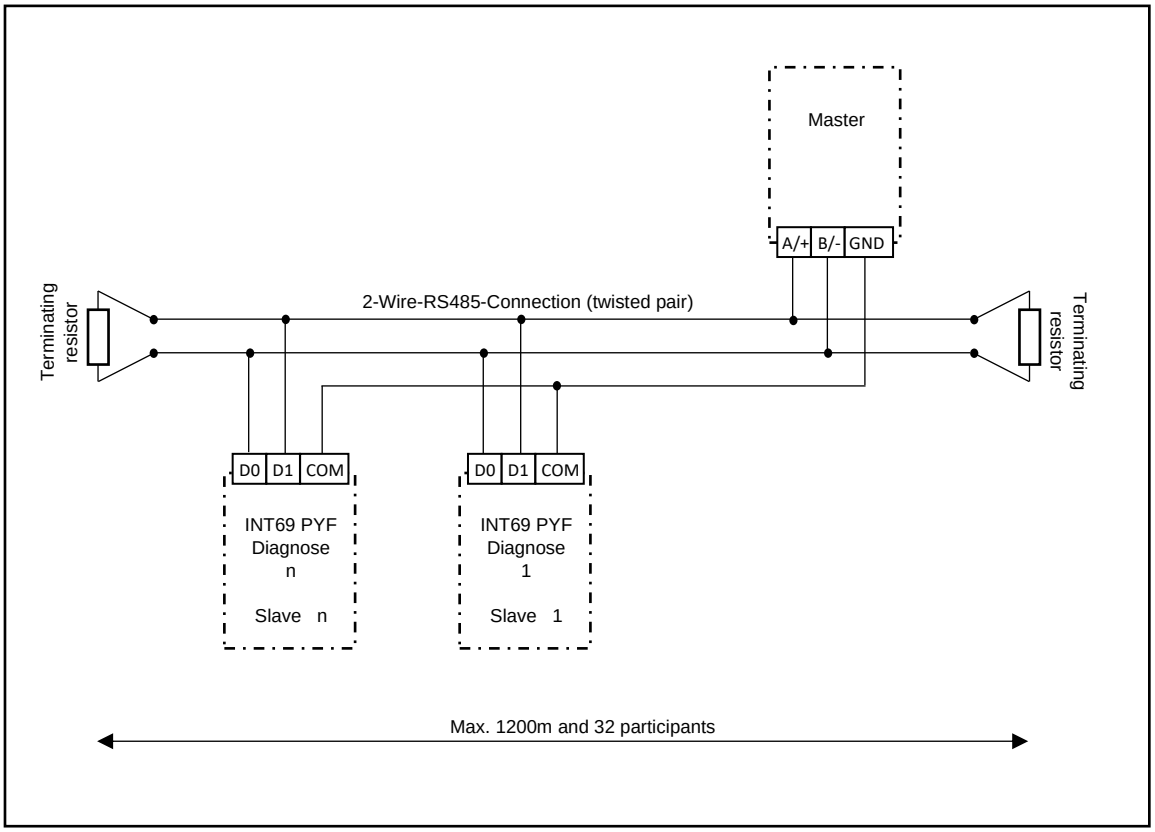


Figure 18 Bus system

Figure 19 Connection to Modbus terminals

The cable to be used for the RS485 Modbus RTU must be a shielded twisted pair (twisted in pairs). For example, a LiYCY (TP) 2x2x0.25 mm².

The number of devices and the length of an RS485 Modbus RTU is limited and depends on external influences (e.g. interference or cable diameter) and the configuration of the system (e.g. baud rate). We recommend no more than 32 participants and a maximum bus length of 1200 m. Expansion is possible through the use of repeaters.

Further information must be taken into account:

- the cable must be connected in a line from device to device in the bus, not in star configuration.
- Measurement and data cables must be laid separately from control cables and power cables.
- In general, care must be taken to ensure low-interference cabling (EMC).
- The protection relay must not to be installed near strong electric and magnetic fields.
- If there are several participants in the bus, the shield of the cable must be connected continuously (low impedance).
- The bus shield must be grounded centrally to a point.

6 Commissioning

6.1 Parameter

The parameters that can be set in the INT69 PYF Diagnose can be found in the parameter table. The parameter table of the INT69 PYF Diagnose is available for download on the product page under https://www.kriwan.com/en/products/protection-relay/multifunctional-relays-for-machines/int69-pyf-diagnose-premium and is not part of this manual.

6.2 KRIWAN INTspector App - General

The INTspector App developed by KRIWAN provides comprehensive insights into the INT69 PYF Diagnose and the plant in which it is used. The app can be used to analyze a wide range of data and measured values in detail and record them over longer periods of time. This allows processes to be presented transparently and documented effectively.

In addition, the app enables fast and efficient fault and condition diagnosis directly on site. For this purpose, an INT600 DU gateway (mat. no. 02 S 365 S21) or an INT600 DB Gateway (mat. no. 02 S 377 S021) is required, which is connected to the INT69 PYF Diagnose. All relevant operating data, which is recorded and stored by the protection relay, is then accessible. This data can be accessed via the KRIWAN INTspector App on a tablet, smartphone or laptop. The app visualises the operating data and supports maintenance and service work. It is also used for commissioning and parameterization of the INT69 PYF Diagnose.

6.3 Connecting to the KRIWAN INTspector App

Connect the INT69 PYF Diagnose to the INT600 DU Gateway (mat. no. 02 S 365 S21) or INT600 DB Gateway (mat. no. 02 S 377 S021). Then connect the INT600 DU Gateway or INT600 DB Gateway to your smartphone, tablet or laptop.

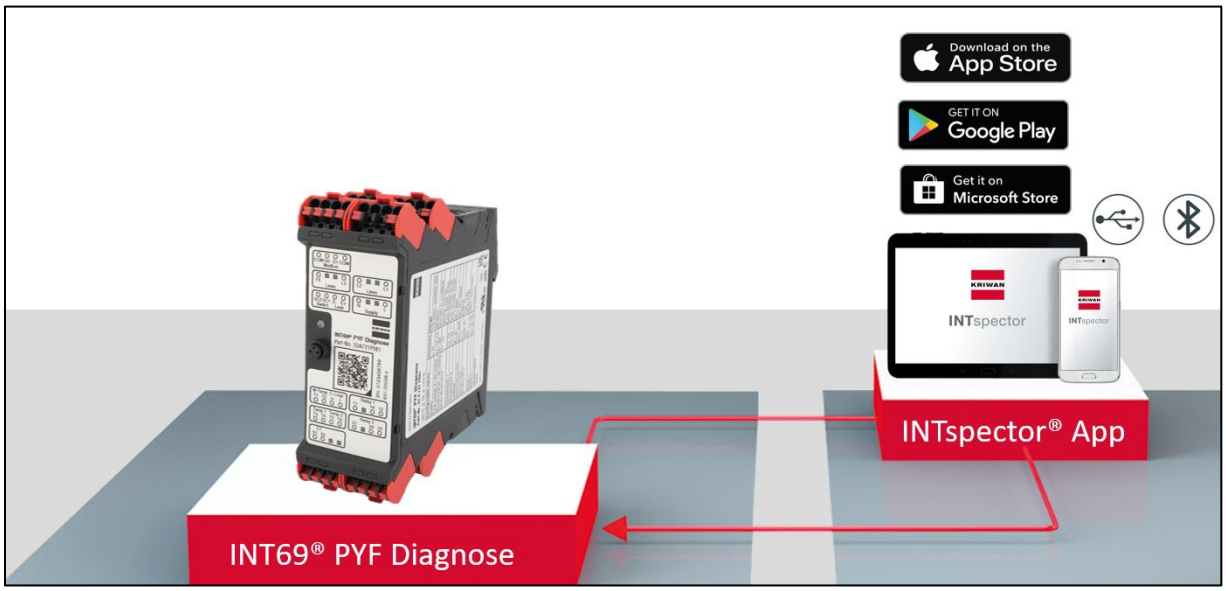


Figure 20 Connecting the KRIWAN Protection Relay to the INTspector App

Download the KRIWAN INTspector App from the respective app store.

Android iOS Windows

NOTICE

The INT600 DU Gateway is only compatible with Windows and Android operating systems. The INT600 DB Gateway is compatible with all operating systems. For devices with iOS software, the INT600 DB Gateway must be used.

Then start the KRIWAN INTspector App. "USB" is selected when an INT600 DU Gateway is connected to the INT69 PYF Diagnose. If an INT600 DB Gateway is connected instead, select Bluetooth. Then you get to the main menu, which consists of diagnosis, parameterization and device information.

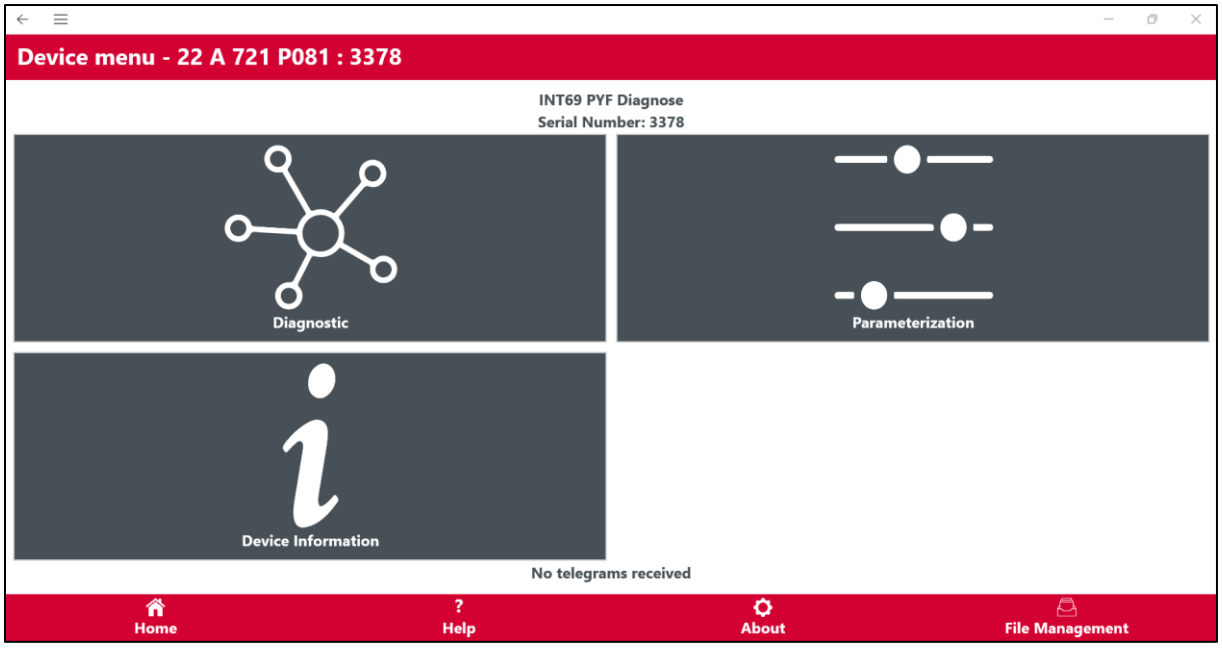


Figure 21 Main menu

6.4 Parameterization with the KRIWAN INTspector App

6.4.1 Changing parameters

Select "Parameterization" in the main menu to parameterize the INT69 PYF Diagnose.

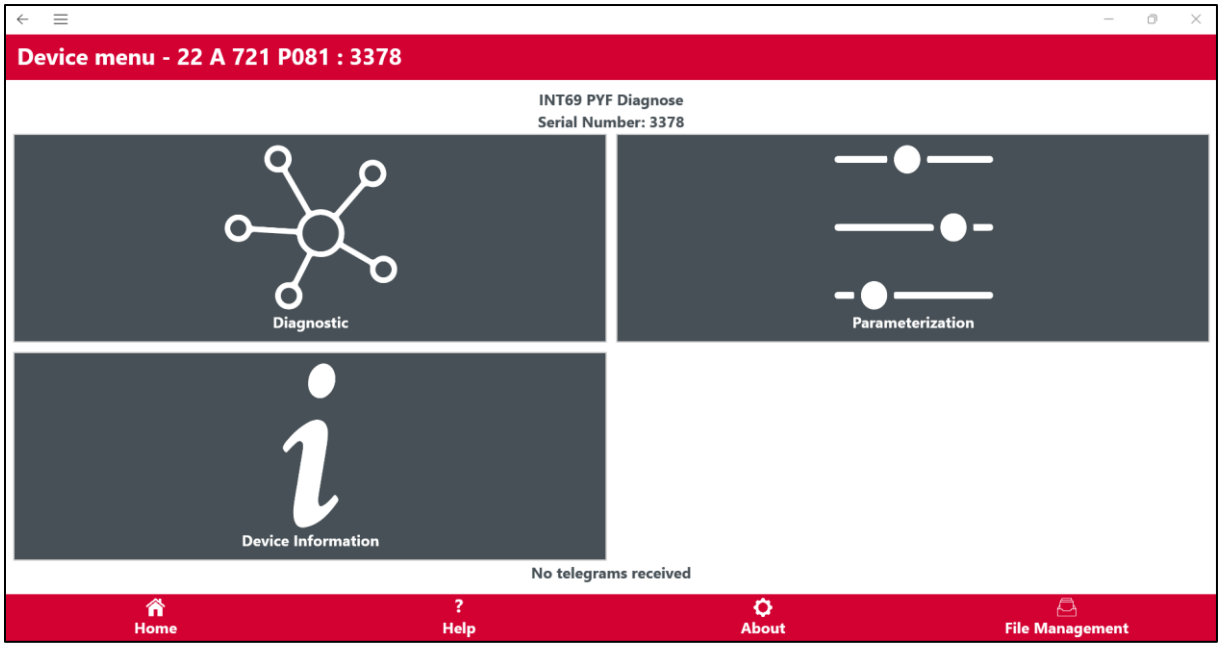


Figure 22 Main menu

To parameterize the INT69 PYF Diagnose, select "Change parameter data".

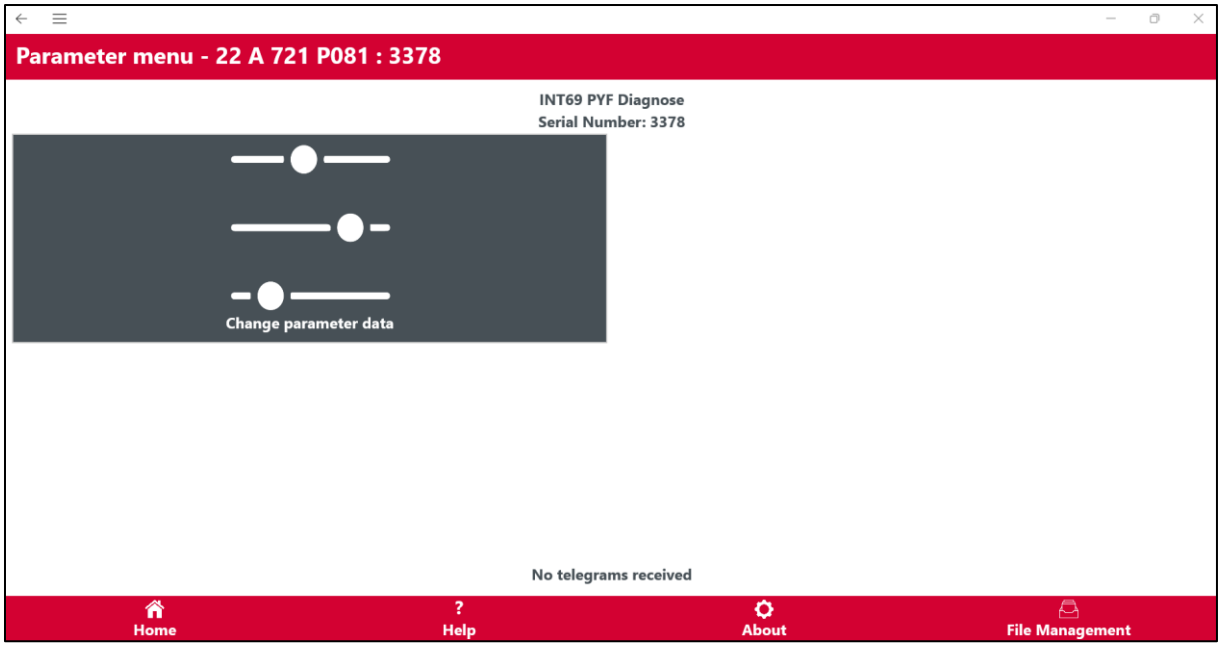


Figure 23 Changing parameter data

A notification then appears that the relay will be switched off as long as the parameterization is being performed.

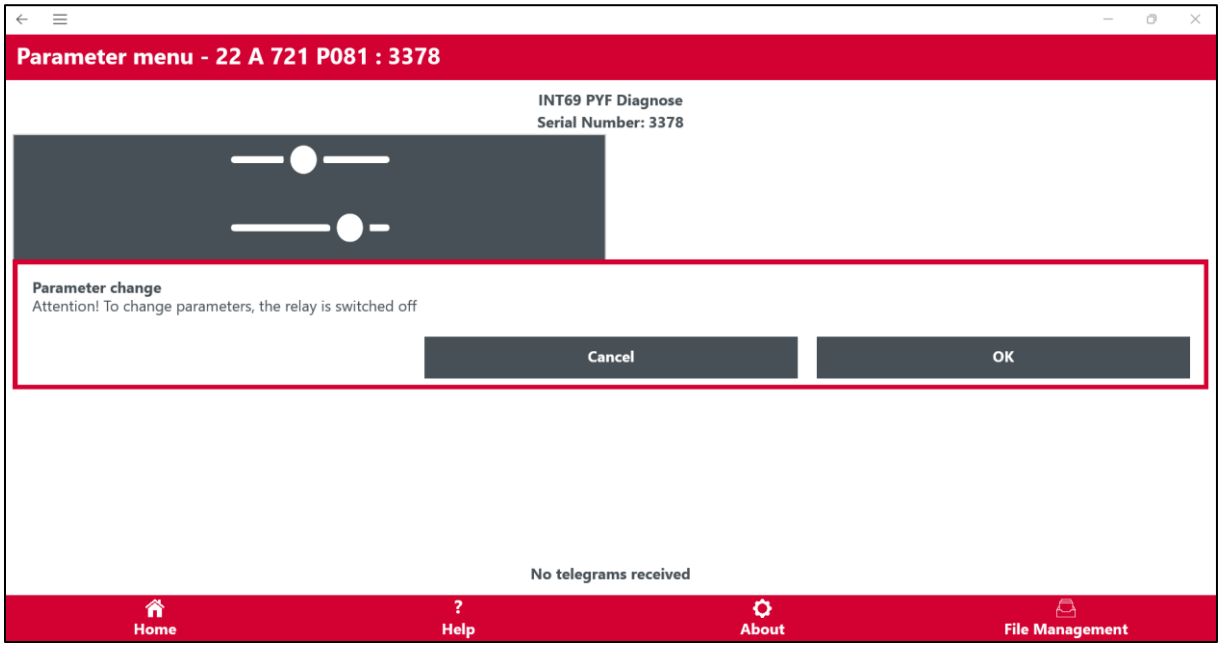


Figure 24 Notification parameter change

After confirming the notification, an overview shows all functions for which parameters can be set. When selecting a function (e.g. "Temperature 1"), all adjustable parameters are displayed.

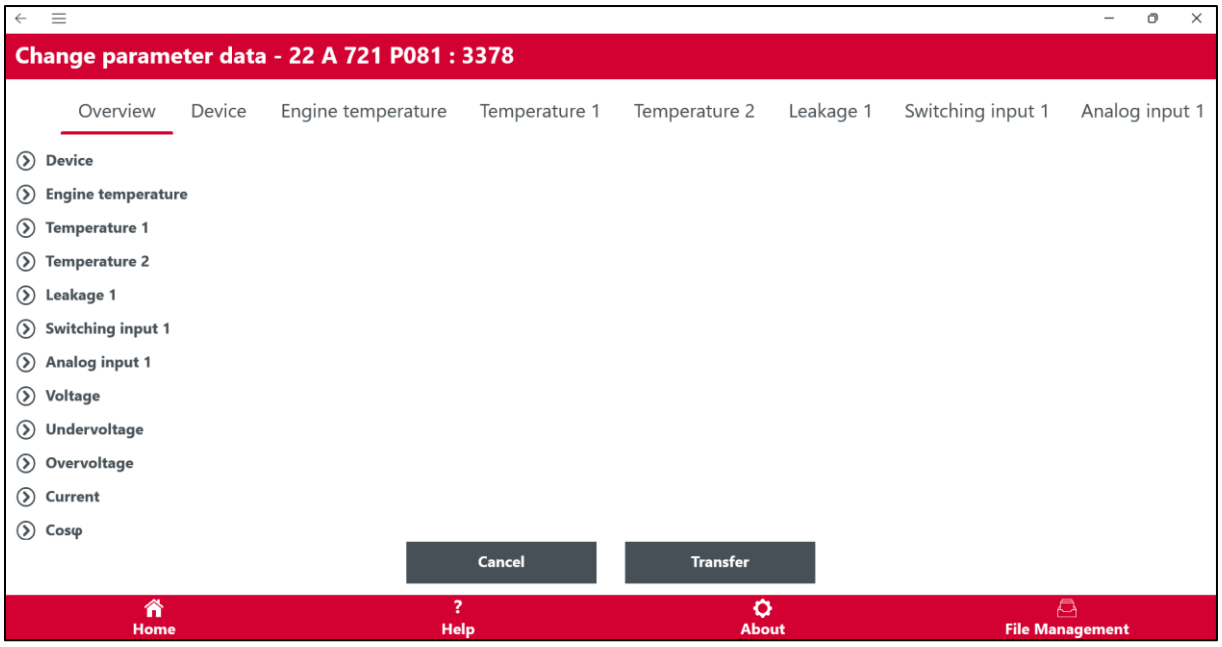


Figure 25 Changing parameter data: overview

The parameters of the respective function are controlled either via a drop-down menu (e.g. for the sensor type) or by entering the desired value directly in the corresponding field (e.g. for the trip point temperature). After adjusting the parameters, the changes are applied to the INT69 PYF Diagnose via the "Transfer" button.

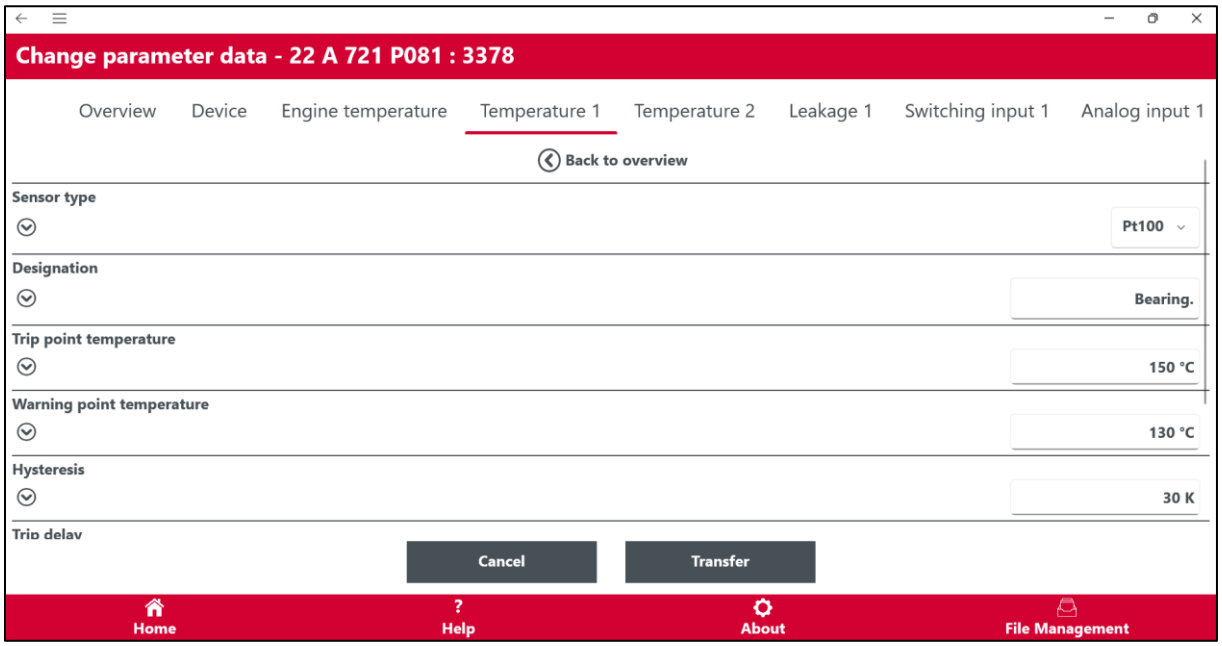


Figure 26 Changing parameter data: temperature 1

All changed parameters are listed one after another. Then confirm the changes with "Ok". To apply the changes to the INT69 PYF Diagnose, a reset must be performed according to chap. 4.6.15.

Figure 27 Sending parameters

NOTICE The parameter table with all setting options and default values is available for download under https://www.kriwan.com/en/products/protection-relay/multifunctional-relays-for-machines/int69-pyf-diagnose-premium.

NOTICE Parameterization is only possible if the supply voltage is applied.

6.4.2 Saving parameter file

The parameterization can be saved as a kpd file in order to upload the parameterization to another INT69 PYF Diagnose (see chap. 6.4.3). To save the kpd file, open the "File Management".

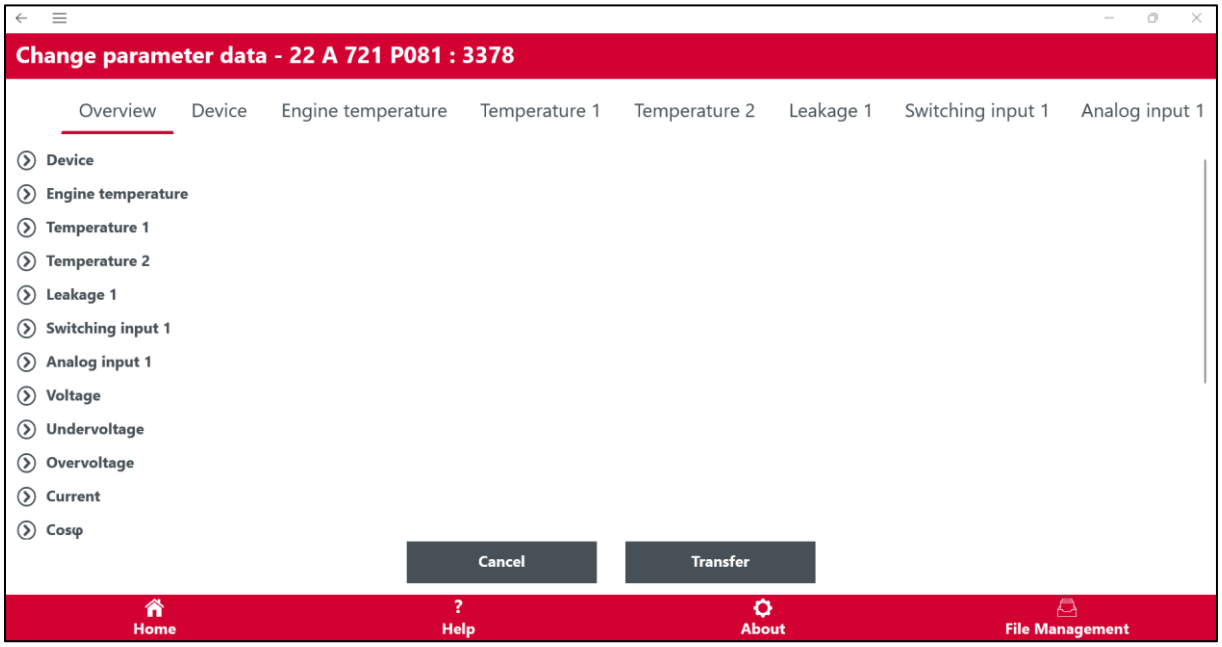


Figure 28 Changing parameter data: overview

Then select "Save".

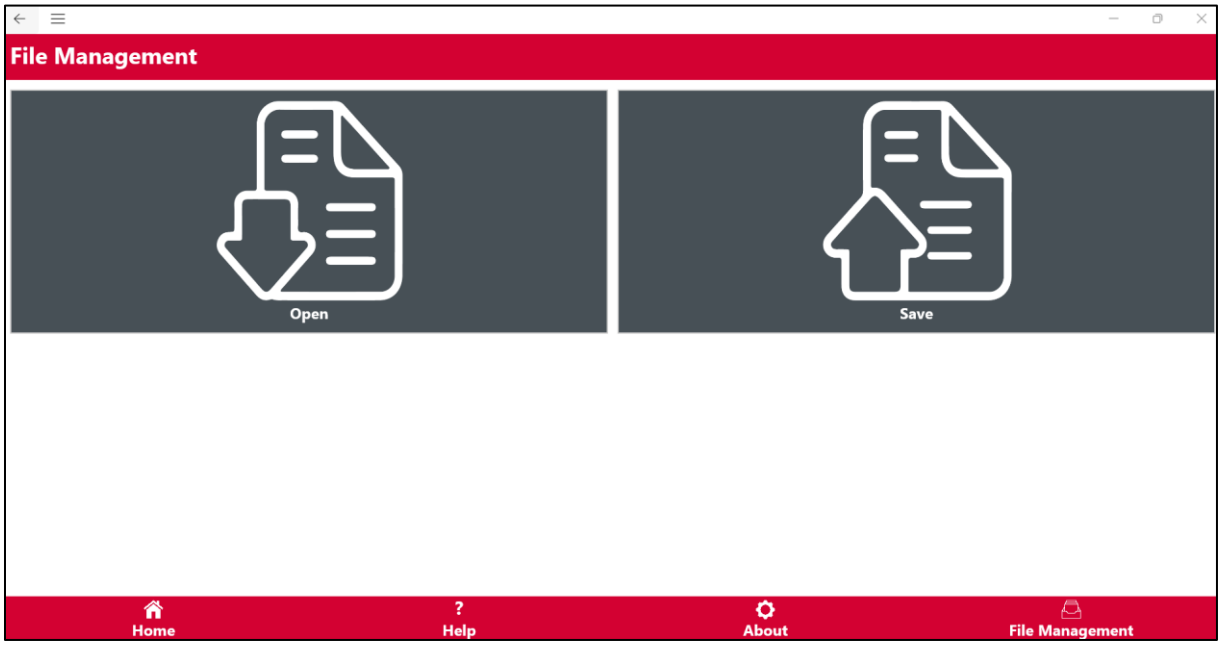


Figure 29 File Management

Next, select “Parameter file (KPD file)” and then select "Save".

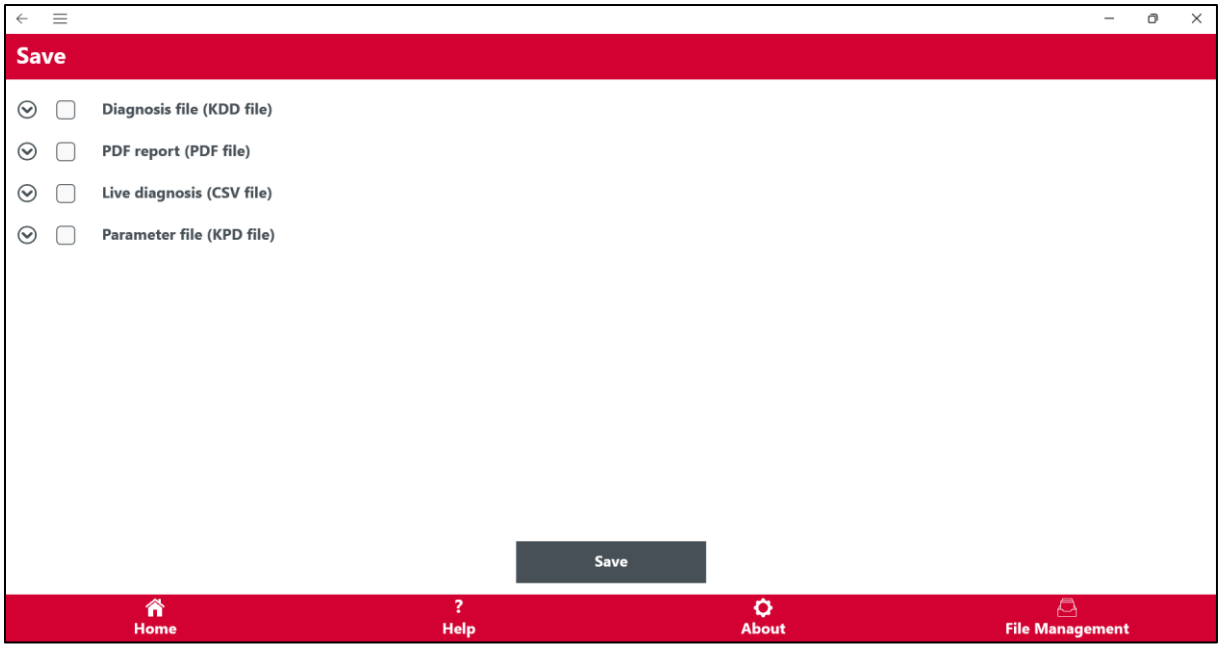


Figure 30 Saving parameter file

Now specify where the parameter file should be saved and then select "Save".

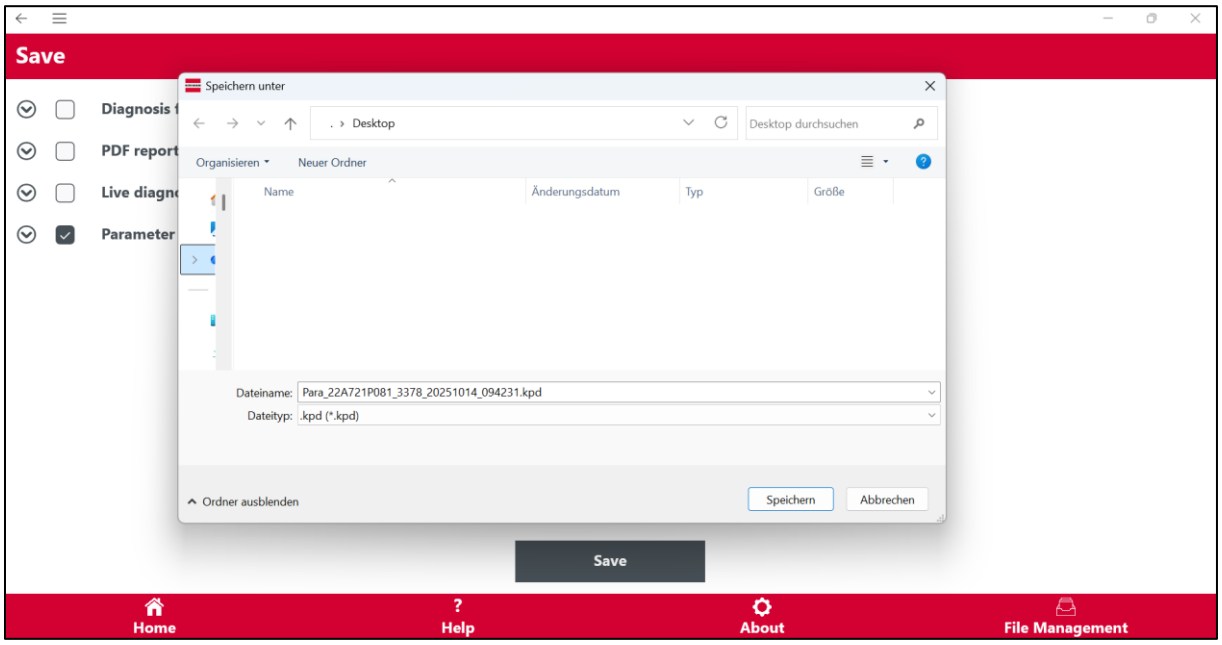


Figure 31 Saving parameter file: location

6.4.3 Opening parameter file

To upload a parameterization to an INT69 PYF Diagnose, open the "File Management".

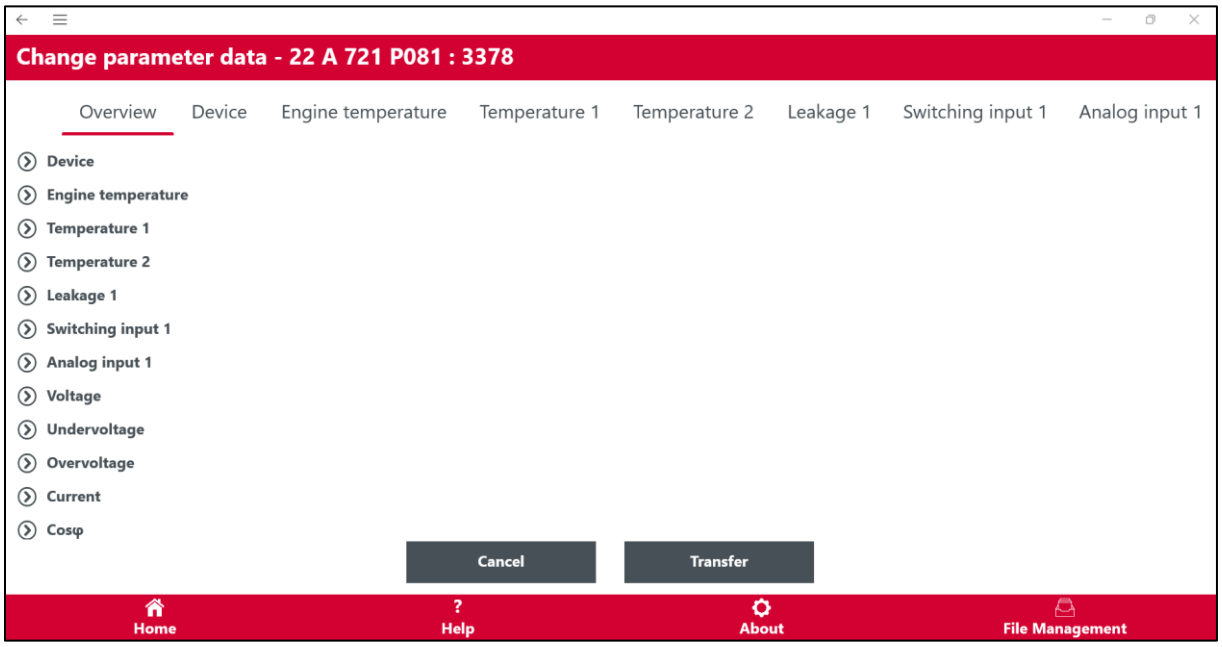


Figure 32 Changing parameter data: overview

Then select "Open".

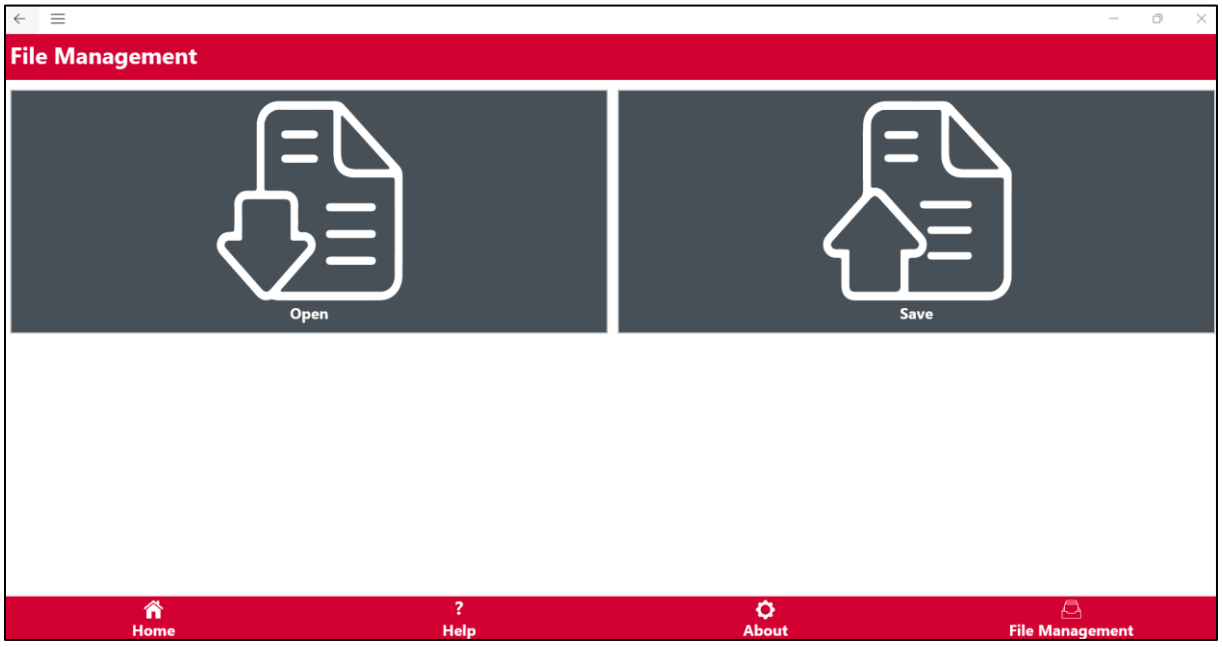


Figure 33 File Management

Next to “Parameter file (KPD file)”, select “Open".

Figure 34 Opening parameter file: file selection

Open the "File Explorer".

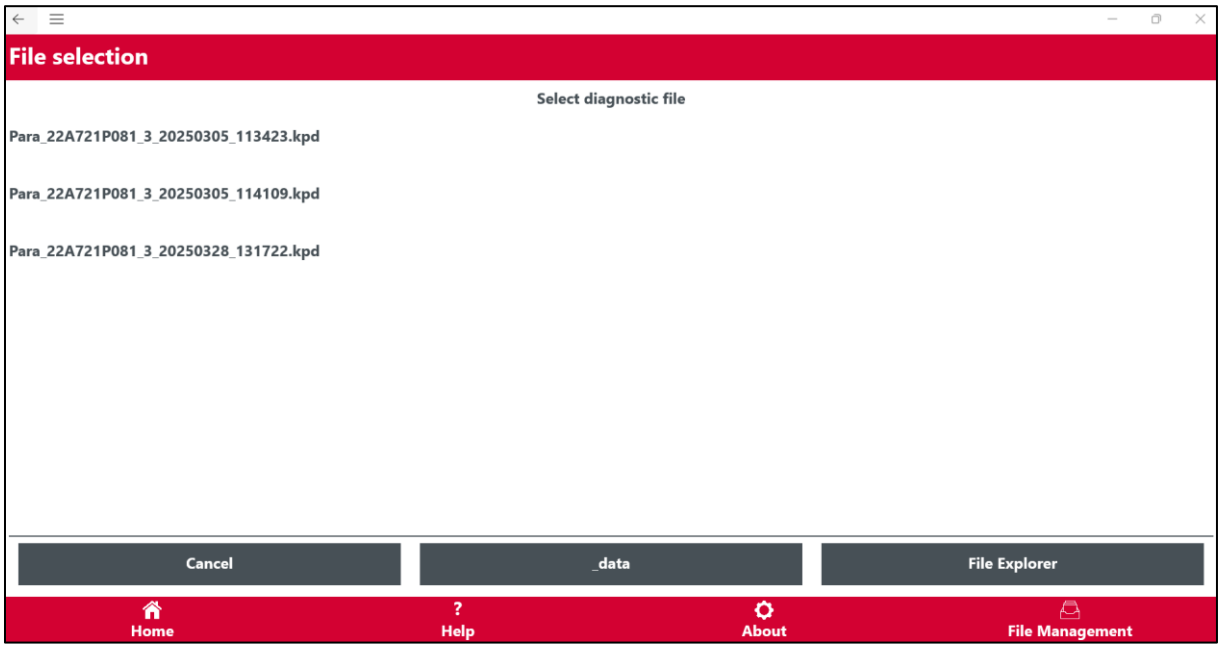


Figure 35 Opening parameter file: File Explorer

Specify the save location of the parameter file and open the parameter file.

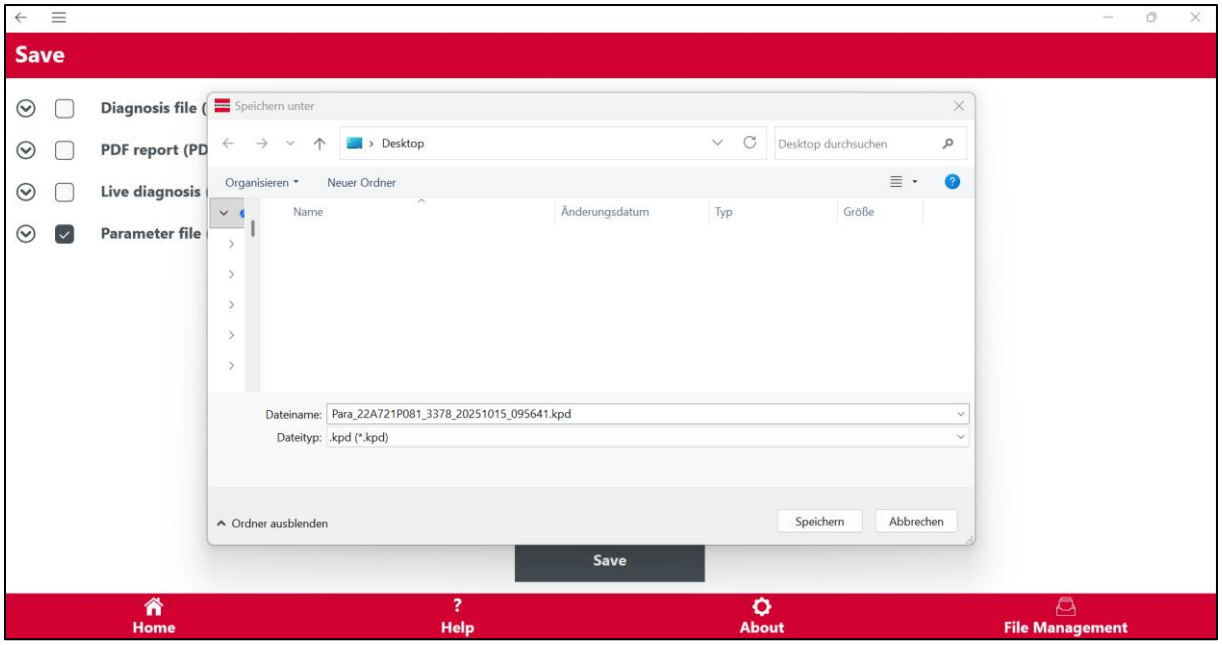


Figure 36 Opening parameter file: save location

After opening the parameter file, the parameterization must be uploaded to the INT69 PYF Diagnose. To do this, select "Transfer".

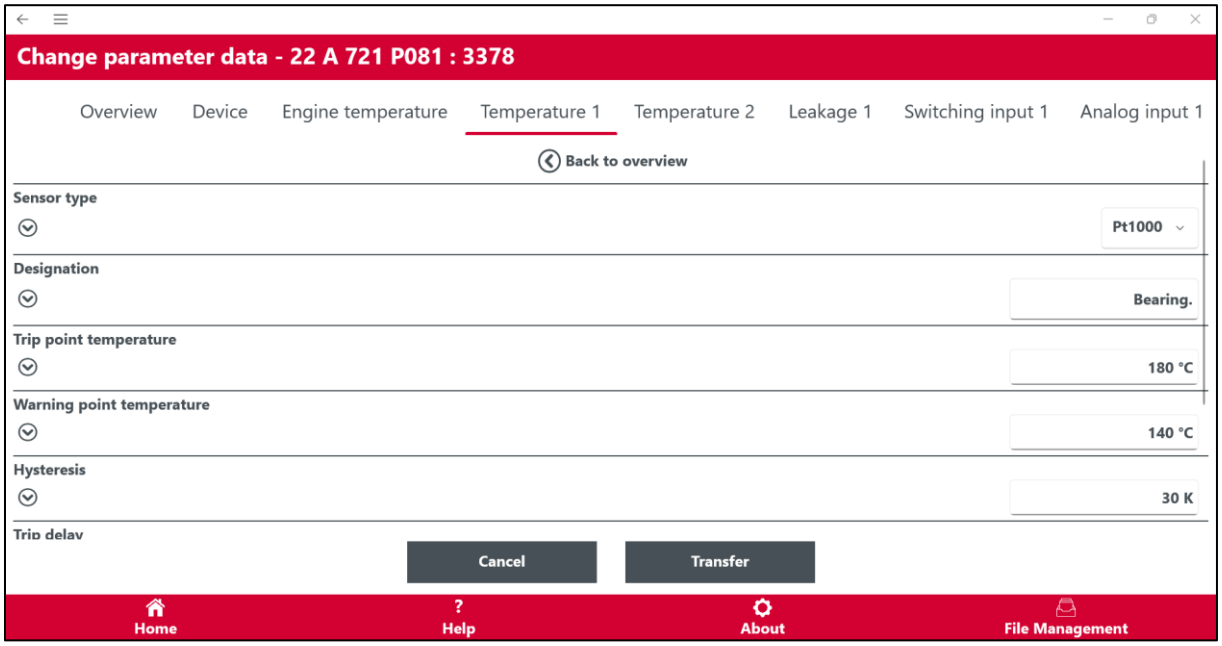


Figure 37 Changing parameter data

All changed parameters are listed one after another. Confirm the changes with "Ok". To apply the changes to the INT69 PYF Diagnose, a reset must be performed according to chap. 4.6.15.

Figure 38 Sending parameters

6.5 Modbus

The data collected by the INT69 PYF Diagnose can be output via an RS485 interface. The corresponding Modbus protocol is available as a separate document on the KRIWAN website under https://www.kriwan.com/en/products/protection-relay/multifunctional-relays-for-machines/int69-pyf-diagnose-premium. The INT69 PYF Diagnose functions as a slave device. If it is the last device on the bus, the supplied terminating resistor must be connected between the connection terminals D0 and D1.

The Modbus address, baud rate, stop bits, parity and Modbus password can be set via the INTspector App. To do this, select "Modbus" in the "Change Parameter Data: Overview" (see fig. 25 in chap. 6.4.1) and perform the parameterization.

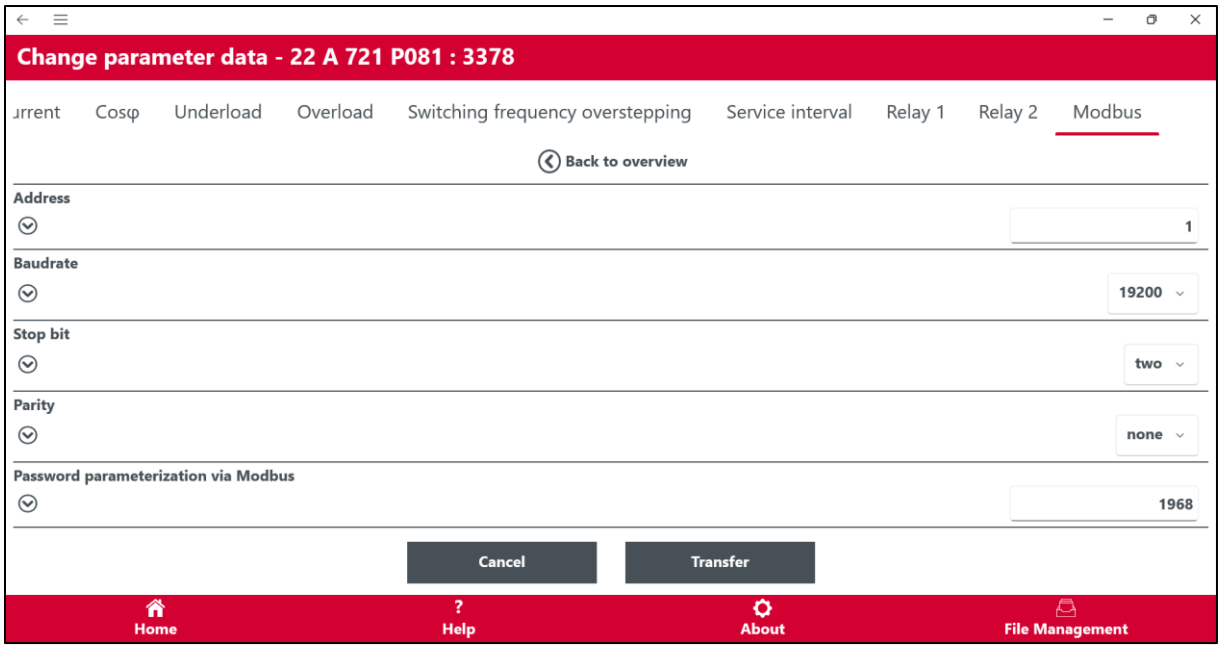


Figure 39 Changing parameter data: Modbus

7 Operation

7.1 Diagnostic with the KRIWAN INTspector App

Diagnostic can be accessed from the main menu.

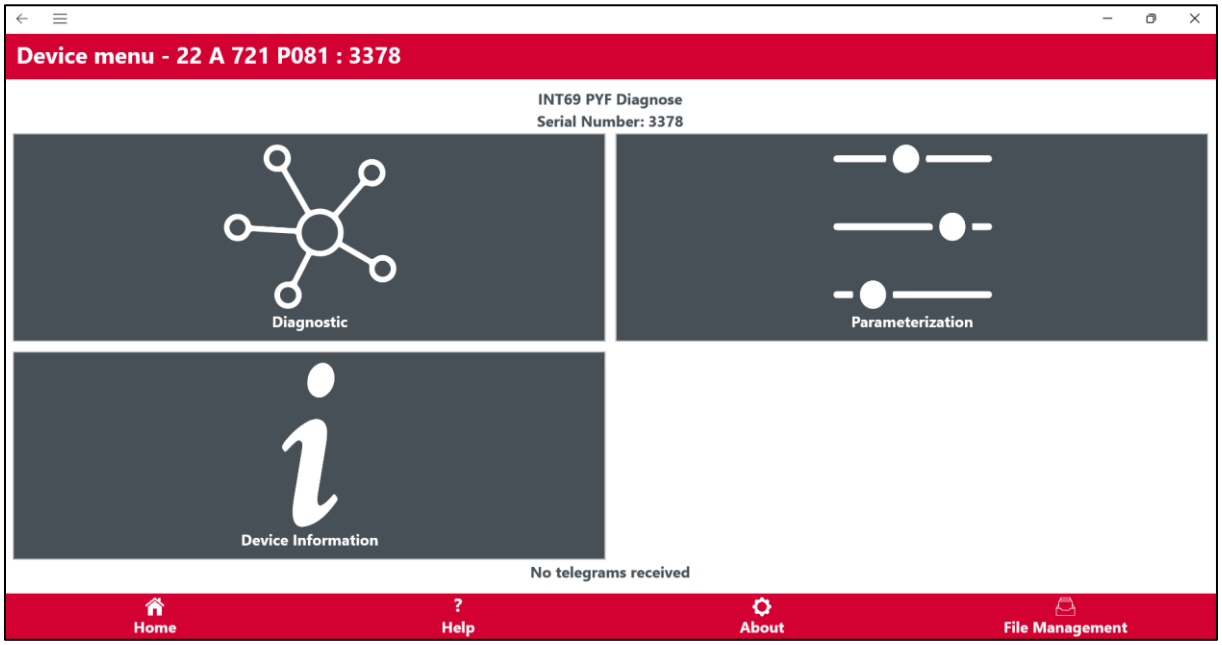


Figure 40 Main menu

The diagnostic enables the data collected by the INT69 PYF Diagnose to be output via the DP interface, enabling analysis of the machine behavior and quicker response to faults.

This data can be displayed on a smartphone, tablet, laptop, etc. via the KRIWAN INTspector App and an INT600 DU Gateway or an INT600 DB Gateway (see chap. 6.3). This allows access to operating data, the event list and the assessment of the current machine status.

The diagnostic includes the diagnostic data, the PDF report and the flash code.

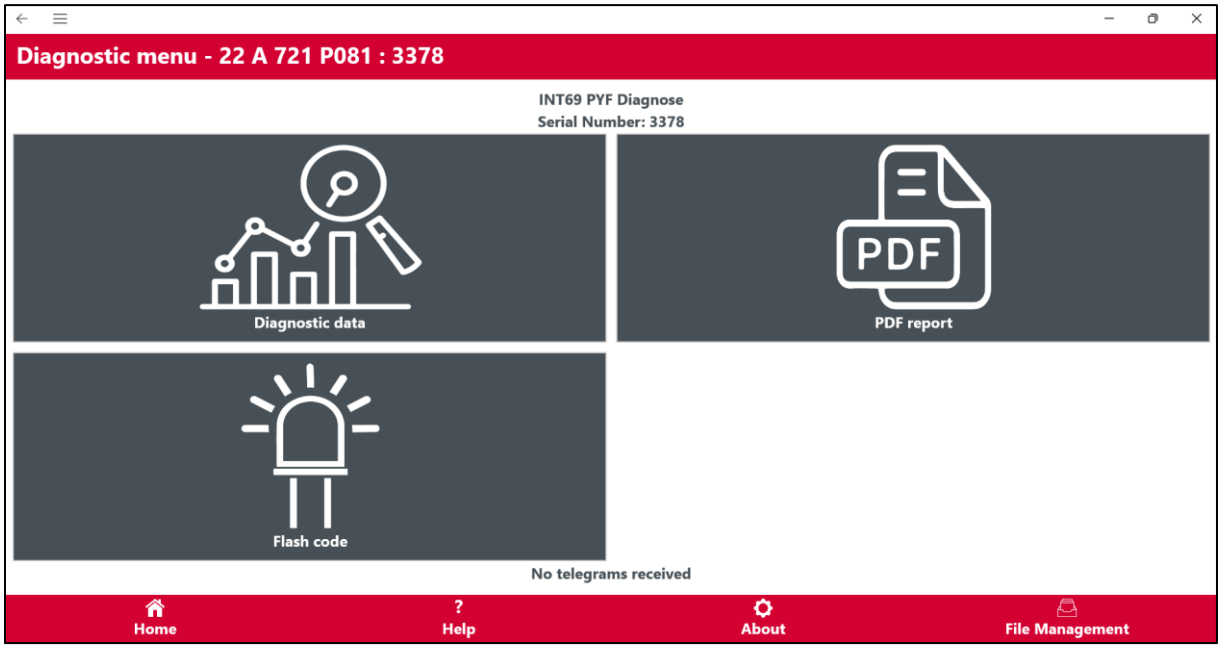


Figure 41 Diagnostic

7.1.1 Diagnostic data

After opening the diagnostic data, an overview displays all functions for which data is collected by the INT69 PYF Diagnose. When you select a function (e.g. "Temperature"), the associated data is displayed.

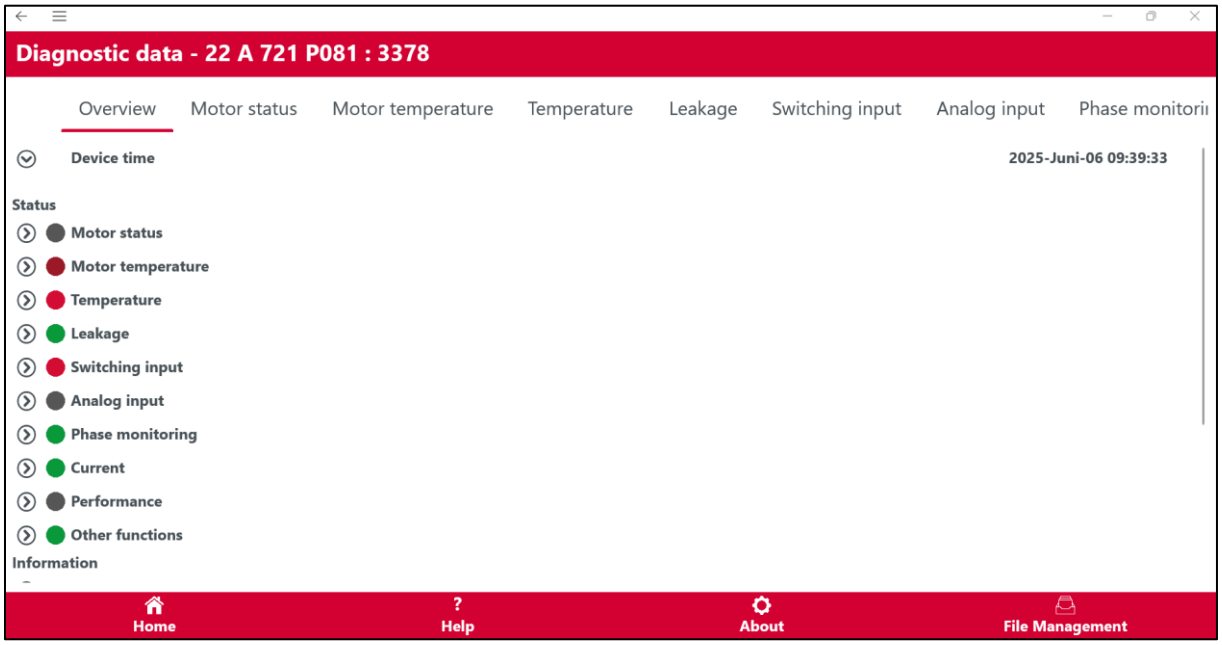


Figure 42 Diagnostic data overview

7.1.1.1 Monitoring functions

For most functions, the "Status" of the function is displayed first. When operating correctly, the LED next to the function is green. If warnings are pending, the LED is orange. In the event of a fault, the LED is red. If there is a locked switch-off, the LED is dark red. If a function is not active, the LED is gray.

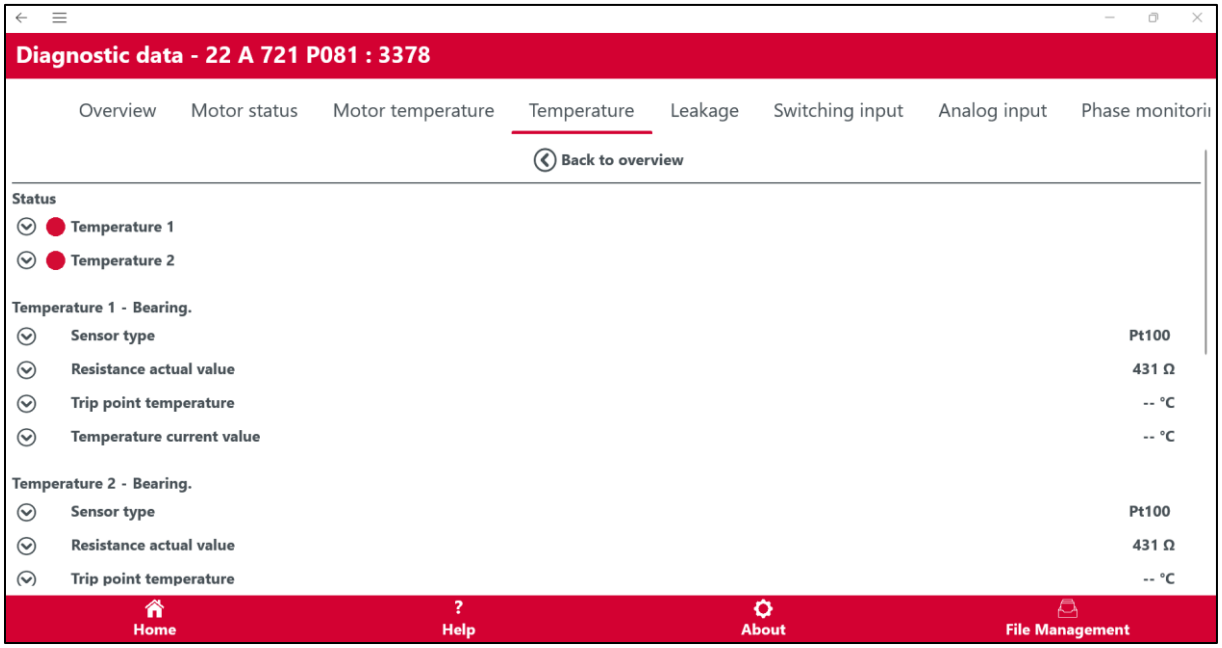


Figure 43 Diagnostic data temperature

Below the status of the function, the most important data of the function is displayed. For temperature, for example, these include the parameterized "Sensor type", the measured "Resistance actual value", the parameterized "Trip point temperature" and the measured "Temperature current value".

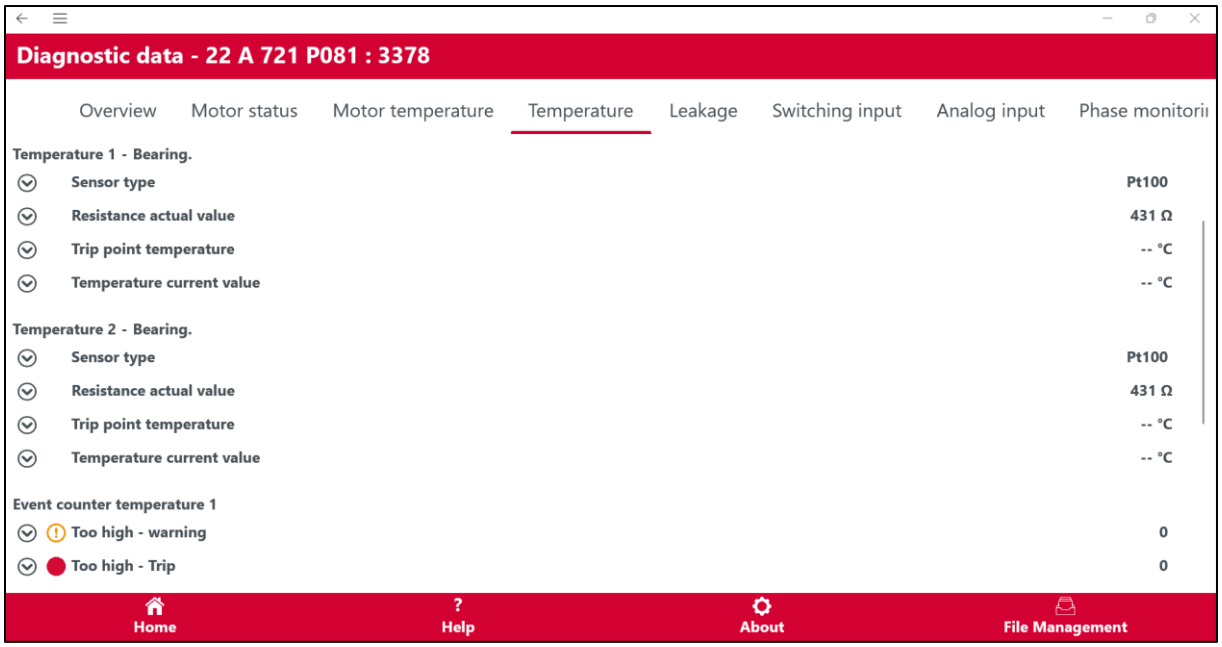


Figure 44 Diagnostic data temperature

Next, the event counter for the function is displayed, showing the number of warnings, switch-offs, locked switch-offs, short circuits and interruptions.

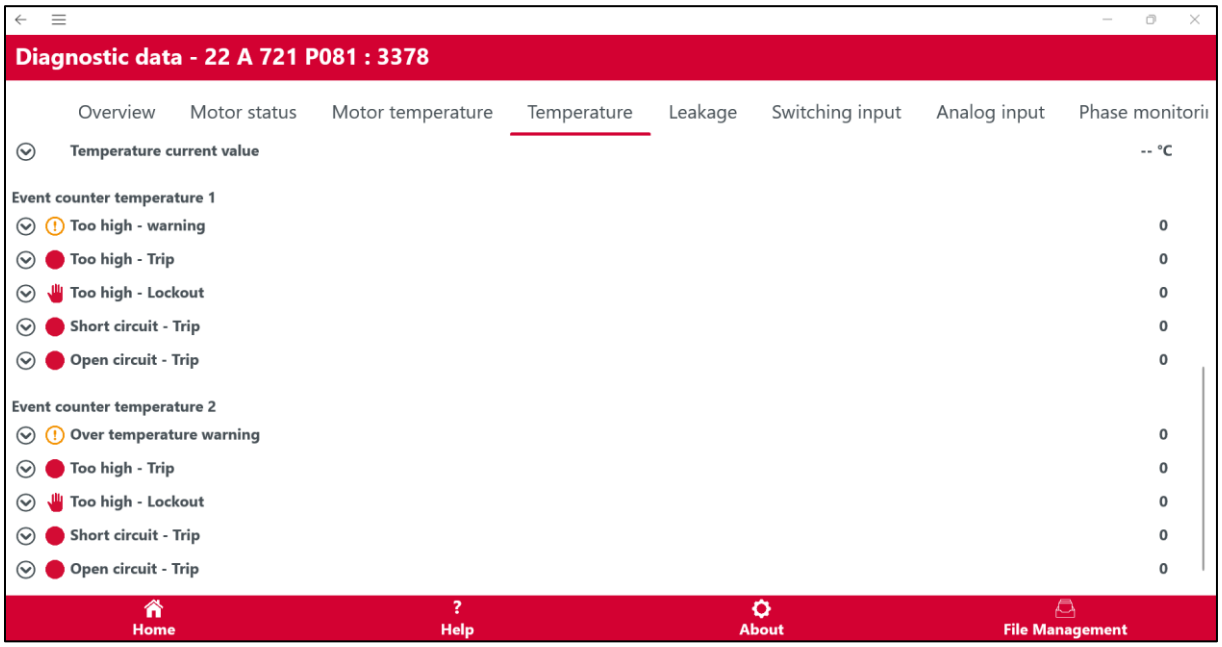


Figure 45 Diagnostic data temperature

7.1.1.2 Event list

The event list can be accessed via the overview of the diagnostic data. In the event list, all detected events such as warnings, faults or messages are stored non-volatilely in an internal memory. The event list contains the last 100 events with time and date, the 10 most recent faults are also recorded with extended data for all sensor inputs.

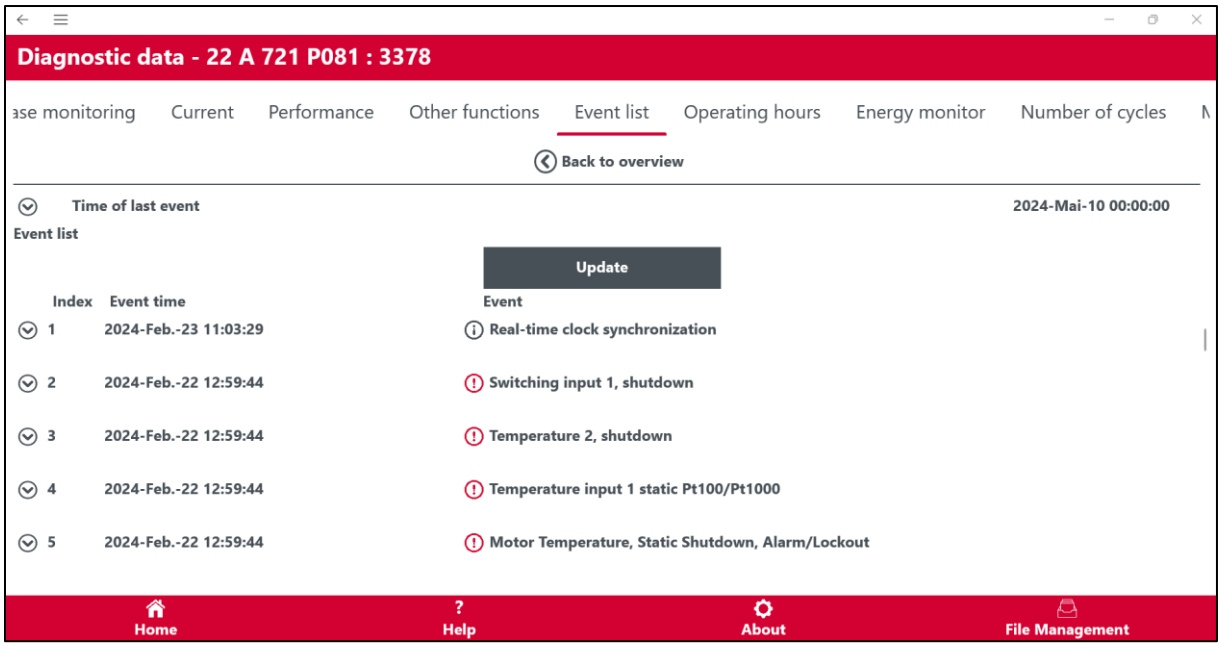


Figure 46 Diagnostic data event list

7.1.1.3 Live Diagnostics

The "Live Diagnostics" can be accessed via the overview of the diagnostic data. It allows the current measurement data of the functions to be displayed in a live diagram, e.g. for the temperature. To do this, the checkbox next to the function must be selected. The display interval is set using the slider. To display the measurement data in the live diagram, press "Start" afterwards.

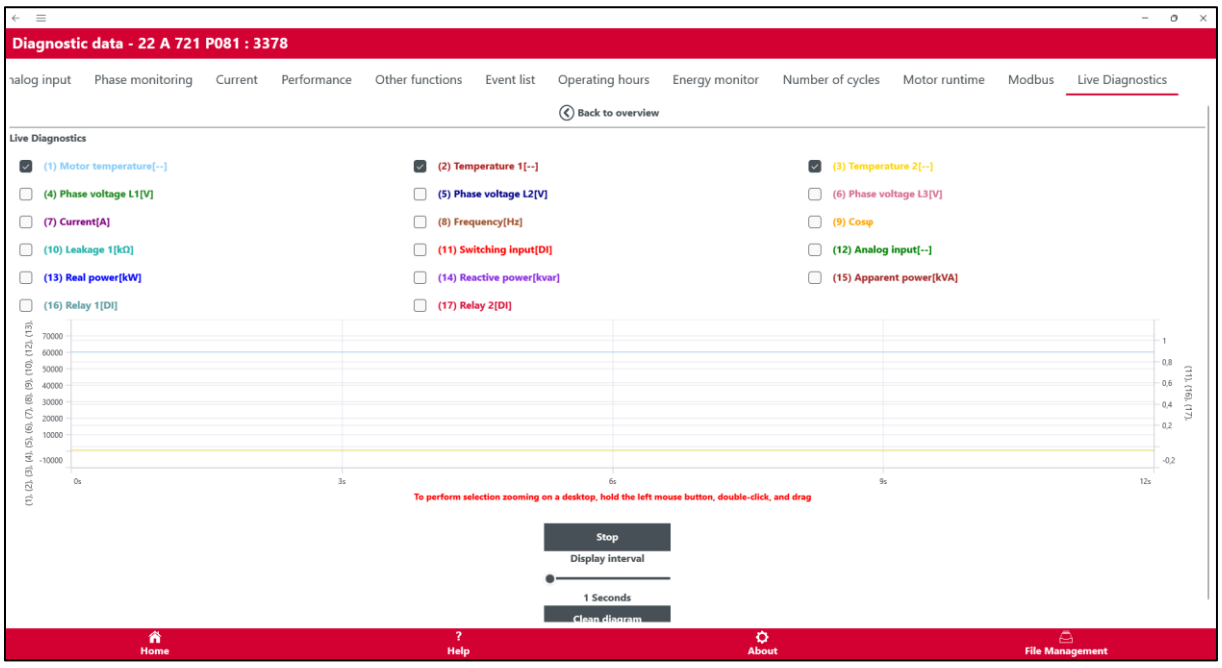


Figure 47 Diagnostic data live diagnostics

The sensor data collected in the live diagnostics can be saved as a csv file. To save the live diagnostic data to a location of your choice, open the file management.

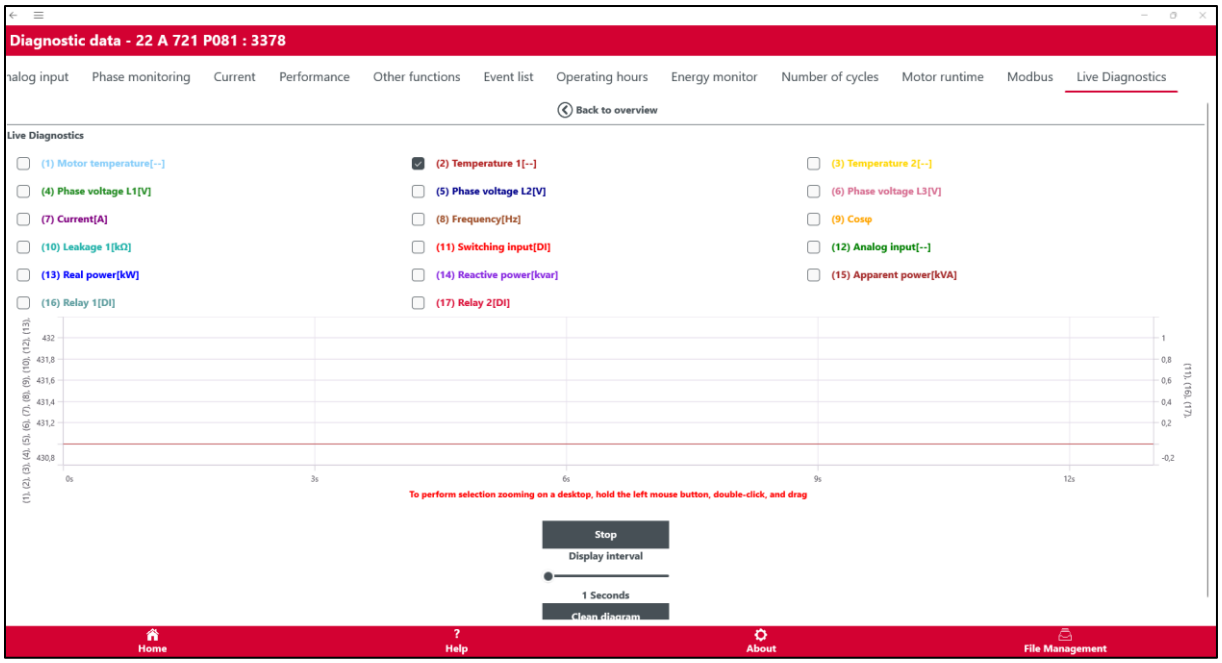


Figure 48 Diagnostic data file management

Then select "Save".

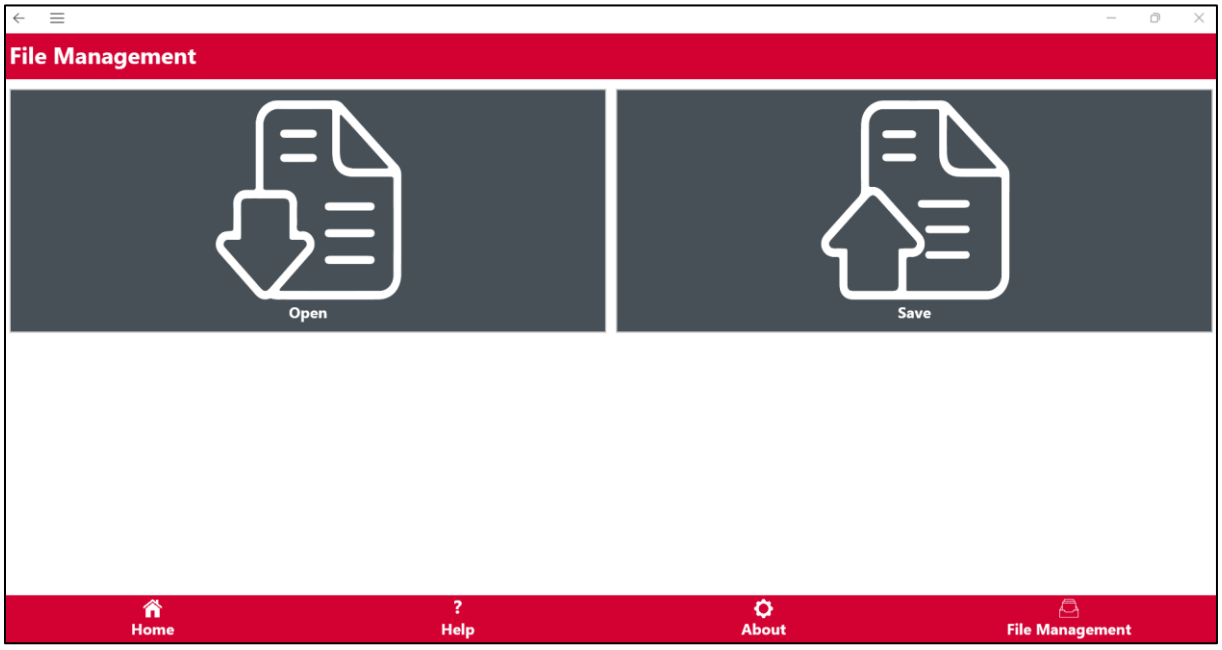


Figure 49 Diagnostic data file management: save

Select “Live diagnosis (csv-file)” and then select "Save".

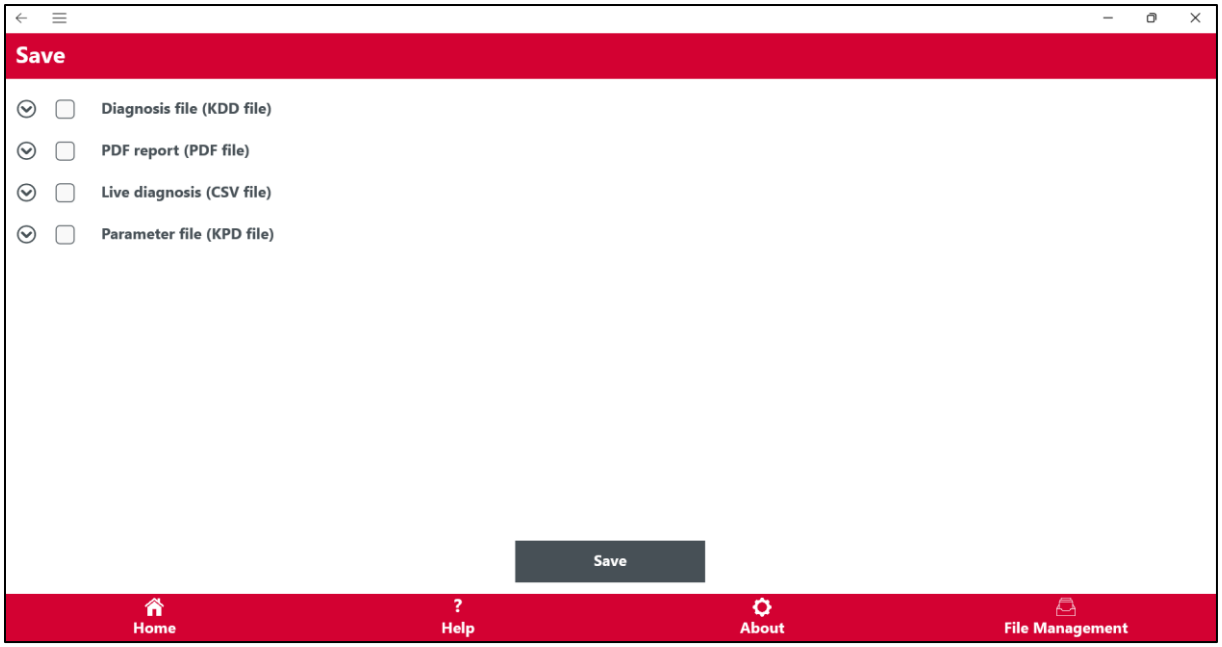


Figure 50 Diagnostic data file management: save

Save the live diagnostic data to a location of your choice.

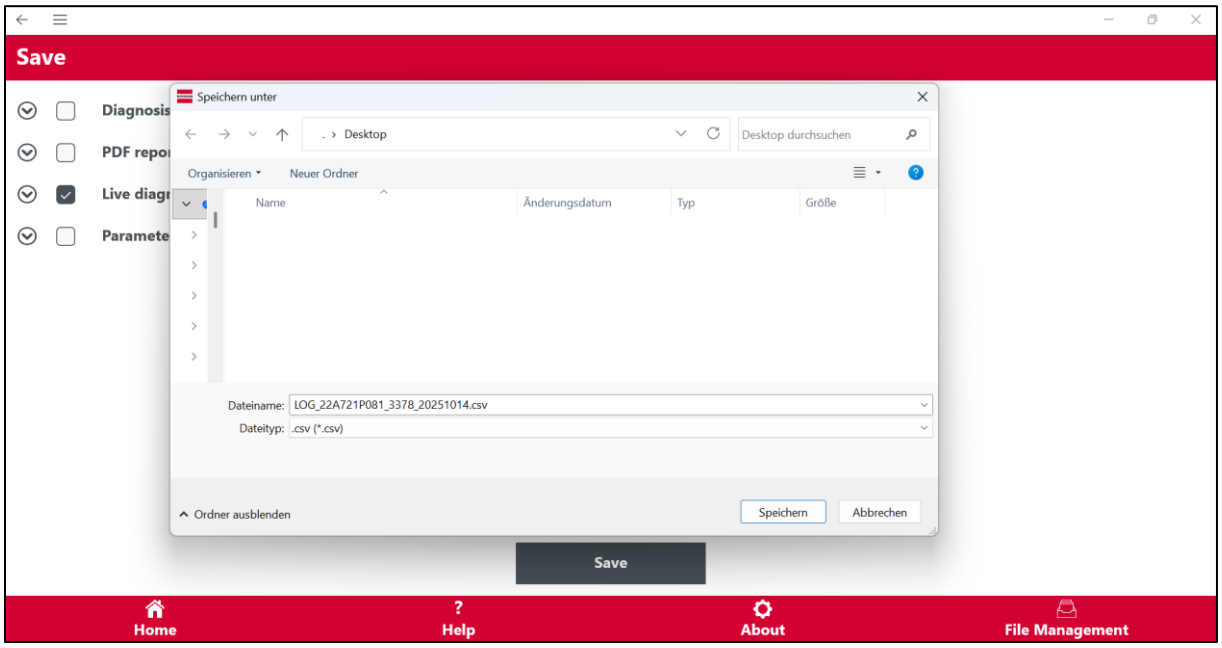


Figure 51 Diagnostic data file management: save

7.1.1.4 Saving diagnostic data

The diagnostic data can be saved in a kdd file. To do this, open the file management in the diagnostic data.

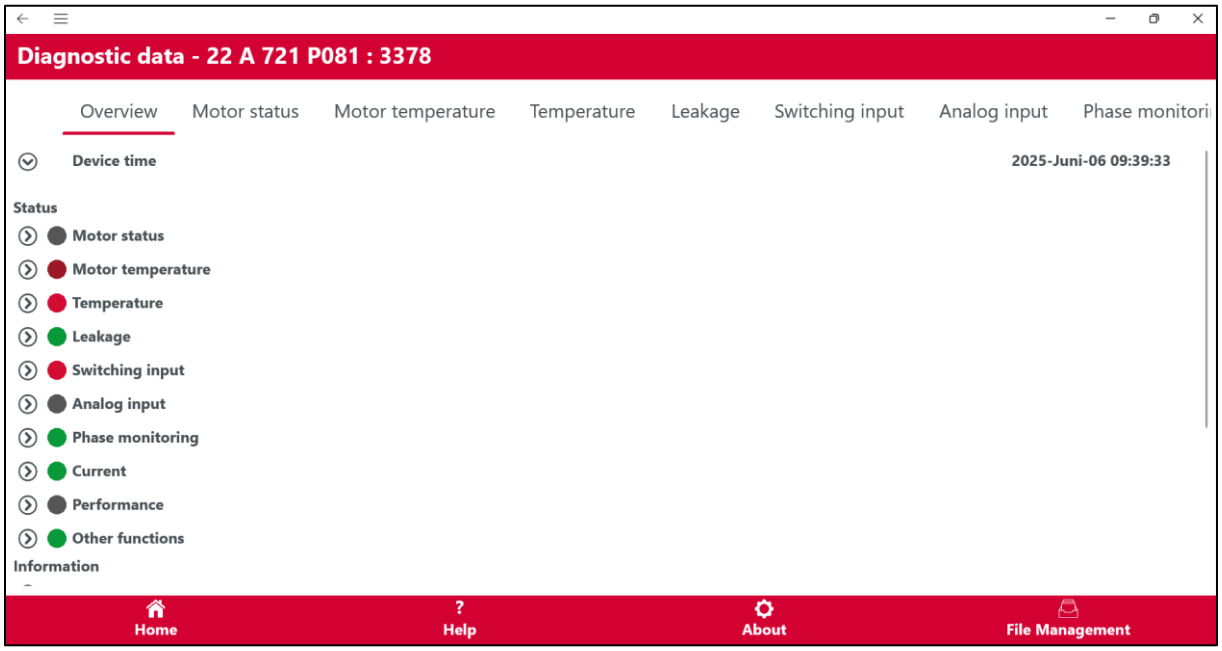


Figure 52 Diagnostic data overview

Then select "Save".

Figure 53 Diagnostic data file management: save

Select "Diagnosis file (KDD file)" and then select "Save".

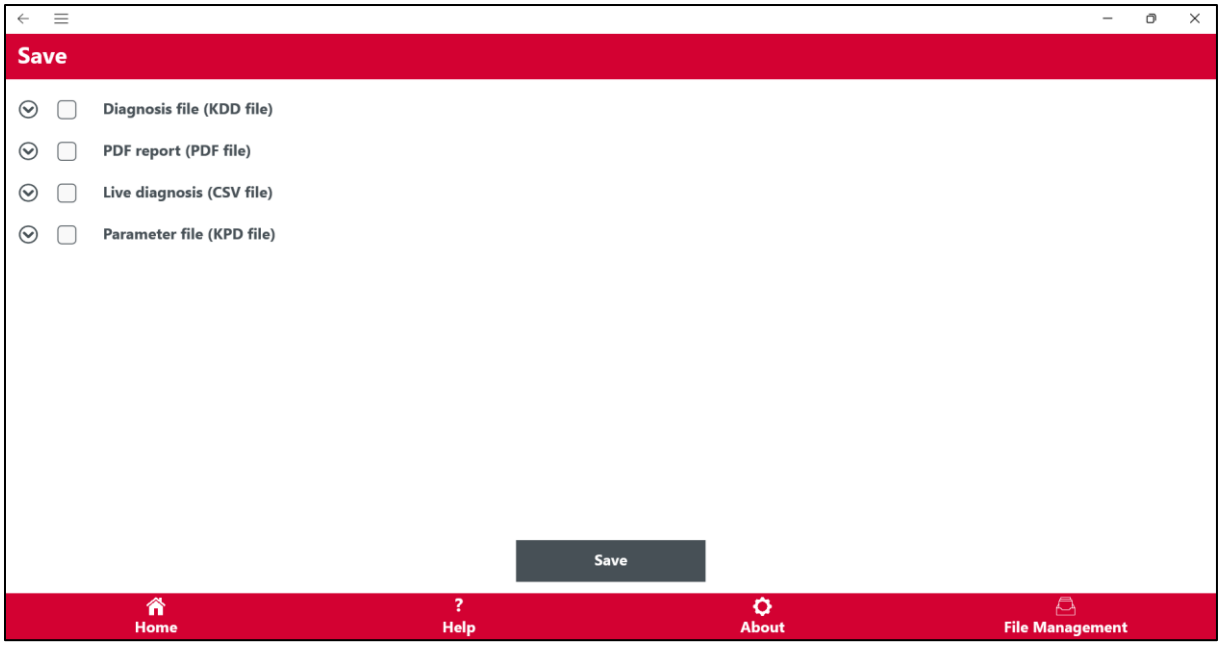


Figure 54 Diagnostic data file management: save

Choose the location where the diagnostic data should be saved and then select “Save”.

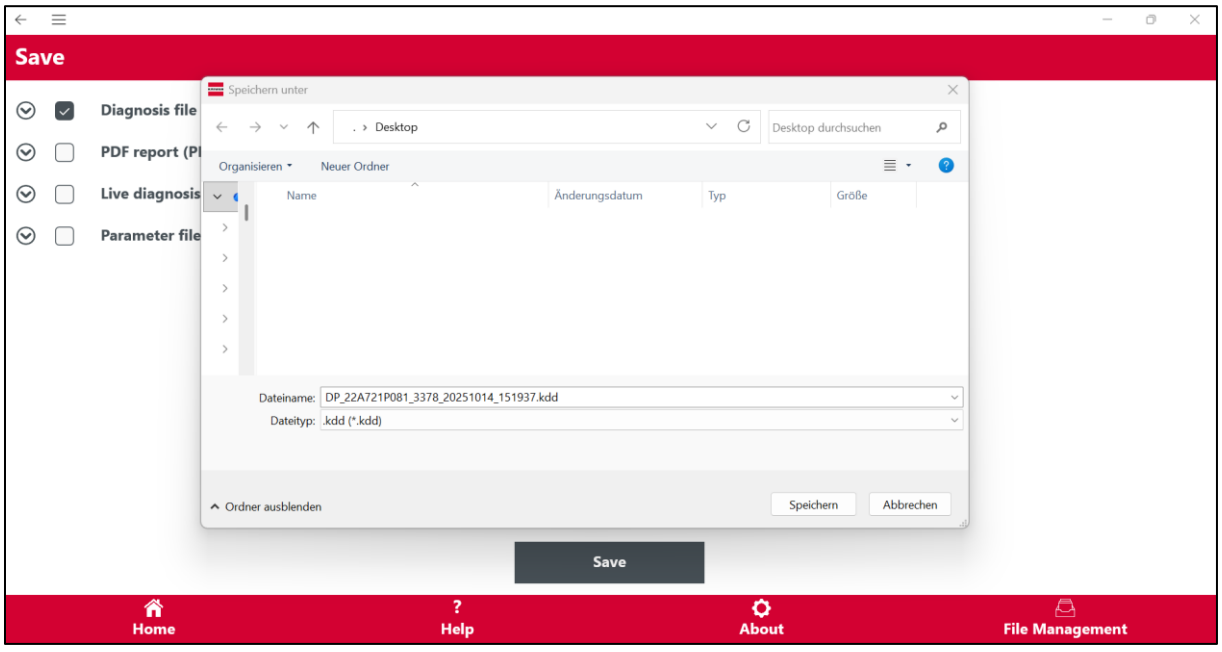


Figure 55 Diagnostic data file management: save

7.1.2 PDF Report

The pdf report can be accessed via the diagnostic. Before opening the pdf report, specify with "Yes" or "No" whether the parameters should be listed in the report. The relay is switched off while the parameters for the pdf report are being read.

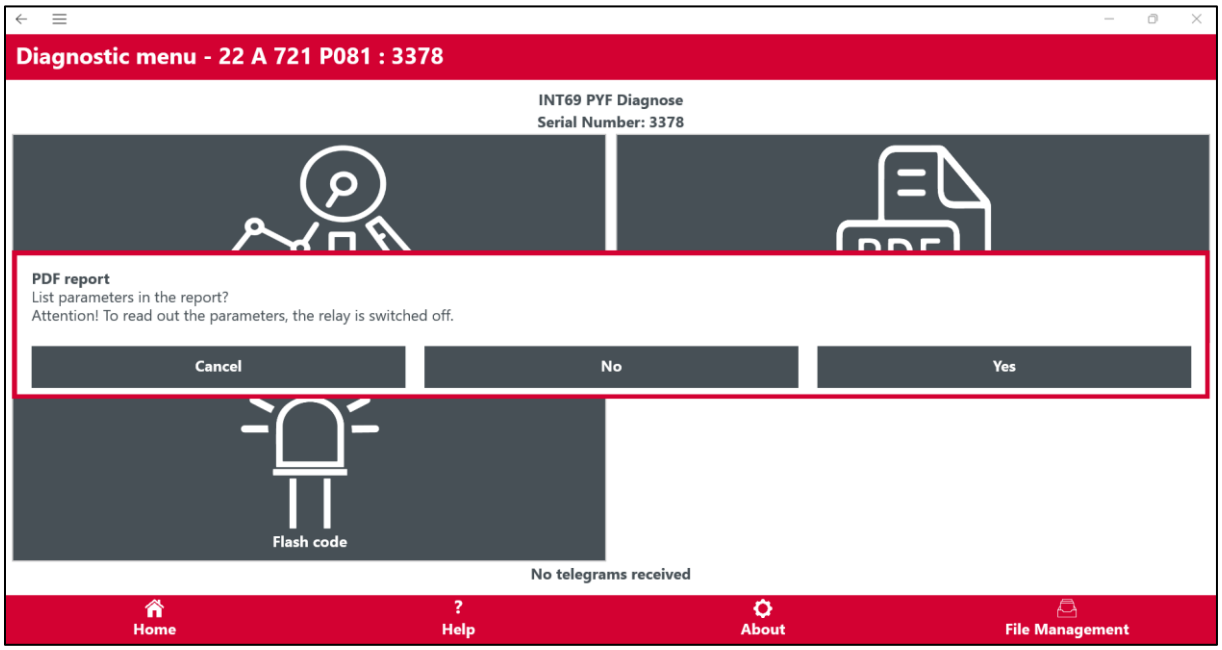
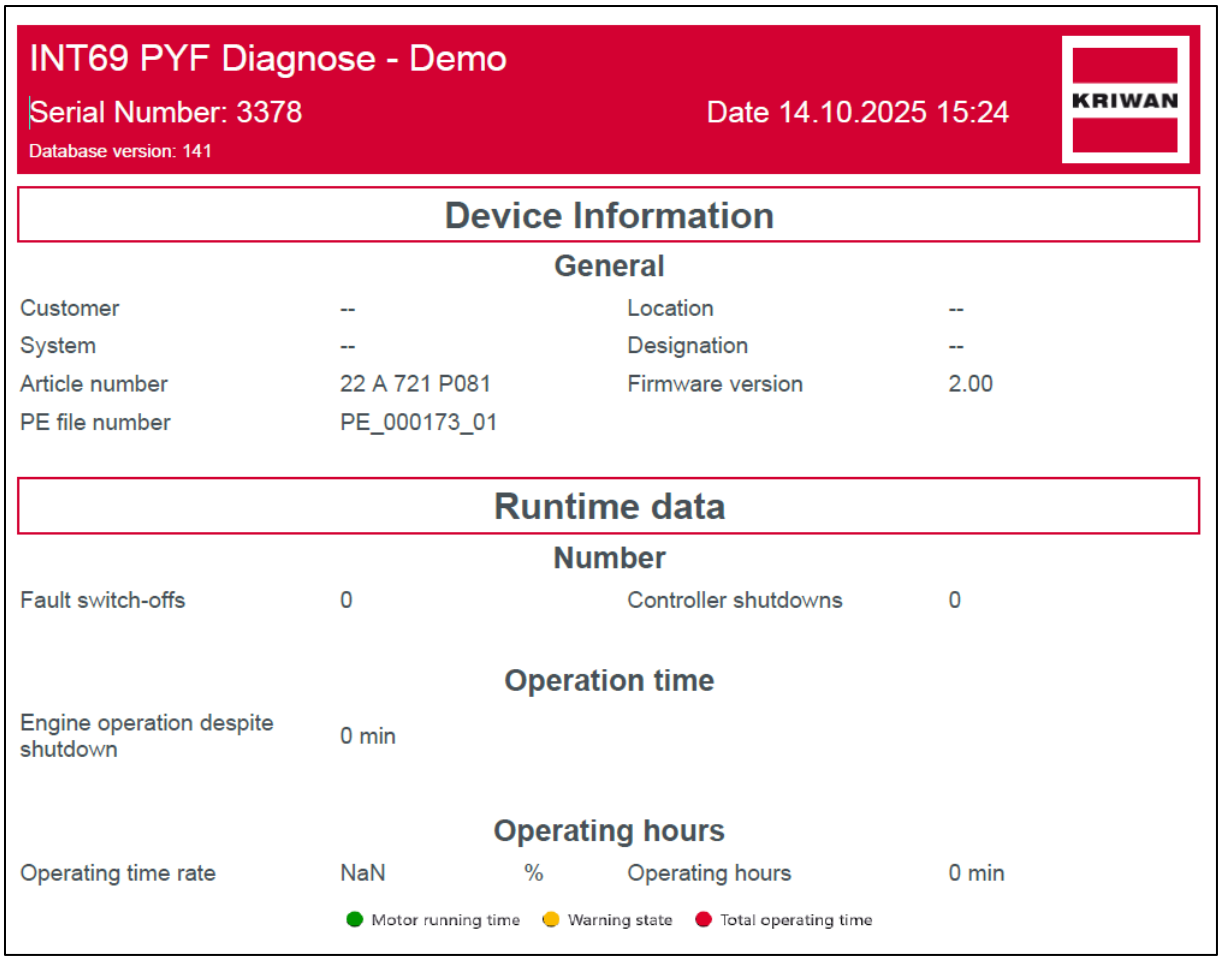


Figure 56 pdf Report

The pdf report then opens automatically. The pdf report contains the device information, diagnostic data and parameterization.



INT69 PYF Diagnose - Demo

Serial Number: 3378 Date 14.10.2025 15:24

Database version: 141

KRIWAN

Device Information

General

Customer	--	Location	--
System	--	Designation	--
Article number	22 A 721 P081	Firmware version	2.00
PE file number	PE_000173_01		

Runtime data

Number

Fault switch-offs	0	Controller shutdowns	0

Operation time

Engine operation despite shutdown	0 min

Operating hours

Operating time rate	NaN	%	Operating hours	0 min

Motor running time Warning state Total operating time

Figure 57 pdf Report

7.1.3 Flash code

The flash code can be accessed via the diagnostics and is used for fault identification and fault diagnosis (see chap. 4.6.17). If the LED emits a flashing code of green and orange pulses, a warning is present. This flashing code can be entered here to identify which warning is present. To do this, check the "Warning" box and enter the number of green and orange pulses. Under "Description", it is shown which warning is present.

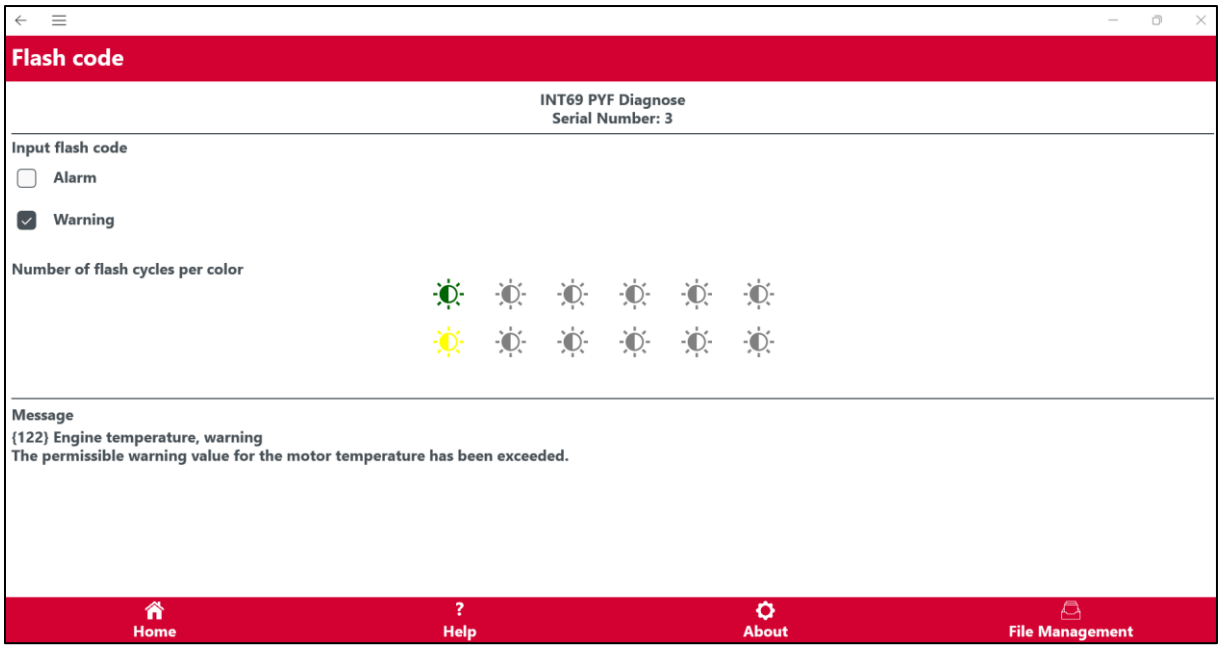


Figure 58 Flash code warning

If the LED emits a flash code of red and orange pulses, a fault is present. To do this, check the "Alarm" box and then enter the number of red and orange pulses. Under "Description", it is shown which alarm is present.

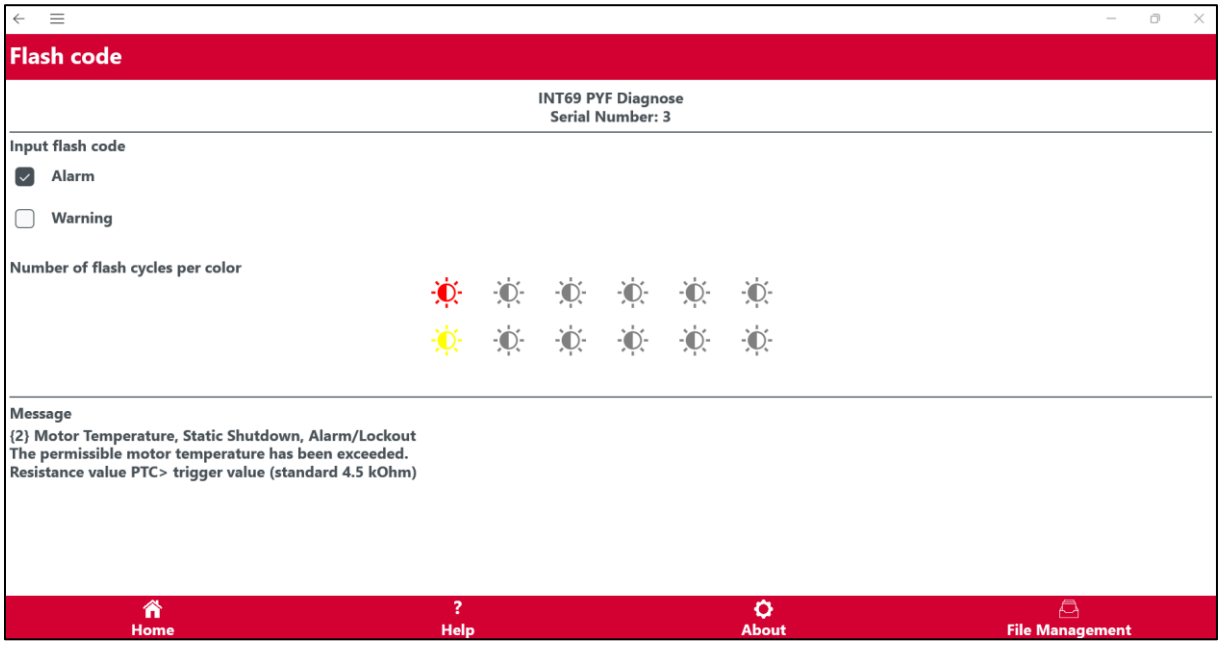


Figure 59 Flash code alarm

7.2 Device Information

The device information is accessible via the main menu of the INTspector App.

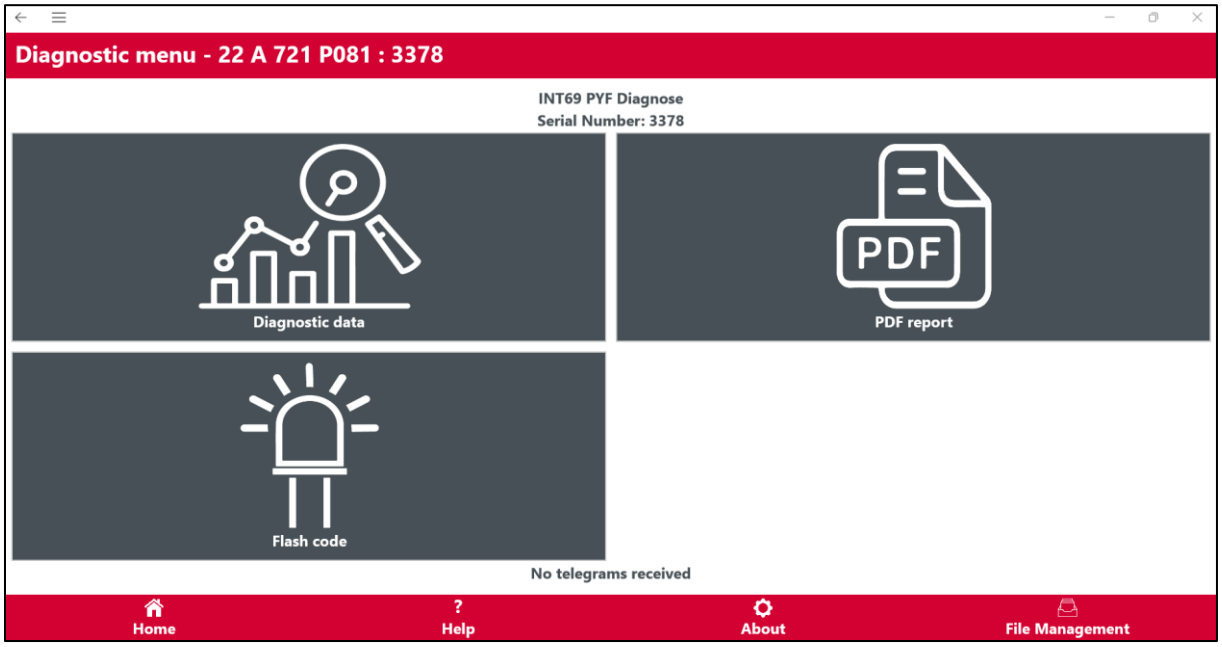


Figure 60 Main menu

The documentation of the INT69 PYF Diagnose (e.g. the data sheet) and the accessories (e.g. INT185 Current Transformer) is available in the device information. In the "Attachment" section, further information about the plant can be entered (e.g., customer, location, system, description).

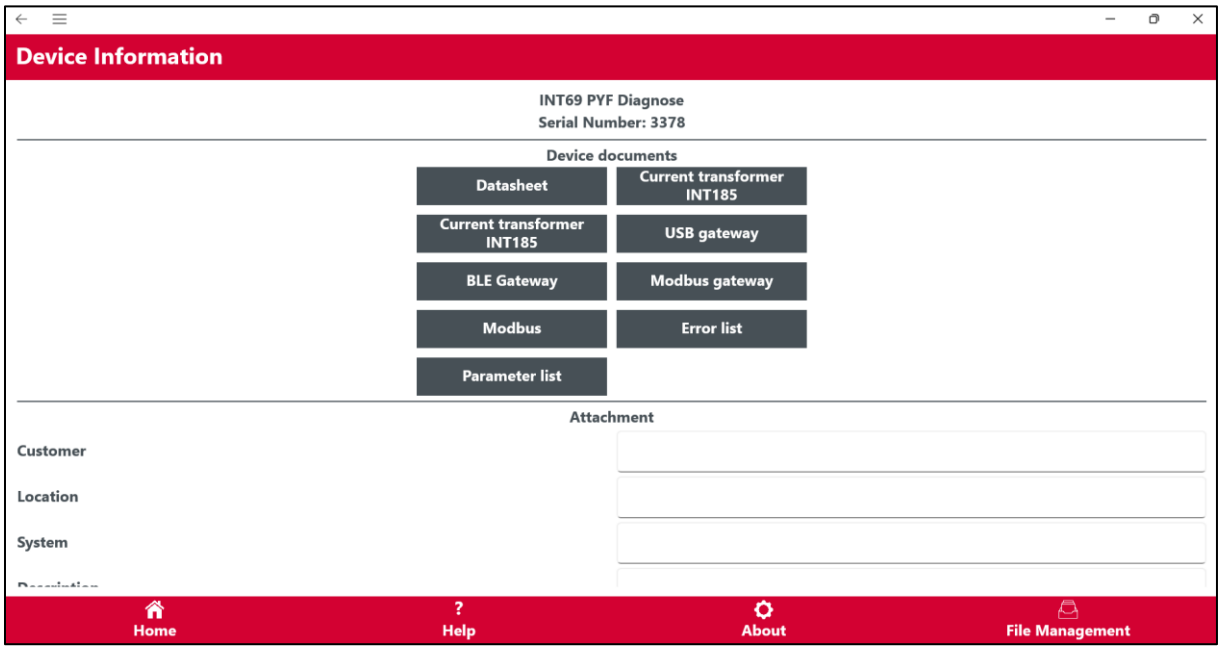


Figure 61 Device information

Below the "Attachment" is the "Device Information". Under "Device Information" you will find more information about the INT69 PYF Diagnose such as the firmware version, the DP ID, the Visu ID, the serial number, the PE file number and the article number of the INT69 PYF Diagnose.

Next is the "Device Data Management" section. The "Device Data Management" section contains the "Path to Device Log". All data (e.g. diagnostic data, parameter file, pdf report, etc.) is saved in this path.

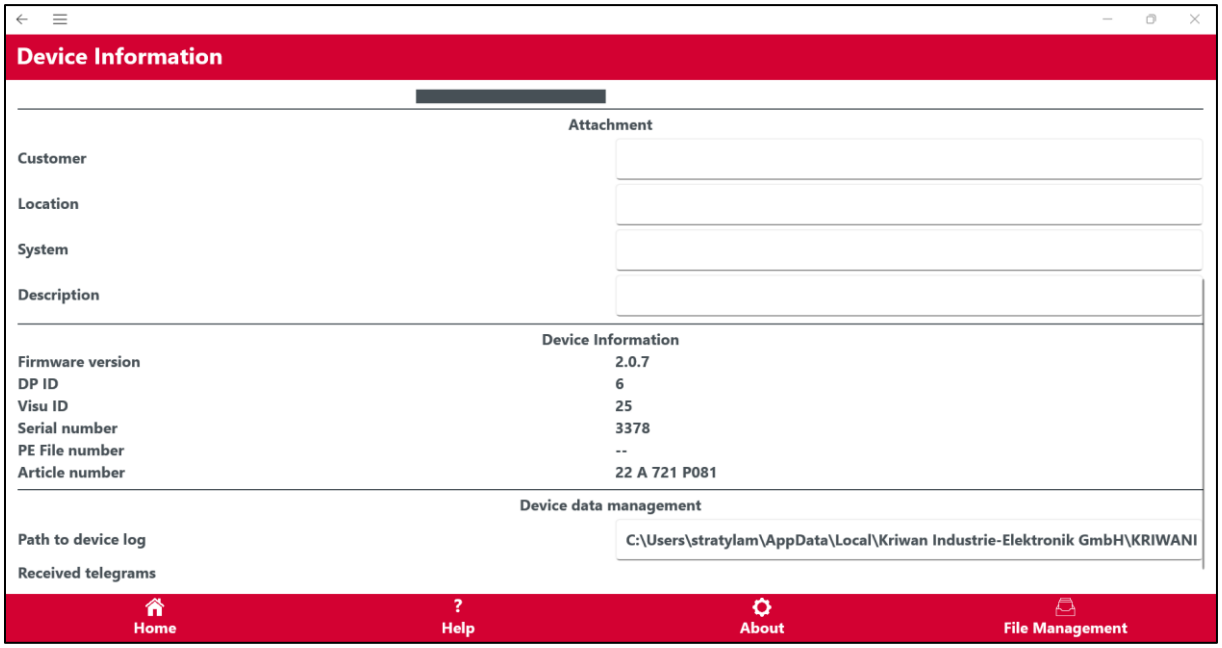


Figure 62 Device information

8 Disassembly / Device Replacement

DANGER

Improper electrical installation

Danger to life due to electric shock!

The electrical connection must be performed only by a qualified electrician.

Observe the technical conditions of local and national energy supply companies.

DANGER

Contact with live parts

Danger to life due to electric shock!

Deenergize the mains connections for all devices.

Secure the mains connections against reconnection.

Before the protection relay can be disassembled from the DIN rail, first disconnect the cables of the connected sensors from the push-in terminals. To do this, use a flat-head screwdriver to push down the push-in terminals and loosen the cables of the connected sensors. Then use a flat-head screwdriver to pull out the red release lever on the base of the device and disconnect the protection relay from the DIN rail.

9 Maintenance

NOTICE

The protection relay is maintenance-free and therefore no fixed inspection intervals are prescribed.

10 FAQs

In the table below are the most common questions about the INT69 PYF Diagnose.

Question	Answer
What are the features of the INT69 PYF Diagnose?	The protection relay connects the pump, the protection function and the digital world. With the help of the integrated Modbus (RTU) interface, simple networking is possible. The protection relay monitors temperatures (3x inputs for PTC, Pt100, Pt1000 or bimetal), leakage (conductivity measurement), analog input (0/4-20mA), voltage, current and power. The protection relay is suitable for operation with frequency converters. The necessary operational reliability is provided by two freely parameterizable relays.
What do I need to parameterize and read the diagnostic data?	You need an end device, such as a laptop, mobile phone or tablet with the KRIWAN INTspector App installed and a KRIWAN USB or Bluetooth gateway to establish the connection between the INT69 PYF Diagnose and the end device.
How do you recognize the current status (operating status)?	For quick and easy status indication and troubleshooting, a flashing code is issued via an LED on the front of the housing of the protection relays. This consists of a cyclic flashing sequence, which can be taken from the data sheet. For a more detailed view, the KRWIAN INTspector App is available. The diagnostic data provides an overview of the operating behavior of your pump. Events, operating times, switching cycles and current measured values are displayed and help with detailed analysis on site.

Question	Answer
Which data is stored in the protection relay and for how long?	All events such as warnings, errors or messages are stored non-volatilely in an internal memory and can be viewed via the INTspector App. The event list contains the last 100 events with time and date. The last 10 events in each case are also recorded with extended data for all sensor inputs. There are also counters for all events.
What does power monitoring involve?	With a current transformer connected to phase L1 and with phases L1, L2 and L3 connected, the power monitoring works automatically. It includes monitoring of underload, overload and cosφ. The active and reactive power are determined from the measured current, the measured voltage and the calculated phase angle φ. The apparent power is also determined. Additionally, the active and reactive energy are output.
Why is it sufficient to measure the current only at phase L1?	In three-phase motors, a symmetry of the motor windings is assumed. The total output of the three-phase motor is made up of three string outputs. The INT69 PYF Diagnose determines the power in string L1 by means of measured current, voltage and phase angle. The total power is then determined from the ratio of the measured three phase voltages and the determined power of string L1.

Question	Answer
What is the external relay contact at the motor temperature input?	With this function, an auxiliary contact (NC) of another relay required in the application can be connected to the INT69 PYF Diagnose. That way, the switching behavior can also be recorded in the internal memory and integrated into a higher-level system control via Modbus. For example, this can be an ATEX certified relay for the motor temperature.
What is the leakage input used for?	Submersible motor pumps and agitators, for example, are often already equipped with moisture electrodes by the manufacturer, which can be monitored with the INT69 PYF Diagnose at E-, E+. These have the function of monitoring against penetrating medium or dry running. For this purpose, the resistance (conductance) between the two electrodes is measured. Depending on the application, the operating mode must be set to exceed resistance or resistance below.
What is the switching input used for?	Depending on the application, there may be a switching contact (normally closed contact, normally open contact) on the monitored machine. For example, a float switch (normally closed contact) is often used in submersible motor pumps, which can be monitored at the SC1, SC2 switching input of the INT69 PYF Diagnose. Furthermore, this input can also be used as an external reset button (normally open contact). In the parameterization, the relevant operating mode (normally closed contact, normally open contact, reset) must be set for that.

Question	Answer
Which options are available to do a reset?	There are several options, such as disconnecting the supply voltage >5s of the INT69 PYF Diagnose (mains reset), via an external reset button (normally open contact) at the switching input SC1, SC2 > 5s or a Modbus reset via the integrated Modbus interface of the INT69 PYF Diagnose (for the reset write the address 515 once with the value 1). The protection relay can only be switched back on after an interlocked switch-off after a reset has been done and if there is no longer an error.
Which functions do the relays of the INT69 PYF Diagnose have?	The INT69 PYF Diagnose has two relays that can be parameterized for any detectable faults or warnings. If an error or warning is detected, an alarm or warning is triggered. For each input, the parameterization of the warning, setpoint and trip point values, trip delays and reset delays or a locked shutdown is possible. The monitoring of motor temperature, phase sequence, phase failure, phase asymmetry, undervoltage and overvoltage are always active as alarms at relay 1 and cannot be deselected at relay 1. The two relays work according to the closed-circuit current principle.
How is the KRIWAN protection relay integrated into the higher-level system control?	The INT69 PYF Diagnose offers an integrated Modbus RTU interface (RTU). This can be used for communication with the plant control system. An additional Modbus gateway (e.g. INT600 DM Gateway) is not absolutely necessary here.

Question	Answer
What is included in the scope of delivery?	The packaging contains the respective protection relay (depending on the voltage variant 24V ~/⎓ or 100-240V ~) and the brief instructions. In addition, terminating resistors for Modbus communication are included in the scope of delivery. The INT185 Current Transformer with a measuring range of up to 100A and up to 250A is not included in the scope of delivery and must be ordered separately.
What is the factory setting (default) of the KRIWAN protection relay?	All KRIWAN pump protection relays are delivered with a factory setting. The INT69 PYF Diagnose can be found on the product page in the download area as a parameter list. The parameterization can be individually adapted to your application during installation and commissioning with the help of the KRIWAN INTspector App.
Who can I contact if I have questions?	We are happy to help you with your questions. Simply use the contact form on our homepage and send us a request. Our customer support will get in touch with you.

11 EU Declaration of Conformity

The EU Declaration of Conformity is available for download on the product page of the INT69 PYF Diagnose under https://www.kriwan.com/en/products/protection-relay/multifunctional-relays-for-machines/int69-pyf-diagnose-premium.

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