TPEM

Parameter description
EN
Valid from release 1.9
2024-02
Competence level CL 1

This document is a part of the operating manual in accordance with Machinery Directive 2006/42/EC.
This is a translation of the German original. All translations are based on the German original.

Technical modifications required to improve our products are reserved with regard to specification data and other technical information contained in the document. No parts of this document may be reproduced in any form or by any means without the written approval of the manufacturer.

The document contains information that is necessary for maintenance and repair work on the product. When carrying out the work listed in the maintenance schedule, only original parts or parts and operating media approved by the manufacturer may be used.

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1 Information about this manual

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1.1 Introduction

1.1.1 Target audience

The document is aimed at authorized specialist personnel with the competence level 1 (CL1). Only authorized specialist personnel may perform the described activities.

For further information on the requirements and qualifications of the authorized specialist personnel, see

- Operating Manual ⇒ General ⇒ Safety regulations
  - Personnel - Qualifications and Duties

1.1.2 Validity

The document is valid for the TPEM system as of release 1.9.

The document is drafted in German. In other languages, the document is a translation of the original manual.

1.1.3 Storage

This document is a component of the product. Keep the document in the immediate vicinity of the product. The document must be accessible at any time.

1.1.4 Other applicable documents

The end customer documentation supplied includes a large number of documents. This document is a component of the end customer documentation and describes the product.

The end customer documentation includes the following documents:

- Power plants layout - Planning notes and assembly notes
- Safety regulations
- Operating media specifications
- Protocols, specifications, certificates
- Technical drawings
- Wiring diagrams and circuit diagrams
- P&I diagram
- Component documentation
  - Assembly notes
  - Operating Manual
  - Maintenance information
  - Work instructions
- Spare parts catalog

1.1.5 Handling

The notes and descriptions given in the document enable safe and efficient handling of the product. Observe and comply with all warnings, safety notes and instructions for handling in order to work safely on the product.

In the document, illustrations assist in basic understanding and may deviate from the actual design.

1.1.6 Operator obligations

The operator must observe and ensure the following points so that the product functions without impairment:

- Have all activities on the product performed in accordance with the applicable standards and specifications
- Determine the responsibilities for operation, servicing and troubleshooting
- Inform the authorized specialist personnel of possible dangers that may arise from handling the product
- Ensure that the authorized specialist personnel have read and understood the operating manual

1.1.7 Symbols used

Symbols are used in this document so that the authorized specialist personnel can quickly recognize issues and clearly categorize them. Warnings are marked with symbols.

For necessary information on the symbols used, see

- Operating Manual ⇒ General ⇒ Safety regulations
  – Signs and symbols

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1.2 Legal notes

1.2.1 Limitations of liability

In this document, all information and notes have been compiled taking the relevant standards and specifications for the product and the state of the art technology into account.

The manufacturer assumes no liability for damage resulting from the following causes:

- Non-observance of the operating manual
- Non-intended use
- Deployment of unauthorized specialist personnel
- Unauthorized conversions
- Technical alterations
- Use of unapproved spare parts or attachments
- Use of unapproved operating media

The actual scope of delivery may differ under the following conditions:

- Special versions
- Utilization of additional order options
- Due to the latest technical modifications

The regulations apply in the following order:

1. Obligations agreed in the delivery agreement
2. Terms and conditions of the manufacturer for the sales and delivery of new engines, new plants and original parts in the current version
3. Legal provisions valid when the contract was concluded

The right for the manufacturer to undertake technical alterations to improve the performance characteristics and further development is reserved.

1.2.2 Copyright

The document is protected by copyright and exclusively designed for in-house purposes.

Unless for in-house purposes, the following measures are not permitted:

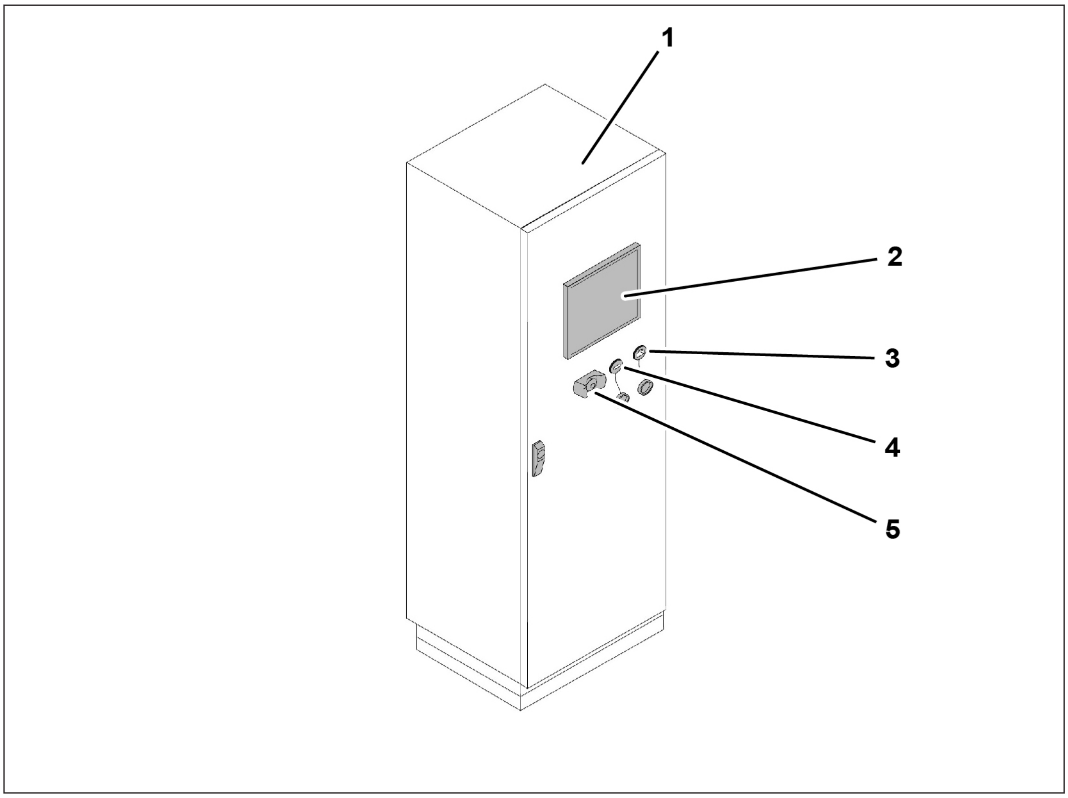
- Transferring the document to third parties
- Reproducing any parts in any form or by any means
- Utilization or disclosure of the contents

Contraventions necessitate compensation. Rights to other claims remain reserved.

1.3 Access authorization via TPEM USB token

The software provides a range of operating and display options of the overall plant. The basic functions can be used safely by every suitably qualified and instructed user. Some areas of the parameterization remain reserved for specially trained personnel (e.g. commissioners) for safety reasons.

1.3.1 TPEM USB token / TPEM USB storage



64486-002

1 TPEM Control Cabinet

2 TPEM Touch Panel

3 RJ45 interface

4 USB interface for TPEM USB token and TPEM USB storage

5 EMERGENCY stop button

A token activates functions which only specially trained users may access. When the TPEM USB token is inserted, the validity of the access authorization is checked (authentication). The user's actions are documented by the TPEM system. The serial number of the TPEM USB token is stored in the logbook for all actions.

The authorizations are stored on the TPEM USB token in compliance with the authorization levels. Users must attain and demonstrate the qualifications for working above authorization level 100 in training programs.

Depending on the order, several TPEM USB tokens with authorization level 50 may be part of the scope of supply. If included, the tokens are in a pocket in the cover of the first documentation folder.

TPEM USB tokens with and without integrated memory are in circulation. Both types of TPEM USB tokens make it possible to export data. Data export using TPEM USB tokens without integrated memory is only possible in conjunction with a separate TPEM USB storage. The TPEM USB storage is configured accordingly and can only be used for data export from TPEM.

Both TPEM USB tokens also offer data export via TPEM Remote Client DT.

TPEM USB token with integrated memory	
TPEM USB token without integrated memory	
TPEM USB storage	

Designation	**Authentication possible?**	**Data export possible?**	**Software update possible?**	**Transferring Software Update Container to the IPC possible?**
TPEM USB token with integrated memory	YES	YES	YES	YES
TPEM USB token without integrated memory	YES	only via TPEM RC (DT)	YES	No
TPEM USB token without integrated memory + TPEM USB storage	YES	YES	YES	YES

1.3.2 Authorization levels

Depending on their level of training and expertise, the users obtain a specific authorization level. Five authorization levels regulate the different access authorizations.

Operators

Level	Description
0	Access via local network or intranet with the TPEM Remote Client. No authentication by token required. Only reading rights, no operation possible.
50	Access via the Touch Panel without authentication or via local network with the TPEM Remote Client. Authentication via token with user name and password required. The following are possible: • Starting and stopping the genset • Power demand of the genset • Auxiliary drive tests • Lube oil change • Acknowledging events • Data export for token with integrated memory • Data export using tokens without integrated memory to TPEM USB storage
100	Access via TPEM Touch Panel with authentication by token. Access via local network or via remote access with the TPEM Remote Client and authentication by token with username and password. Operation of the TPEM interface is possible in compliance with the authorization level.

Service

Level	Description
200	Access via TPEM Touch Panel with authentication by token. Access via local network or via remote access with the TPEM Remote Client and authentication by token with username and password. Operation of the TPEM interface is possible in compliance with the authorization level.
230	Access authorization such as level 200. Operation of the TPEM interface for the generator, the TPEM Multi Function Relay and the TPEM Remote Plant Gateway is additionally possible in compliance with the authorization level. Additional required qualification: qualified electrician

1.3.3 Assignment of the authorization levels to the parameters

Two authorization levels are assigned to each parameter, a read permission and a write permission.

The read permission only displays the parameters when authenticated by a token.

The write permission enables parameters to be edited when authenticated by a token.

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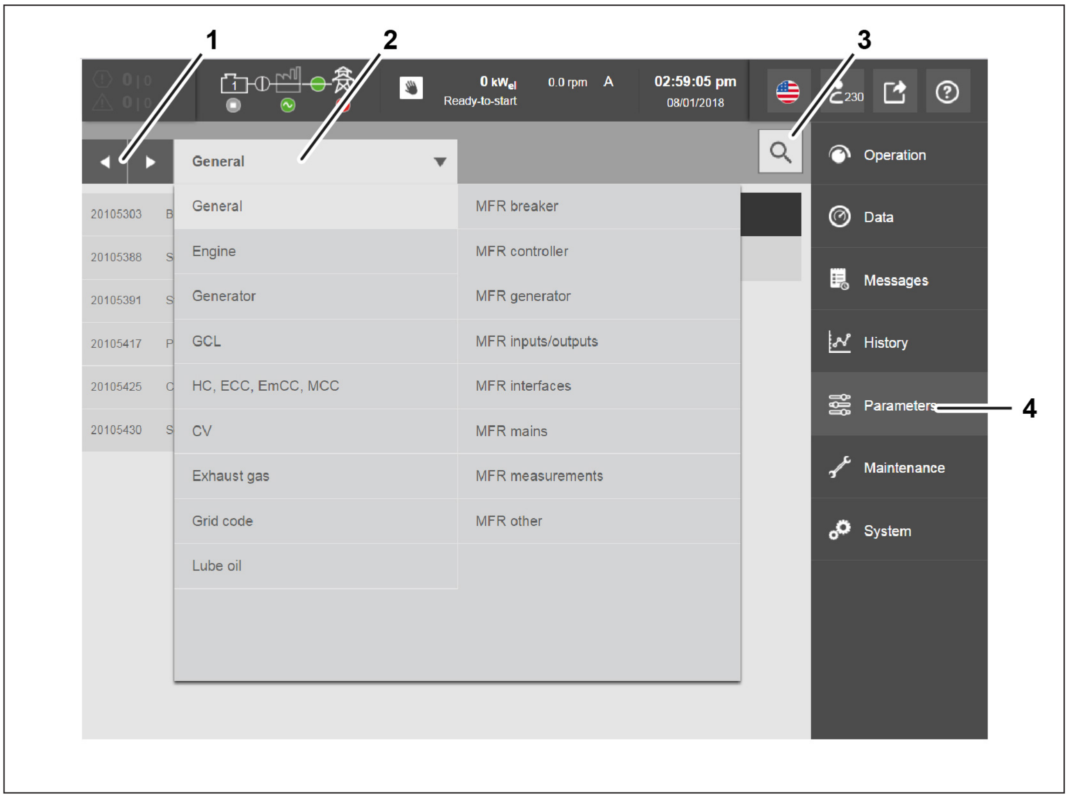
Example:

Read permission: Level 100, Write permission: Level 200

In order to display the parameter, a token with authorization level 100 is required. To edit the parameter, a token with authorization level 200 is required.

The editable parameters displayed by the TPEM Touch Panel or TPEM Remote Client are dependent on the options of the customer-specific commission. Therefore, not all described parameters are visible or editable on every plant.

1.4 Displaying, changing parameters



61051-004

1 Arrow buttons for switching between the subgroups when pull-down menu is closed.

2 Pull-down menu for subgroups
Tapping the buttons toggles between the individual masks. The `General` screen summarizes the most important parameters of the genset.

3 Button for searching for parameters.

4 `Parameters` button in the functional group selection.

The functional group `Parameters` can be accessed directly from the functional group selection.

The functional group `Parameters` allows you to display the parameters of the control with the current value and change these within defined limits.

The parameters are divided into various authorization levels.

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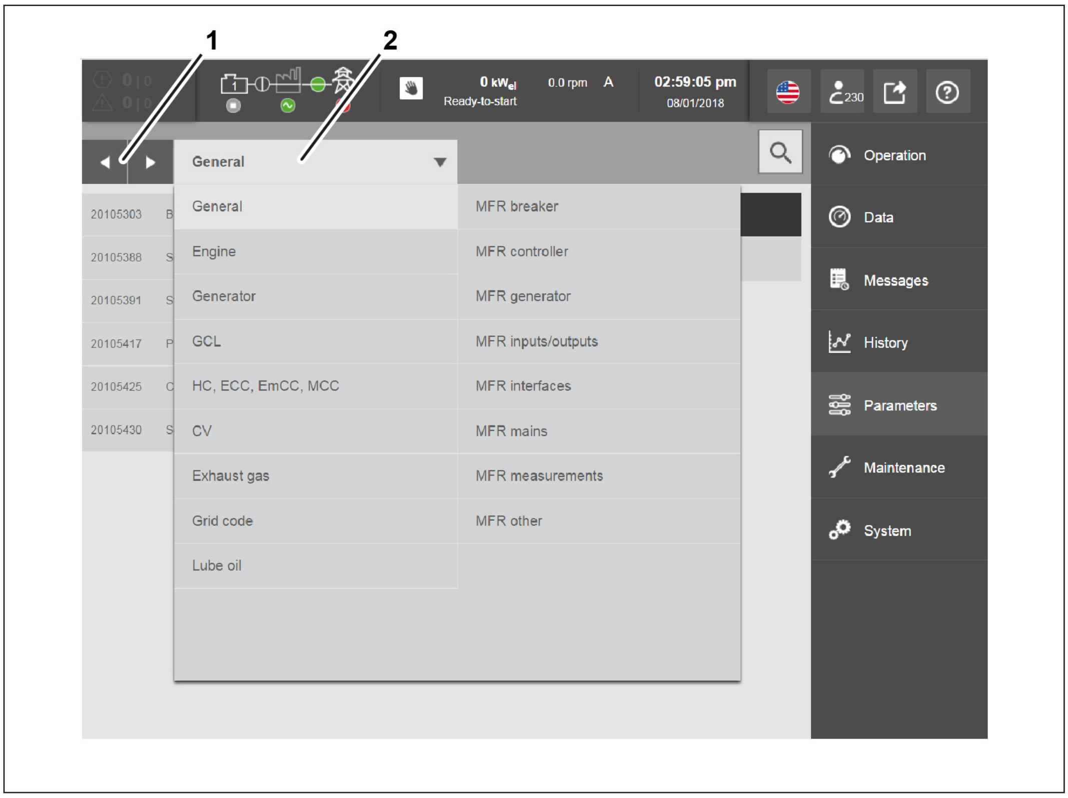
1.4.1 Selecting subgroups



75506-001

Selecting the `Parameters` functional group opens the start page with the subassembly `General`.

A subassembly can be selected in one of two ways:

- Flicking through using the arrow buttons (1)
- Direct selection in the pull-down menu (2)

▶	Each tap on the arrow button advances one subassembly in the sequence of the pull-down menu.
◀	Each tap on the arrow button goes back one subassembly in the sequence of the pull-down menu.

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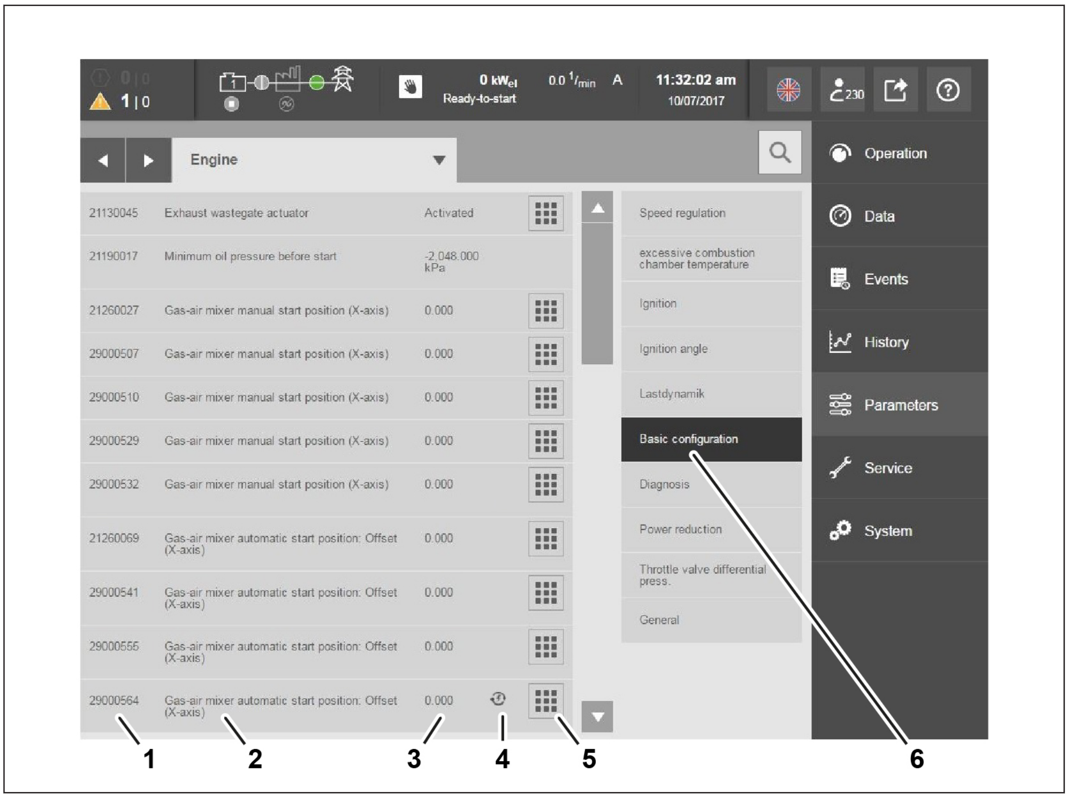
1.4.2 Elements of the subgroups



63463-003

1 Number of the parameter

2 Name of the parameter

3 Active value of the parameter

4 Shows that the parameter is being securely transferred to the control.
Shows that the parameter has not been transferred to the control.

5 Symbol showing that the parameter can be changed with the authorization level of the inserted TPEM USB token.

6 Selected submenu of the open subgroup

Tapping one of the areas 1 to 5 opens the dialog area of the corresponding parameter. Depending on the dialog area, the parameter value can be adjusted or a selection can be made.

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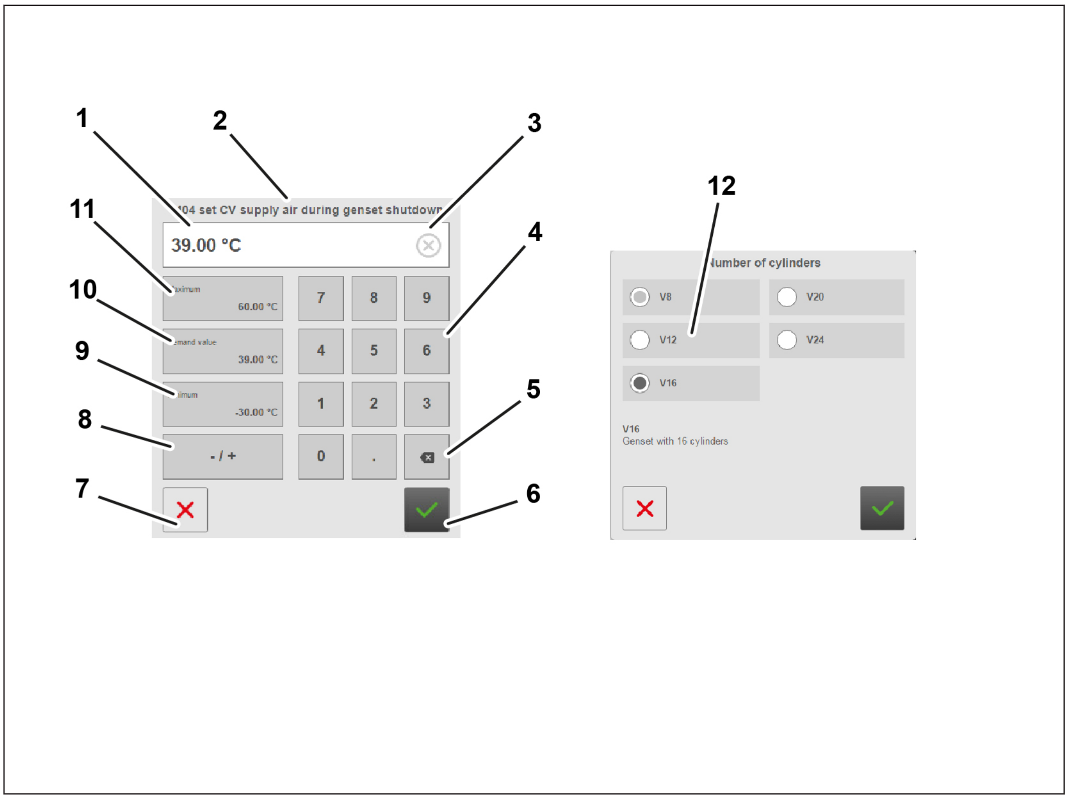
1.4.3 Dialog area

Tapping the area of the parameter opens the dialog area.

Depending on the parameter, either the parameter value can be adjusted within the stated value range or a selection can be made.



61049-004

1 Display and input field
For displaying and entering the setpoint value.

2 Parameter name
Display of the selected parameter.

3 Set input value to "0"

4 Keypad
For entering the setpoint value.

5 Delete last input

6 Accept input
Accepts the entered value as a setpoint value and closes the dialog area.

7 Cancel input or close input mask
Cancels an input without accepting the setpoint value. Closes the dialog area.

8 Change mathematical sign
Negative sign: Enter setpoint value, then change the sign.

9 Minimum
Display the factory-set minimum value as a setpoint value. If the value falls below the minimum value, the display appears in red and the minimum field is given a red border.

10 Default value
Display the factory-set default value as a setpoint value.

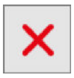
11 Maximum
Display the factory-set maximum value as a setpoint value. If the maximum value is exceeded, the display appears in red and the maximum field is given a red border.

12 Selection option
To activate/deactivate parameters or to select an option.

1.4.4 Parameter search function

In the `Parameters` functional group, the parameters are divided by topic into subgroups and submenus. The search function makes it possible to search with search terms such as digits of the parameter numbers or parts of the parameter names.

The following symbols are relevant for the search function:

	Button for searching for parameters
	Button for deleting the search term
	Button for starting the search
	Button for ending the search

Parameter search

1. Tap the button for searching for parameters.
   → The search window opens. The keyboard appears.

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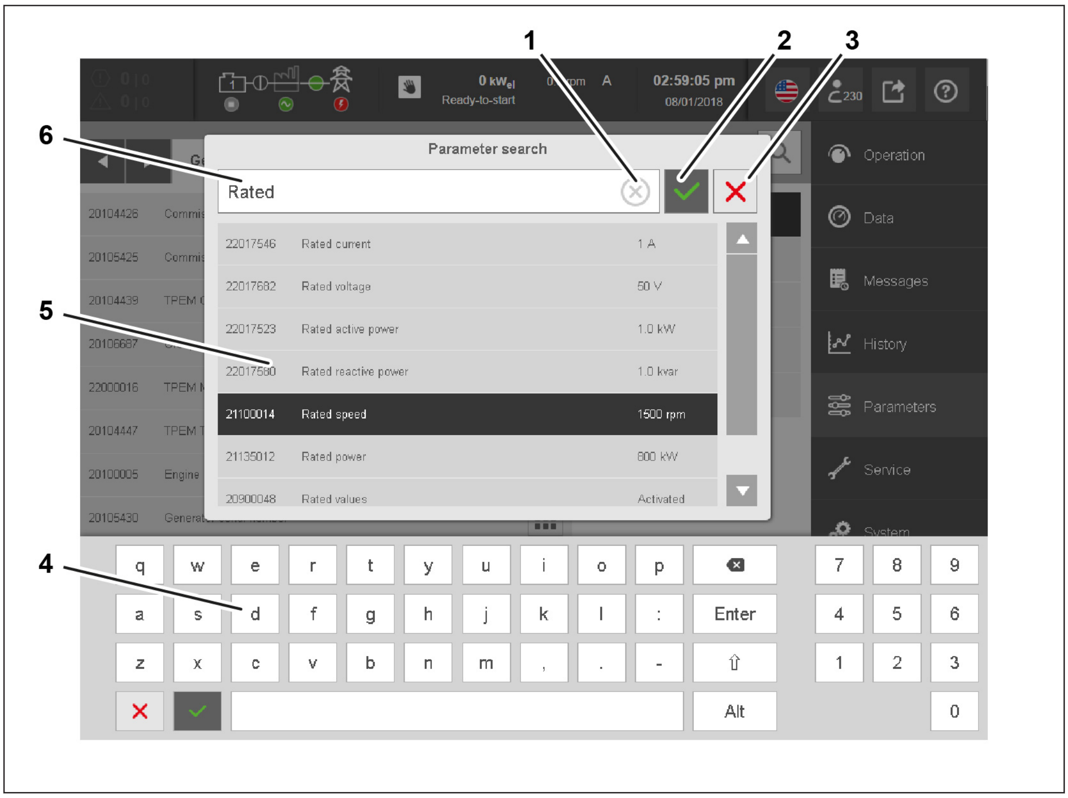
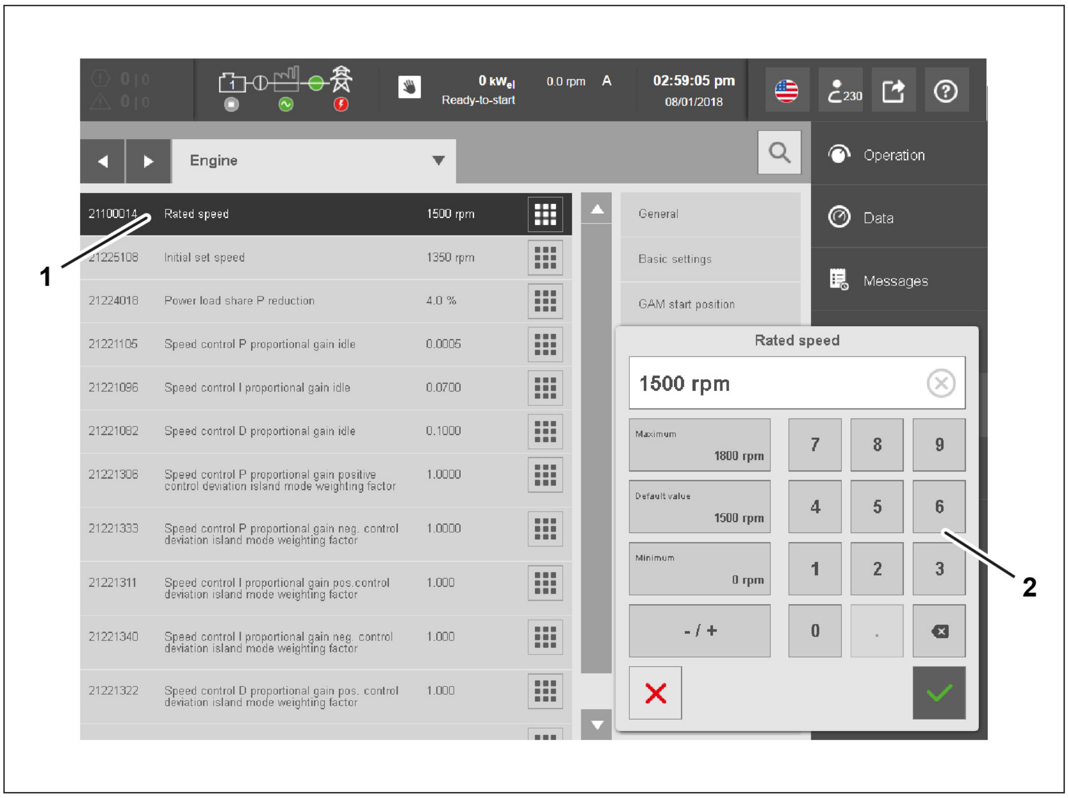


75508-001

2. Enter the search term into the input field (6) using the keyboard (4).
   → For example, digits of the parameter number or parts of the parameter names can be entered.
   → The search results (5) are displayed as a list after pressing enter and updated if the entry is changed.
3. Select the desired parameter (5).
   → The parameter is highlighted in color.
   → The confirm button (2) is activated.
4. Option: Tap the button for deleting the search term (1).
   → The search term (6) and the search results (5) are deleted.
5. Option: End search process by pressing the cancel button (3).
6. Tap on the confirm button (2).



75509-001

→ The search window is closed.

→ The parameter (1) is displayed and highlighted in color.

→ The parameter dialog (2) opens.

1.4.5 Parameter values after software update

The set setpoint values are always accepted during a software update. However, acceptance is not always possible in all cases.

If, for example, the factory-set minimum value or maximum value was changed with the software update, it is possible that the originally set setpoint lies outside these limits after the software update. In this case, the standard value is not automatically accepted as the setpoint value.

All parameters marked after the software update require adjustment of the setpoints. In order to draw attention to the required adjustment, the subgroups in question are also marked with the symbol in the pull-down menu and the submenus in the subgroups. The symbol is visible in the subgroups and submenus for all authorization levels. This is also the case if the affected parameter is not visible due to an insufficient authorization level.

If a parameter has been changed with a software update, the serial number `00000000` is displayed in the functional group `History` instead of the serial number of a connected USB token.

68796-002

1 Identifies the subgroup

2 Marking the submenu

3 Identifies the parameter

1.5 Feedback on documentation

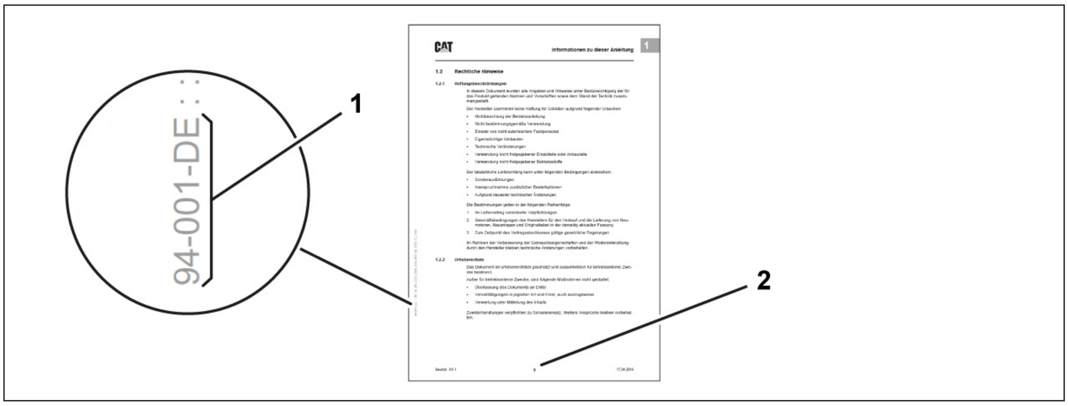
Do you have any praise, criticism or suggestions for improvement for this document?

Send an e-mail to techred@mwm.net.

Describe your request as precisely as possible.

So that we can allocate your feedback, please also provide the following information:

- Document number (1)
- Page number (2)
- Contact data (name, email) for potential further enquiries



71842-002

Thank you for your support. We read all feedback carefully.

We look forward to hearing from you!

2 Safety

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2.1 Safety regulations

Observe the applicable safety regulations for operation, maintenance and servicing. Observe and comply with all instructions for handling and safety notes given in this document. Otherwise, substantial hazards may arise.

The product is used in the commercial sector. The operator is subject to the legal obligations for health and safety at work.

The operator must comply with the following for the product's and overall plant's area of application:

- Safety notes in this document
- Safety regulations
- Accident prevention regulations
- Environmental protection specifications
- General rules on health and safety at work
- Risk assessment of the operator
- Directives and ordinances on operational safety

Directives, ordinances and regulations are available from trade associations or specialist dealers.

For necessary information on the safety regulations, see

- Operating Manual ⇒ General ⇒ Safety regulations
  - Safety and Product Information Specification

2.2 Use and misuse of the TPEM system

Proper use of the TPEM system

The TPEM system (Total Plant and Energy Management System) assumes the complete plant management for modules with gas engines.

The TPEM system controls, regulates and monitors the essential functions of the individual plant components (e.g. genset, cooling/heating circuits).

Proper use also includes compliance with all the information in this document.

Any use other than that defined as proper use of the genset or which goes beyond that use is considered misuse and may lead to hazardous situations.

All types of claims due to damage resulting from improper use are excluded.

Risk of destruction of components

Misuse of the genset

- Use only approved operating media
- Only operate the genset within the limit values
- Never retrofit the genset independently without authorization from the manufacturer

---

Risk of destruction of components

Incorrectly set parameters may lead to the genset or auxiliaries becoming damaged.
Take utmost care when setting the parameters. Standard values are reference values and must be checked in terms of their applicability.
Parameters may only be modified when the emergency stop button has been pressed and the genset is stationary.

Exceptions include:

- Controller parameters
- Setpoint values
- Limits

For further information on the proper use and improper use of the genset, see

- Operating Manual ⇒ General ⇒ Safety regulations
  - Safety regulations

3 General

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3.1 Plant

The texts for the following parameters can be freely drafted within the following limits:

- Maximum 13 characters
- Only Roman letters and numbers
- No umlauts and no special characters

3.1.1 `20104426 Commission name`

Read permission: Level 0, Write permission: Level 100

Take the commission name from the order-specific documents.

Display: ⇒ Functional group "System", Submenu "Overview"

3.1.2 `20105425 Commission number`

Read permission: Level 0, Write permission: Level 100

Take the commission number from the order-specific documents.

Display: ⇒ Functional group "System", Submenu "Overview"

3.1.3 `20104439 TPEM CC serial number`

Read permission: Level 0, Write permission: Level 100

TPEM CC serial number in accordance with rating plate.

Display: ⇒ Functional group "System", Submenu "Overview"

3.1.4 `20106687 Collective acknowledgement`

Read permission: Level 0, Write permission: Level 200

Deactivated

A collective acknowledgement of warnings and alarms is not possible.

Activated

- On the TPEM TP, the button `Collective acknowledgement` appears in the functional group `Messages`, in the submenu "New".
- With the button, all warnings and alarms that are displayed in the `New` submenu can be acknowledged as a group.
- A collective acknowledgement is also possible via Modbus.

3.1.5 `20106847 Quick stop`

Read permission: Level 0, Write permission: Level 200

The quick stop allows the genset to be stopped quickly. The quick stop can be performed at the HMI on the TPEM TP or with the TPEM RC DT.

⇒ TPEM Operating manual ⇒ Operation ⇒ Stopping the genset.

Deactivated

The quick stop is deactivated.

Activated

The quick stop is activated.

3.1.6 22000016 TPEM MFR serial number

Read permission: Level 0, Write permission: Level 100

TPEM MFR serial number in accordance with rating plate in TPEM CC.

Display: ⇒ Functional group "System", Submenu "Overview"

3.1.7 20104447 TPEM TP serial number

Read permission: Level 0, Write permission: Level 100

TPEM TP serial number in accordance with rating plate in TPEM CC.

Display: ⇒ Functional group "System", Submenu "Overview"

3.1.8 20100005 Engine serial number

Read permission: Level 0, Write permission: Level 100

Engine serial number in accordance with rating plate.

Display: ⇒ Functional group "System", Submenu "Overview"

3.1.9 20105430 Generator serial number

Read permission: Level 0, Write permission: Level 100

Generator serial number in accordance with rating plate.

Display: ⇒ Functional group "System", Submenu "Overview"

3.1.10 20105417 Plant name

Read permission: Level 0, Write permission: Level 100

Take the plant name from the order-specific documents.

Display: ⇒ Functional group "System", Submenu "Overview"

3.1.11 60002360 Operation mode

Read permission: Level 0, Write permission: Level 200

The selection of the operation mode activates the monitoring of the plant configuration in combination with the status of the mains circuit breaker.

If island mode is selected and the mains circuit breaker is closed, the following message is issued: `35001685 Plant is not ready for island mode, MCB closed`.

If mains parallel mode is selected and the mains circuit breaker is open, the following message appears: `35001673 Plant is not ready for mains parallel mode, MCB open`.

Possible operation modes

- Island mode
- Mains parallel mode
- Mains parallel mode and island mode

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3.2 Parameterizable inputs

3.2.1 DES (demand for external starting preparations)

The following message texts can only be edited using the TPEM Remote Client.

The texts can be freely drafted within the following limits:

- Maximum 20 characters
- Only Roman letters and numbers
- No umlauts and no special characters

`60008009 DES`

Read permission: Level 0, Write permission: Level 100

Activates/deactivates the following parameters:

- `60008342 DES feedback 1`
- `60008350 DES feedback 2`
- `60008369 DES feedback 3`

All activated feedbacks are required for a start. Each feedback creates an entry in the functional group `Messages`.

60008342 DES feedback 1

Read permission: Level 0, Write permission: Level 100

Activates the digital input 541.

Activates the following parameters:

- `60008505 DES feedback 1 black start override`
- `20105449 DES feedback text 1`

60008350 DES feedback 2

Read permission: Level 0, Write permission: Level 100

Activates the digital input 542.

Activates the following parameters:

- `60008518 DES feedback 2 black start override`
- `20105458 DES feedback text 2`

60008369 DES feedback 3

Read permission: Level 0, Write permission: Level 100

Activates the digital input 543.

Activates the following parameters:

- `60008526 DES feedback 3 black start override`
- `20105463 DES feedback text 3`

`20105449 DES feedback text 1`

Read permission: Level 0, Write permission: Level 100

The parameter is visible if the parameter `60008342 DES feedback 1` is activated.

Freely configurable message text for parameter `60008342 DES feedback 1`.

`20105458 DES feedback text 2`

Read permission: Level 0, Write permission: Level 100

The parameter is visible if the parameter `60008350 DES feedback 2` is activated.

Freely configurable message text for parameter `60008350 DES feedback 2`.

`20105463 DES feedback text 3`

Read permission: Level 0, Write permission: Level 100

The parameter is visible if the parameter `60008369 DES feedback 3` is activated.

Freely configurable message text for parameter `60008369 DES feedback 3`.

`60008505 DES feedback 1 black start override`

Read permission: Level 0, Write permission: Level 100

The parameter is only visible if the following parameters are activated:

- `20105303 Black start possible`
- `60008342 DES feedback 1`

Deactivated

A black start is not possible if DI 541 does not receive a high signal.

Activated

A black start is possible even if DI 541 does not receive a high signal.

`60008518 DES feedback 2 black start override`

Read permission: Level 0, Write permission: Level 100

The parameter is only visible if the following parameters are activated:

- `20105303 Black start possible`
- `60008350 DES feedback 2`

Deactivated

A black start is not possible if DI 542 does not receive a high signal.

Activated

A black start is possible even if DI 542 does not receive a high signal.

`60008526 DES feedback 3 black start override`

Read permission: Level 0, Write permission: Level 100

The parameter is only visible if the following parameters are activated:

- `20105303 Black start possible`
- `60008369 DES feedback 3`

Deactivated

A black start is not possible if DI 543 does not receive a high signal.

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Activated

A black start is possible even if DI 543 does not receive a high signal.

3.2.2 Parameterizable operating messages

TPEM has 13 digital inputs (544 to 556), which can be monitored individually after activating and setting the following parameters. An operating message is issued if a corresponding signal is received.

`60008014 Parameterizable operating message 1`

Read permission: Level 0, Write permission: Level 100

Activates/deactivates digital input 544 as parameterizable operating message 1 and the following parameters:

- `20106289 Enabling condition for monitoring`
- `20106277 Delay monitoring`
- `20106266 Delay event`
- `20105474 Name`
- `20106070 Event type`
- `20106202 Level logic`

`20106289 Enabling condition for monitoring`

Read permission: Level 0, Write permission: Level 100

The monitoring of the DI 544 is analyzed in relation to the operating sates. Only if the enabling condition is met is the monitoring analyzed and, if applicable, a message is issued.

Always

The DI 544 is always analyzed.

Genset running

DI 544 is only analyzed if the genset is running.

Running under load

DI 544 is only analyzed if the circuit breaker is closed.

Genset shut off

DI 544 is only analyzed if the genset is not running.

Plant control running

DI 544 is only analyzed if the plant control is running.

Start demand

The DI 544 is analyzed from the start demand.

Never

The DI 544 is never analyzed.

`20106277 Delay monitoring`

Read permission: Level 0, Write permission: Level 100

Time that must pass in the selected operating state until the monitoring starts.

Unit: s

20106266 Delay event

Read permission: Level 0, Write permission: Level 100

Time, which has to pass at a change from a high-level to a low-level or vice versa at DI 544, until a message is issued corresponding to the selected event type.

The time begins after the delay of parameter `20106277 Delay monitoring` has passed.

⇒ Parameter `20106070 Event type`

Unit: s

20105474 Name

Read permission: Level 0, Write permission: Level 100

Freely selectable name of the event, as it should appear in TPEM TP.

The text can only be edited using the TPEM Remote Client.

The text can be freely drafted within the following limits:

- Maximum 20 characters
- Only Roman letters and numbers
- No umlauts and no special characters

20106070 Event type

Read permission: Level 0, Write permission: Level 100

The severity of the event can be specified.

Note
The event type may not be changed as long as an event is present.

Operating message
Sends a message to the display.

Warning
Sends a message to the display, which must be acknowledged.

Alarm SC
Causes a delayed and controlled shutdown of the genset.

Alarm
Causes an immediate shutdown of the genset; the auxiliary drives continue to supply the genset with power.

20106202 Level logic

Read permission: Level 0, Write permission: Level 100

Level logic for digital input 544, which triggers a message. The level logic must be selected corresponding to the selected event type.

Positive logic

In positive logic, the High level encodes binary value 1 and the Low level encodes binary value 0 at the signal input.

Negative logic

In negative logic, the High level encodes binary value 0 and the Low level encodes binary value 1 at the signal input.

60008023 Parameterizable operating message 2

Read permission: Level 0, Write permission: Level 100

Activates digital input 545 as parameterizable operating message 2.

⇒ Parameter 60008014 Parameterizable operating message 1

60008038 Parameterizable operating message 3

Read permission: Level 0, Write permission: Level 100

Activates digital input 546 as parameterizable operating message 3.

⇒ Parameter 60008014 Parameterizable operating message 1

60008046 Parameterizable operating message 4

Read permission: Level 0, Write permission: Level 100

Activates digital input 547 as parameterizable operating message 4.

⇒ Parameter 60008014 Parameterizable operating message 1

60008051 Parameterizable operating message 5

Read permission: Level 0, Write permission: Level 100

Activates digital input 548 as parameterizable operating message 5.

⇒ Parameter 60008014 Parameterizable operating message 1

60008067 Parameterizable operating message 6

Read permission: Level 0, Write permission: Level 100

Activates digital input 549 as parameterizable operating message 6.

⇒ Parameter 60008014 Parameterizable operating message 1

60008072 Parameterizable operating message 7

Read permission: Level 0, Write permission: Level 100

Activates digital input 550 as parameterizable operating message 7.

⇒ Parameter 60008014 Parameterizable operating message 1

60008080 Parameterizable operating message 8

Read permission: Level 0, Write permission: Level 100

Activates digital input 551 as parameterizable operating message 8.

⇒ Parameter 60008014 Parameterizable operating message 1

60008095 Parameterizable operating message 9

Read permission: Level 0, Write permission: Level 100

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Activates digital input 552 as parameterizable operating message 9.

⇒ Parameter `60008014 Parameterizable operating message 1`

`60008102 Parameterizable operating message 10`

Read permission: Level 0, Write permission: Level 100

Activates digital input 553 as parameterizable operating message 10.

⇒ Parameter `60008014 Parameterizable operating message 1`

`60008115 Parameterizable operating message 11`

Read permission: Level 0, Write permission: Level 100

Activates digital input 554 as parameterizable operating message 11.

⇒ Parameter `60008014 Parameterizable operating message 1`

`60008128 Parameterizable operating message 12`

Read permission: Level 0, Write permission: Level 100

Activates digital input 555 as parameterizable operating message 12.

⇒ Parameter `60008014 Parameterizable operating message 1`

`60008131 Parameterizable operating message 13`

Read permission: Level 0, Write permission: Level 100

Activates digital input 556 as parameterizable operating message 13.

⇒ Parameter `60008014 Parameterizable operating message 1`

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

3.3 Parameterizable Counters

The TPEM IO Controller has four digital inputs (581 to 584), which can be used as parameterizable counters. The counters can be used to determine the gas consumption or the amount of electrical energy produced, for example. The counter readings are displayed in TPEM TP ⇒ Data ⇒ Measured values, counted values.

The counted values can be transmitted to a superior plant control per Modbus.

Depending on the plant version, one or more counters can be preset.

No.	Designation
581	Parameterizable counter 1
582	Parameterizable counter 2
583	Parameterizable counter 3
584	Parameterizable counter 4

The counters can be activated and/or deactivated independently of each other. Each counter can be individually adjusted using the parameters listed below.

Requirements for the input signals:

- Minimum pulse width 25 ms
- Maximum frequency 20 Hz

3.3.1 `20901476 Parameterizable counter 1`

Read permission: Level 0, Write permission: Level 200

Activates/deactivates the following parameters:

- `20901511 Name`
- `20901522 Counter reading`
- `20901579 Maximum counter reading`
- `20901533 Enabling condition`
- `20901540 Trigger`
- `20901554 Increment per trigger`
- `20901566 Unit`

3.3.2 `20901511 Name`

Read permission: Level 0, Write permission: Level 100

Freely selectable name of counter, as it should appear in TPEM TP under Data.

The text can be freely drafted within the following limits:

- Maximum 20 characters
- Only Roman letters and numbers
- No umlauts and no special characters

3.3.3 `20901522 Counter reading`

Read permission: Level 0, Write permission: Level 100

The counted value of the display can be reset or set to a specific starting value.

If the counted value is reset, the value becomes zero.

To pre-set a starting value, the desired counter reading is entered.

3.3.4 `20901579 Maximum counter reading`

Read permission: Level 0, Write permission: Level 100

Maximum counted value of the display. If the maximum counter reading is exceeded, the counted value is set to zero and a corresponding warning is issued.

3.3.5 `20901533 Enabling condition`

Read permission: Level 0, Write permission: Level 100

Always

The signal is always analyzed.

Genset running

The signal is only analyzed while the genset is running.

Running under load

The signal is only analyzed while the generator circuit breaker is closed.

Genset shut off

The signal is only analyzed while the genset is shut down.

Plant control running

The signal is only analyzed if the pumps are running (engine cooling water pump etc.).

Start demand

The signal is analyzed after the start demand (demand for external starting preparations).

Never

The signal is never analyzed

3.3.6 `20901540 Trigger`

Read permission: Level 0, Write permission: Level 100

Rising flank

The counted value increases when the input changes from 0 V to 24 V.

Falling flank

The counted value increases when the input changes from 24 V to 0 V.

Both

The counted value increases for both rising and falling flanks. If the input signals are identical, the counting of both flanks leads to a counter reading that is twice as high as for the first two variants.

3.3.7 `20901554 Increment per trigger`

Read permission: Level 0, Write permission: Level 100

For all counting results, the counted value is increased by the set increment.

3.3.8 `20901565 Unit`

Read permission: Level 0, Write permission: Level 100

It is possible to select one of the following units:

- None: no unit
- kWh: kilowatt hour
- MWh: megawatt hour
- l: liter
- m^3: cubic meter
- h: hour

3.3.9 `20901484 Parameterizable counter 2`

⇒ Parameter `20901476 Parameterizable counter 1`

3.3.10 `20901492 Parameterizable counter 3`

⇒ Parameter `20901476 Parameterizable counter 1`

3.3.11 `20901506 Parameterizable counter 4`

⇒ Parameter `20901476 Parameterizable counter 1`

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3.4 Parameterizable measured values and controllers

TPEM has four analog inputs in order to display plant-specific measured values and monitor limits. This allows additional devices to be monitored. Depending on the measured value, three limits can be parameterized, which trigger an event if exceeded or undercut.

For each parameterizable measured value, an input is available at the TPEM IO Controller for a 4 ... 20 mA signal.

It must be ensured that the analog ground of the signals is interconnected, also to the ground of the transmitters included in the standard scope. A supply voltage of 24 V is available for connecting two-conductor sensors.

The current measured values are displayed in the functional group `Data`.

3.4.1 `20300008 Parameterizable measured value 1`

Read permission: Level 0, Write permission: Level 200

Activates/deactivates the following parameters:

- `20300019 Name`
- `20300024 Unit`
- `20300035 Measured value at 4 mA`
- `20300043 Measured value at 20 mA`
- `20310224 Extended input range`
- `20300056 Enabling condition for monitoring`
- `20300062 Delay monitoring`
- `20300070 Sensor failure monitoring`
- `20300097 Event 1 Monitoring`
- `20300137 Event 2 Monitoring`
- `20300176 Event 3 Monitoring`
- `20300503 Parameterizable controller for measured value 1`

`20300019 Name`

Read permission: Level 0, Write permission: Level 100

Freely selectable name of the measured value, as it should appear in TPEM TP under Data.

The text can be freely drafted within the following limits:

- Maximum 20 characters
- Only Roman letters and numbers
- No umlauts and no special characters

`20300024 Unit`

Read permission: Level 0, Write permission: Level 100

One of the following units can be selected for the measured value:

No unit, %, 1/min, A, V, bar, mbar, kOhm, kW, mA, mg/m³, m³/h, °C

20300035 Measured value at 4 mA

Read permission: Level 0, Write permission: Level 100

Measured value, which is assigned to the analog signal 4 mA.

20300043 Measured value at 20 mA

Read permission: Level 0, Write permission: Level 100

Measured value, which is assigned to the analog signal 20 mA.

20310224 Extended input range

Read permission: Level 0, Write permission: Level 100

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

20300056 Enabling condition for monitoring

Read permission: Level 0, Write permission: Level 100

The monitoring is analyzed in relation to the operating sates. Only if the enabling condition is met is the measured value analyzed and, if applicable, a message is issued.

Always

The measured value is always analyzed.

Genset running

The measured value is only analyzed if the genset is running.

Running under load

The measured value is only analyzed if the circuit breaker is closed.

Genset shut off

The measured value is only analyzed if the genset is not running.

Plant monitoring running

The measured value is only analyzed if the plant monitoring is running.

Start demand

The measured value is analyzed from the start demand.

Never

The measured value is never analyzed.

20300062 Delay monitoring

Read permission: Level 0, Write permission: Level 100

Time, which has to pass after the measured value is enabled, until the monitoring begins.

Unit: s

20300070 Sensor failure monitoring

Read permission: Level 0, Write permission: Level 200

Deactivated

No monitoring for sensor failure.

Activated

A message is issued if the sensor fails. The severity of the event can be specified ⇒ parameter `20300253 Event type`.

`20300081 Delay sensor failure monitoring`

Read permission: Level 0, Write permission: Level 100

Delay time, after which a message is issued. Precondition: parameter `20300070 Sensor failure monitoring` is activated.

`20300253 Sensor failure event type`

Read permission: Level 0, Write permission: Level 100

The severity of the event upon failure of the sensor can be specified.

Note

The event type may not be changed as long as an event is present.

Operating message

Sends a message to the display.

Warning

Sends a message to the display, which must be acknowledged.

Alarm SC

Causes a delayed and controlled shutdown of the genset.

Alarm

Causes an immediate shutdown of the genset; the auxiliary drives continue to supply the genset with power.

`20300097 Event 1 Monitoring`

Read permission: Level 0, Write permission: Level 200

Activates/deactivates the monitoring of limit 1 and the following parameters:

- `20300100 Event 1 Condition`
- `20300113 Event 1 Limit`
- `20300121 Event 1 Delay`
- `20300228 Event 1 Type`

`20300100 Event 1 Condition`

Read permission: Level 0, Write permission: Level 100

Limit 1 can be monitored for exceedance or undercut.

Exceedance

Exceedance of limit 1 causes a message to be issued.

Undercut

Undercutting of limit 1 causes a message to be issued.

20300228 Event 1 Type

Read permission: Level 0, Write permission: Level 100

The severity of the event if limit 1 is exceeded or undercut can be specified.

Note

The event type may not be changed as long as an event is present.

Operating message

Sends a message to the display.

Warning

Sends a message to the display, which must be acknowledged.

Alarm SC

Causes a delayed shutdown of the genset.

Alarm

Causes a shutdown of the genset; the auxiliary drives continue to supply the genset with power.

20300137 Event 2 Monitoring

⇒ Parameter 20300097 Event 1 Monitoring

20300176 Event 3 Monitoring

⇒ Parameter 20300097 Event 1 Monitoring

20300503 Parameterizable controller for measured value 1

Read permission: Level 0, Write permission: Level 200

Activates/deactivates the controller and the following parameters for measured value 1.

- 20300429 Para controller 1 Desired value selection
- 20300432 Para controller 1 Internal desired value
- 20300441 Para controller 1 Enabling condition for control mode
- 20300455 Para controller 1 Output type
- 20300464 Para controller 1 Standby behavior
- 20300486 Para controller 1 Control cycle
- 20300493 Para controller 1 Minimal signal length
- 20300410 Para controller 1 Control low pass time
- 20300385 Para controller 1 Control P proportional gain
- 20300399 Para controller 1 Control I proportional gain
- 20300407 Para controller 1 Control D proportional gain
- 20300516 Para controller 1 Control deviation monitoring

20300429 Para controller 1 Desired value selection

Read permission: Level 0, Write permission: Level 100

Internal desired value (parameter)

The setpoint value is specified with parameter `20300432 Para controller 1 Internal desired value`.

External setpoint value (Modbus)

The setpoint value is provided via Modbus.

20300432 Para controller 1 Internal desired value

Read permission: Level 0, Write permission: Level 100

Setpoint value demand for the control if parameter `20300429 Para controller 1 Desired value selection` is parameterized to `Internal desired value (parameter).`

20300441 Para controller 1 Enabling condition for control mode

Read permission: Level 0, Write permission: Level 100

The controller operation is enabled in relation to the operating sates.

Always

The controller operation is always enabled.

Genset running

The controller operation is only enabled if the genset is running.

Running under load

The controller operation is only enabled if the circuit breaker is closed.

Genset shut off

The controller operation is only enabled if the genset is not running.

Plant monitoring running

The controller operation is only enabled if the plant monitoring is running.

Start demand

The controller operation is enabled from the start demand.

Never

The controller operation is never enabled.

20300455 Para controller 1 Output type

Read permission: Level 0, Write permission: Level 100

For selection of the controller type:

- Two-point controller positive
- Two-point controller negative
- Three-point controller

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20300464 Para controller 1 Standby behavior

Read permission: Level 0, Write permission: Level 100

Behavior of the outputs if the enabling condition is not fulfilled or the sensor has failed. The standby behavior can be parameterized respectively for controllers 1 to 3.

⇒ Parameter 20300441 Para controller 1 Enabling condition for control mode.

All outputs inactive

Both outputs 0 V (low)

Plus output active

Plus output: 24 V, minus output: 0 V

Minus output active

Minus output: 24 V, plus output: 0 V

20300486 Para controller 1 Control cycle

Read permission: Level 0, Write permission: Level 100

The control cycle should be adapted to the dynamics of the control line. It is expedient to make a setting in the range 1/15 ... 1/4 of the settling time for the control variable at 95 % of the end value.

A fast control line requires faster processing (short control cycle).

A slow control line can be controlled with a longer control cycle.

Unit: s

20300493 Para controller 1 Minimal signal length

Read permission: Level 0, Write permission: Level 100

Minimal signal length that the output is switched.

Unit: s

20300410 Para controller 1 Control low pass time

Read permission: Level 0, Write permission: Level 100

A high value corresponds to a strong filter. For filtering fast (high-frequency) changes.

Unit: ms

20300385 Para controller 1 Control P proportional gain

Read permission: Level 0, Write permission: Level 100

The parameter influences the controller's proportional gain (stationary behavior).

The greater the numerical value, the better the controller reacts to control deviations.

20300399 Para controller 1 Control I proportional gain

Read permission: Level 0, Write permission: Level 100

The parameter influences the control behavior in the event of stationary control deviations.

The greater the numerical value, the better and faster the controller reacts to stationary control deviations.

20300407 Para controller 1 Control D proportional gain

Read permission: Level 0, Write permission: Level 100

The parameter influences the control behavior in the event of fast-paced control deviations (dynamic behavior).

The greater the numerical value, the better the controller reacts to large fast-paced control deviations.

A higher D value dampens continuous vibrations.

20300516 Para controller 1 Control deviation monitoring

Read permission: Level 0, Write permission: Level 200

Activates/deactivates the following parameters:

- 20300534 Para controller 1 Event type monitoring
- 20300550 Para controller 1 Delay monitoring
- 20300527 Para controller 1 Delay event
- 20300542 Para controller 1 Monitoring limit

20300534 Para controller 1 Event type monitoring

Read permission: Level 0, Write permission: Level 100

The severity of the event can be specified:

Operating message
Sends a message to the display.

Warning
Sends a message to the display, which must be acknowledged.

Alarm SC
Causes a delayed and controlled shutdown of the genset.

Alarm
Causes an immediate shutdown of the genset; the auxiliary drives continue to supply the genset with power.

20300550 Para controller 1 Delay monitoring

Read permission: Level 0, Write permission: Level 100

Time, which has to pass after activation of controller 1, until the monitoring begins.

Unit: s

20300527 Para controller 1 Delay event

Read permission: Level 200, Write permission: Level 200

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Time, which has to pass when an event occurs, until a message is issued corresponding to the selected event type.

⇒ Parameter `20300534 Para controller 1 Event type monitoring`

Unit: s

`20300542 Para controller 1 Monitoring limit`

Read permission: Level 0, Write permission: Level 100

Limit for the level of the control deviation (setpoint value minus actual value), which issues a message corresponding to the event type when exceeded.

3.4.2 `20301009 Parameterizable measured value 2`

Read permission: Level 0, Write permission: Level 200

⇒ Parameter `20300008 Parameterizable measured value 1`

3.4.3 `20310235 Extended input range`

Read permission: Level 0, Write permission: Level 100

⇒ Parameter `20310224 Extended input range`

3.4.4 `20302001 Parameterizable measured value 3`

Read permission: Level 0, Write permission: Level 200

⇒ Parameter `20300008 Parameterizable measured value 1`

3.4.5 `20310243 Extended input range`

Read permission: Level 0, Write permission: Level 100

⇒ Parameter `20310224 Extended input range`

3.4.6 `20303000 Parameterizable measured value 4`

Read permission: Level 0, Write permission: Level 200

⇒ Parameter `20300008 Parameterizable measured value 1`

`20303502 Parameterizable controller for measured value 4`

Read permission: Level 0, Write permission: Level 100

Activates/deactivates the controller and the following parameters for measured value 4.

- `20303427 Para controller 4 Desired value selection`
- `20303434 Para controller 4 Internal desired value`
- `20303442 Para controller 4 Enabling condition for control mode`
- `20303469 Para controller 4 Standby behavior`
- `20303475 Para controller 4 Output value in standby`
- `20303488 Para controller 4 Control cycle`
- `20303416 Para controller 4 Control low pass time`
- `20303403 Para controller 4 Control D proportional gain`
- `20303397 Para controller 4 Control I proportional gain`

- `20303381 Para controller 4 Control P proportional gain`
- `20303515 Para controller 4 Control deviation monitoring`

The descriptions of the parameters for controller 4 correspond to those of controller 1 apart from the parameters for standby behavior and output value in standby. These two parameters are described below.

`20303469 Para controller 4 Standby behavior`

Read permission: Level 0, Write permission: Level 100

Existing output value remains active

The last valid output value remains active.

Output value from parameter

The output value as in parameter `20303475 Para controller 4 Output value in standby` is accepted.

`20303475 Para controller 4 Output value in standby`

Read permission: Level 0, Write permission: Level 100

4 ... 20 mA am analog output.

`20310256 Extended input range`

Read permission: Level 0, Write permission: Level 100

⇒ Parameter `20310224 Extended input range`

3.5 Superior control

3.5.1 `20530006 Start demand type and power demand type`

Read permission: Level 0, Write permission: Level 200

Analog

Start demand and power demand via TPEM IO Controller.

Activates/deactivates the following parameters:

- `20540002 Min power demand (at 4 mA)`
- `20310049 Input power demanded extended input range`
- `20540015 Max power demand (at 20 mA)`
- `20105014 Substitute value mode for wire break from analog power demand`

Serial

Start demand via TPEM IO, power demand via data bus connection.

Contacts

Start demand via TPEM IO Controller, power demand constant at 100 %.

Protocol

The selection has no function.

3.5.2 `20540002 Min power demand (at 4 mA)`

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the parameter `20530006 Start demand type and power demand type` is parameterized to `Analog`.

Defines the minimum possible power for power demand in %.

Unit: %

3.5.3 `20540015 Max power demand (at 20 mA)`

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the parameter `20530006 Start demand type and power demand type` is parameterized to `Analog`.

Defines the maximum possible power for power demand in %.

Unit: %

3.5.4 `20310049 Input power demanded extended input range`

Read permission: Level 0, Write permission: Level 200

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

3.5.5 `20105014 Substitute value mode for wire break from analog power demand`

Read permission: Level 0, Write permission: Level 200

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The parameter is only visible if the parameter `20530006 Start demand type and power demand type` is parameterized to `Analog`.

The cable for the analog power demand is monitored for a cable break. If the parameter is activated, the genset is not switched off in the event of a cable break. The following selection options are available for the analog power demand.

Fixed value

Activates/deactivates the following parameters:

- `20105009 Fixed substitute value in case of wire break from analog power demand`

Value retention

Last valid value received.

3.5.6 20105009 Fixed substitute value in case of wire break from analog power demand

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the parameter `20105014 Substitute value mode for wire break from analog power demand` is parameterized to `Fixed value`.

Power demand entry.

Unit: %

3.5.7 20530079 Protocol type write mode

Read permission: Level 0, Write permission: Level 100

Activates/deactivates the write mode.

If the parameter is deactivated, the writing of coils or holding registers is ignored. No values can be changed via Modbus TCP or Modbus RTU.

3.5.8 20530040 Protocol type

Read permission: Level 0, Write permission: Level 100

Modbus RTU

Activates the following parameters:

- `20530011 Baud rate`
- `20530033 Parity`
- `20530022 Slave address`

Modbus TCP

Activates the following parameters:

- `20530054 IP address`
- `20530065 Subnet mask`
- `20530087 Maximum number of connections`
- `20530098 Device address`

3.5.9 20530011 Baud rate

Read permission: Level 0, Write permission: Level 100

The baud rate of the Modbus RTU segment is entered in discrete values.

3.5.10 20530033 Parity

Read permission: Level 0, Write permission: Level 100

Communication parameters of the Modbus RTU slave. The setting must correspond to the bus segment setting, otherwise communication difficulties and data loss may result.

3.5.11 20530022 Slave address

Read permission: Level 0, Write permission: Level 100

Address of the Modbus RTU slave. The address of each slave must be unique within the Modbus segment, otherwise communication difficulties and data loss may result.

3.5.12 20530054 IP address

Read permission: Level 0, Write permission: Level 100

IP address via which the Modbus TCP server can be addressed.

To avoid network problems, the following IP address areas are not allowed: 10.0.0.0 to 10.0.0.255

3.5.13 20530065 Subnet mask

Read permission: Level 0, Write permission: Level 100

Subnet mask of the network via which the Modbus TCP server can be reached.

3.5.14 20530087 Maximum number of connections

Read permission: Level 0, Write permission: Level 100

Maximum number of simultaneous Modbus TCP connections. After changing the desired value, the value only applies to new connections. Existing connections are not disconnected.

3.5.15 20530098 Device address

Read permission: Level 0, Write permission: Level 100

Device address of the Modbus TCP server.

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4 Engine

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4.1 General

4.1.1 `20105095 Power limit upon relief`

Read permission: Level 0, Write permission: Level 230

Limit at which TPEM opens the generator circuit breaker.

Unit: %

4.1.2 `20105287 Engine type`

Read permission: Level 0

The engine type is selected in the commissioning wizard.

4.1.3 `20105298 Number of cylinders`

Read permission: Level 0

The number of cylinders is selected in the commissioning wizard.

4.1.4 `20130369 597 monitoring mains starting device`

Read permission: Level 0, Write permission: Level 200

Activates or deactivates the failure monitoring of the mains starting device.

Terminal 110K6: DI01 at the TPEM IO in the HAS is assigned a high signal.

Activated:

If the signal at the abovementioned input drops to low, a warning is issued: `3500224 597 mains starting device failed`

4.1.5 `20130375 613 starter batteries charge monitoring`

Read permission: Level 0, Write permission: Level 200

Activates or deactivates the monitoring of the starter batteries charge.

Terminal 110K4: DI12 at the TPEM IO in the HAS is assigned a high signal.

Activated:

If the signal at the abovementioned input drops to low, a warning is issued: `35002253 613 starter battery charge too low`

4.1.6 `20530006 Start demand type and power demand type`

Read permission: Level 0, Write permission: Level 200

Analog

Start demand and power demand via TPEM IO Controller.

Activates/deactivates the following parameters:

- `20540002 Min power demand (at 4 mA)`
- `20310049 Input power demanded extended input range`
- `20540015 Max power demand (at 20 mA)`
- `20105014 Substitute value mode for wire break from analog power demand`

Serial

Start demand via TPEM IO, power demand via data bus connection.

Contacts

Start demand via TPEM IO Controller, power demand constant at 100 %.

Protocol

The selection has no function.

4.1.7 `20750112 T286/T287 max exhaust gas at 40 % power`

Read permission: Level 0, Write permission: Level 200

Maximum exhaust temperature at 40 % load.

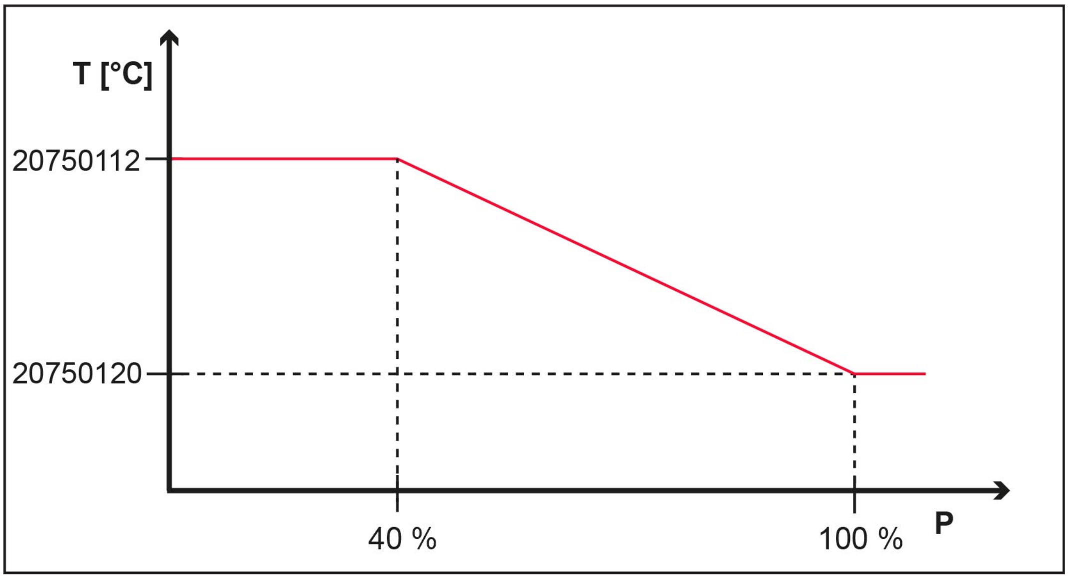
Unit: °C

Applies to the following parameters:

- `20130144 T286 monitoring downstream of engine`
- `20130131 T287 monitoring downstream of CAT`

For engine loads between 40 % and 100 %, the maximum value for the exhaust gas temperature is interpolated between the two values for 40 % load and 100 % load.

If one of the stated exhaust gas temperatures exceeds the maximum value, the genset performs a quick stop with pump run-on.



60986-004 Characteristic curve T286/T287 max exhaust gas

4.1.8 `20750120 T286/T287 max exhaust gas at 100 % power`

Read permission: Level 0, Write permission: Level 200

Maximum exhaust temperature at 100 % load

Applies to the following parameters:

- `20130144 T286 monitoring downstream of engine`
- `20130131 T287 monitoring downstream of CAT`

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If one of the stated exhaust gas temperatures exceeds the maximum value, the genset performs a quick stop with pump run-on.

Unit: °C

4.1.9 60002360 Operation mode

Read permission: Level 0, Write permission: Level 200

The selection of the operation mode activates the monitoring of the plant configuration in combination with the status of the mains circuit breaker.

If island mode is selected and the mains circuit breaker is closed, the following message is issued: `35001685 Plant is not ready for island mode, MCB closed`.

If mains parallel mode is selected and the mains circuit breaker is open, the following message appears: `35001673 Plant is not ready for mains parallel mode, MCB open`.

Possible operation modes

- Island mode
- Mains parallel mode
- Mains parallel mode and island mode

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

4.2 Basic settings

4.2.1 `21320016 Camshaft offset`

Read permission: Level 0, Write permission: Level 50

This parameter can be used to enter an offset to correct the ignition timing.

Camshaft offset = Desired ignition timing minus measured ignition timing

A positive value shifts the ignition timing towards early, a negative value shifts the ignition timing towards late.

Unit: ° crank angle

Example 1:

Desired ignition timing = 23° before UDC, measured ignition timing: 21° before UDC

Camshaft offset = 23° - 21° = +2°

Example 2:

Desired ignition timing = 23° before UDC, measured ignition timing: 25° before UDC

Camshaft offset = 23° - 25° = -2°

4.2.2 `21100206 Delay time for Alarm SC`

Read permission: Level 100, Write permission: Level 200

This parameter indicates the delay time after which time the engine shuts down in a controlled manner in the event of an Alarm SC.

Unit: s

4.2.3 `21410118 T intake air too high: Alarm SC from limit`

Read permission: Level 100, Write permission: Level 200

Temperature of the intake air (T203 Row A / T377 Row B), which triggers an Alarm SC when exceeded.

Unit: °C

4.2.4 `21410219 T intake air too low: Alarm SC from limit`

Read permission: Level 100, Write permission: Level 200

Temperature of the intake air (T203 Row A / T377 Row B), which triggers an Alarm SC when undercut.

Unit: °C

4.2.5 `21351263 Throttle valve differential pressure limit`

Read permission: Level 100, Write permission: Level 200

Limit for monitoring the differential pressure of throttle valve A and throttle valve B. The limit is the sum total of these parameters and the required throttle valve differential pressure. If the limit is exceeded, a warning for the relevant monitoring is issued.

Unit: kPa

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

4.2.6 `21130076 Starter compressed air sensor`

Read permission: Level 100, Write permission: Level 200

This parameter indicates whether or not a sensor for recording the pressure for the starter compressed air is installed.

Deactivated

The sensor is not installed.

Activated

The sensor is installed.

4.2.7 `21130158 L327 oil reservoir sensor`

Read permission: Level 100, Write permission: Level 200

This parameter is only displayed if an engine type that has an oil reservoir in the base frame has been selected ⇒ `Engine` ⇒ `General` ⇒ parameter `20105287 Engine type`.

The parameter indicates whether or not the lube oil level sensor (L327) is installed in the oil reservoir.

Deactivated

The sensor is not installed.

Activated

The sensor is installed.

4.2.8 `21130207 Emission monitoring`

Read permission: Level 0, Write permission: Level 100

If the plant is equipped with a NOx sensor, the emission monitoring can be activated with this parameter.

Activated

Activates the emission monitoring.

The following parameters are activated:

- `20260010 NOx limit`
- `20260029 NOx calibration slope`
- `20260032 NOx calibration offset`
- `20260041 O2 limit`
- `20260181 Event type O2 daily mean value too high`
- `20260197 Event type NOx daily mean value too high`
- `21130210 K factor`

Deactivated

Deactivates the emission monitoring.

4.2.9 `20260010 NOx limit`

Read permission: Level 0, Write permission: Level 100

If the limit for the NOx daily mean value is reached or exceeded, a message is issued. The severity of the event can be specified ⇒ parameter `20260197 Event type NOx daily mean value too high`.

Unit: g/m³

4.2.10 **`20260029 NOx calibration slope`**

Read permission: Level 0, Write permission: Level 100

The parameter is not used. Set parameter value to 1.

4.2.11 **`20260032 NOx calibration offset`**

Read permission: Level 0, Write permission: Level 100

During the calibration, the NOx concentration displayed by the TPEM is compared with the actual concentration, which is measured by an emission analyzer during analysis of the exhaust gas.

To correct the sensor signal, the control adds the offset to the measured NOx value. The offset can be positive or negative.

Unit: g/m³

4.2.12 **`20260041 O2 limit`**

Read permission: Level 0, Write permission: Level 100

If the limit for the O2 daily mean value is reached or exceeded, a message is issued. The severity of the event can be specified ⇒ parameter `20260181 Event type O2 daily mean value too high`.

Unit: %

4.3 GAM start position

4.3.1 21130013 GAM automatic start position

Read permission: Level 0, Write permission: Level 200

The parameter defines the calculation method for the start position of the gas-air mixer.

Activated

The following parameters are activated:

- 21260042 GAM automatic start position ramp 1
- 21260050 GAM automatic start position ramp 2

The start position is automatically determined every time the engine is started. This is done by continuously ramping up the gas-air mixer during the start process from lean to rich until an ignitable mixture is achieved. The ramp-up speed of the gas-air mixer can be set with ramp 1 and ramp 2.

Ramp 1 starts when the starter and the ignition are active and the gas valves are open. The purpose of ramp 1 is to quickly start up the gas-air mixer until the setting allows for an ignitable mixture.

Ramp 2 starts as soon as the mixture is ignitable and the engine gains speed. The purpose of ramp 2 is to finely adjust the gas-air mixer. Ramp 2 is considerably flatter than ramp 1 and is only to ensure that the engine is not too lean to reach 1500 rpm. If ramp 1 is too steep and the mixture is already too rich, ramp 2 may also accept negative values in order to make the mixture slightly leaner.

Deactivated

The start position is determined by a preset characteristic curve on the basis of the gas quality transmitted by the TPEM CC.

The characteristic curve can be set via the parameters 21260016 GAM A start position (Y-axis) and 21260027 GAM A start position (X-axis).

In addition to the characteristic curve, an offset can be set via parameter 21260091 GAM A start position: offset.

4.3.2 21260042 GAM automatic start position ramp 1

Read permission: Level 0, Write permission: Level 200

The parameter is visible when parameter 21130013 GAM automatic start position is set to Activated.

This parameter determines the slope of ramp 1 for the automatic start position of the GAM. For more information, see parameter 21130013 GAM automatic start position.

4.3.3 21260050 GAM automatic start position ramp 2

Read permission: Level 0, Write permission: Level 200

The parameter is visible when parameter 21130013 GAM automatic start position is set to Activated.

This parameter determines the slope of ramp 2 for the automatic start position of the GAM. For more information, see parameter 21130013 GAM automatic start position.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

4.3.4 21260027 GAM A start position (X-axis)

Read permission: Level 0, Write permission: Level 100

This parameter enables the setting of the start position of gas-air mixer A.

The parameter is only displayed when the parameter `21130013 GAM automatic start position` is deactivated.

The position can be set depending on the gas quality, then a characteristic curve is configured accordingly. This parameter stands for the X-axis of this characteristic curve and represents the gas quality. The characteristic curve has five sampling points. The values of the sampling points must increase, i.e. each entry must be greater than the previous one. Interpolation takes place between the sampling points.

The Y-axis indicates the start positions for the different gas qualities and can be set via parameter `21260016 GAM A start position (Y-axis)`.

Unit: %

4.3.5 21260016 GAM A start position (Y-axis)

Read permission: Level 0, Write permission: Level 100

This parameter enables the setting of the start position of gas-air mixer A.

The parameter is only displayed when the parameter `21130013 GAM automatic start position` is deactivated.

The position can be set depending on the gas quality, then a characteristic curve is configured accordingly. This parameter stands for the Y-axis of this characteristic curve and stands for the gas-air mixer position. The characteristic curve has five sampling points. Interpolation takes place between the sampling points.

The X-axis indicates the gas quality to which the corresponding start position is assigned. The gas quality can be set via parameter `21260027 GAM A start position (X-axis)`.

In addition to the characteristic curve, an offset can be set via parameter `21260091 GAM A start position: offset`.

Unit: Increments

4.3.6 21260091 GAM A start position: offset

Read permission: Level 0, Write permission: Level 50

The parameter serves as an offset for the start position of gas-air mixer A.

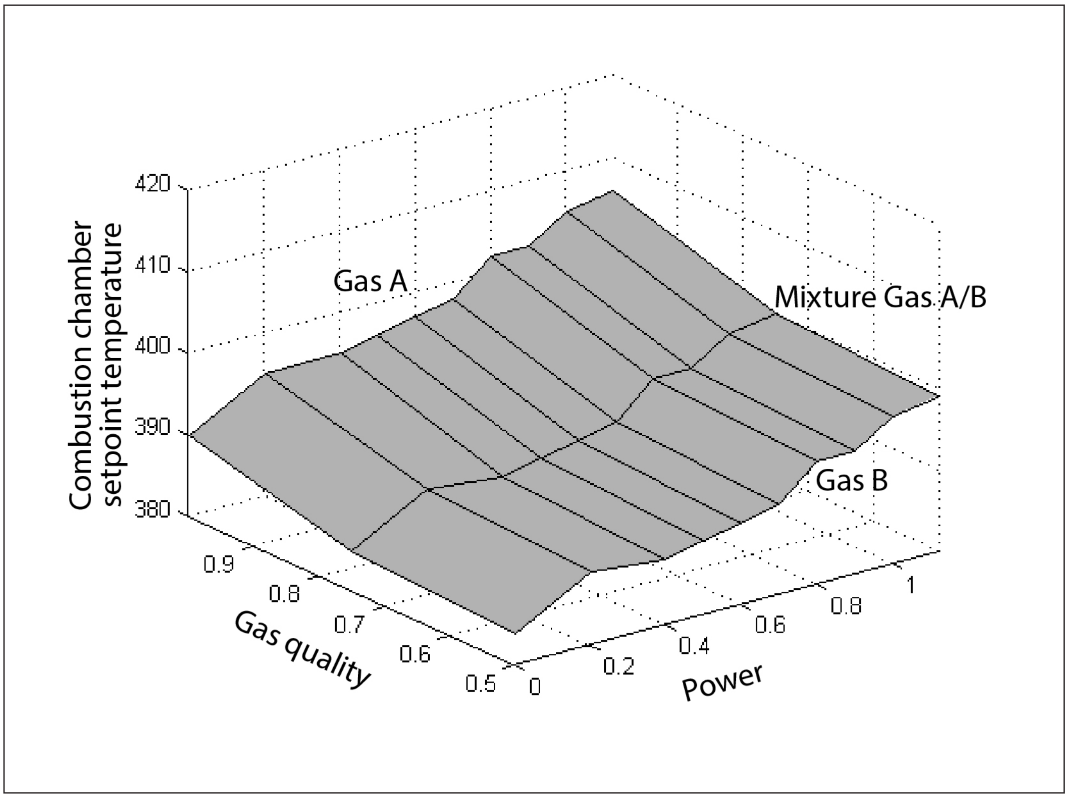
The parameter is only displayed when the parameter `21130013 GAM automatic start position` is deactivated.

Description	Value
Gas-air mixer completely closed	0 increments
Gas-air mixer completely open	4000 increments

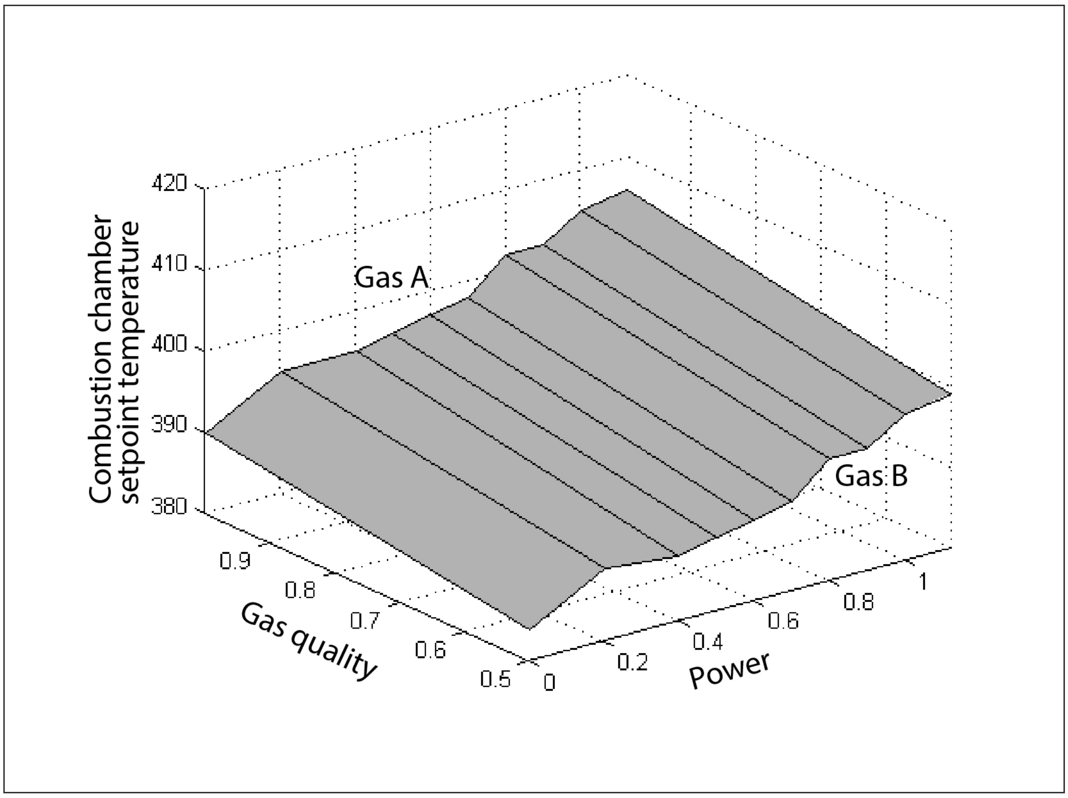
Unit: Increments

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

4.4 T set combustion chamber



68148-001 Combustion chamber set temperature in full mix mode and admix mode characteristic diagram (example)



68155-001 Combustion chamber set temperature in switch over operation characteristic diagram (example)

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

For further information on the CH4 value, see

- Parameter 20130014 CH4 compensation
- Parameter 20390009 CH4 value min (at 4 mA)
- Parameter 20390014 CH4 value max (at 20 mA)

For further information on dual gas operation, see

- TPEM Operating manual ⇒ Structure and function⇒ Dual gas operation

Note

The setting for the following parameters for the combustion chamber desired temperature directly affects the NOx emissions of the genset. The owner or operator of the genset is solely responsible and liable for compliance with the locally applicable country-specific laws and regulations in respect to the emissions of the genset.

4.4.1 21260998 T set combustion chamber Set 1 (X-axis)

Read permission: Level 100, Write permission: Level 100

This parameter is used to set the combustion chamber temperature characteristic curve (Set 1) depending on the current power.

This parameter stands for the X-axis of the measured generator power. The characteristic curve has ten sampling points. The values of the sampling points must increase, i.e. each entry must be greater than the previous one. Interpolation takes place between the sampling points.

The Y-axis can be set via parameter 21260205 T set combustion chamber Set 1 at max expected gas quality (Y-axis).

In addition, the combustion chamber temperature can still be shown depending on the gas quality.

To find this, interpolation takes place between the characteristic curves for the maximum expected gas quality, average expected gas quality and minimum expected gas quality. In this case, the characteristic curve 21260205 T set combustion chamber Set 1 at max expected gas quality (Y-axis) is assigned to the gas quality indicated in parameter 21380038 Maximum expected gas quality.

If no CH4 sensor is installed (parameter 21380401 CH4 sensor), only the characteristic curve for maximum expected gas quality (parameter 21260205) is used.

4.4.2 21380038 Maximum expected gas quality

Read permission: Level 100, Write permission: Level 200

The parameter is visible if at least one of the following parameters is activated:

- 21380023 Dual gas operation⇒Engine⇒Variable gas quality
- 20130014 CH4 compensation⇒Initial setup

This parameter is used as a substitute value for a gas quality. If the plant is designed for dual gas operation, the gas quality of gas A will be specified in this parameter.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

When calculating the set combustion chamber temperatures, the parameter for interpolation via the gas quality is used as a corresponding sampling point for the characteristic curve with parameter `21260205 T set combustion chamber Set 1 at max expected gas quality (Y-axis)` or `21261113 T set combustion chamber Set 2 at max expected gas quality (Y-axis)`.

If the plant is only designed for one gas type, this parameter also forms the internal substitute value for the gas quality if no CH4 sensor is installed ⇒ parameter `21380401 CH4 sensor`.

When calculating the set combustion chamber temperatures, only the characteristic curve with parameter `21260205 T set combustion chamber Set 1 at max expected gas quality (Y-axis)` or `21261113 T set combustion chamber Set 2 at max expected gas quality (Y-axis)` is used.

4.4.3 21260205 T set combustion chamber Set 1 at max expected gas quality (Y-axis)

Read permission: Level 100, Write permission: Level 100

This parameter is used to set the combustion chamber temperature characteristic curve (Set 1) depending on the current power.

This parameter stands for the Y-axis, of the set temperature. The characteristic curve has ten sampling points. Interpolation takes place between the sampling points.

The X-axis can be set via parameter `21260998 T set combustion chamber Set 1 (X-axis)`.

In addition, the combustion chamber temperature can still be shown depending on the gas quality.

To find this, interpolation takes place between the characteristic curves for the maximum expected gas quality, average expected gas quality and minimum expected gas quality. In this case, the characteristic curve `21260205 T set combustion chamber Set 1 at max expected gas quality (Y-axis)` is assigned to the gas quality indicated in parameter `21380038 Maximum expected gas quality`.

Unit: °C

4.4.4 21380046 Average expected gas quality

Read permission: Level 100, Write permission: Level 200

The parameter is visible if at least one of the following parameters is activated:

- `21380023 Dual gas operation⇒Engine⇒Variable gas quality`
- `20130014 CH4 compensation⇒Initial setup`

If the plant is designed for dual gas operation, the gas quality of the gas mixture from gas types A and B that is usually used will be specified in this parameter ⇒ parameter `21380023 Dual gas operation`.

If the plant is only designed for one gas type, this parameter indicates the expected gas quality if a CH4 sensor is installed ⇒ parameter `21380401 CH4 sensor`.

When calculating the set combustion chamber temperatures, the parameter for interpolation via the gas quality is used as a corresponding sampling point for the characteristic curve with parameter `21260226 T set combustion chamber Set 1 at average expected gas quality (Y-axis)` or `21261137 T set combustion chamber Set 2 at average expected gas quality (Y-axis)`.

If no CH4 sensor is installed on a single gas plant, this parameter has no effect.

4.4.5 21260226 T set combustion chamber Set 1 at average expected gas quality (Y-axis)

Read permission: Level 100, Write permission: Level 100

This parameter is used to set the combustion chamber temperature characteristic curve (Set 1) depending on the current power.

This parameter stands for the Y-axis, of the set temperature. The characteristic curve has ten sampling points. Interpolation takes place between the sampling points.

The X-axis can be set via parameter `21260998 T set combustion chamber Set 1 (X-axis)`.

Unit: °C

4.4.6 21380051 Minimum expected gas quality

Read permission: Level 100, Write permission: Level 200

The parameter is visible if at least one of the following parameters is activated:

- `21380023 Dual gas operation⇒Engine⇒Variable gas quality`
- `20130014 CH4 compensation⇒Initial setup`

If a CH4 sensor is installed, the minimum acceptable gas quality of gas type B monitored by the CH4 sensor is indicated in this parameter.

When calculating the set combustion chamber temperatures, the parameter for interpolation via the gas quality is used as a corresponding sampling point for the characteristic curve with parameter `21260218 T set combustion chamber Set 1 at min expected gas quality (Y-axis)` or `21261121 T set combustion chamber Set 2 at min expected gas quality (Y-axis)`.

If no CH4 sensor is installed, this parameter has no effect.

4.4.7 21260218 T set combustion chamber Set 1 at min expected gas quality (Y-axis)

Read permission: Level 100, Write permission: Level 100

This parameter is used to set the combustion chamber temperature characteristic curve (Set 1) depending on the current power.

This parameter stands for the Y-axis, of the set temperature. The characteristic curve has ten sampling points. Interpolation takes place between the sampling points.

The X-axis can be set via parameter `21260998 T set combustion chamber Set 1 (X-axis)`.

Unit: °C

4.4.8 21261100 T set combustion chamber Set 2 (X-axis)

Read permission: Level 100, Write permission: Level 100

The parameter is visible if parameter `20260431 T combustion chamber Set 2 control type` is not deactivated ⇒ `Engine ⇒ T combustion chamber control`.

This parameter is used to set the combustion chamber temperature characteristic curve (Set 2) depending on the current power.

This parameter stands for the X-axis of the measured generator power. The characteristic curve has ten sampling points. The values of the sampling points must increase, i.e. each entry must be greater than the previous one. Interpolation takes place between the sampling points.

The Y-axis can be set via parameter `21261113 T set combustion chamber Set 2 at max expected gas quality (Y-axis)`.

In addition, the combustion chamber temperature can still be shown depending on the gas quality.

To find this, interpolation takes place between the characteristic curves for the maximum expected gas quality, average expected gas quality and minimum expected gas quality. In this case, the characteristic curve `21261113 T set combustion chamber Set 2 at max expected gas quality (Y-axis)` is assigned to the gas quality indicated in parameter `21380038 Maximum expected gas quality`.

If no CH4 sensor is installed (parameter `21380401 CH4 sensor`), only the characteristic curve for maximum expected gas quality (parameter 21260205) is used.

4.4.9 21261113 T set combustion chamber Set 2 at max expected gas quality (Y-axis)

Read permission: Level 100, Write permission: Level 100

The parameter is visible if parameter `20260431 T combustion chamber Set 2 control type` is not deactivated ⇒ `Engine` ⇒ `T combustion chamber control`.

This parameter is used to set the combustion chamber temperature characteristic curve (Set 2) as a function of the current power.

This parameter stands for the Y-axis, of the set temperature. The characteristic curve has ten sampling points. Interpolation takes place between the sampling points.

The X-axis can be set via parameter `21261100 T set combustion chamber Set 2 (X-axis)`.

In addition, the combustion chamber temperature can still be shown depending on the gas quality.

To find this, interpolation takes place between the characteristic curves for the maximum expected gas quality, average expected gas quality and minimum expected gas quality. In this case, the characteristic curve `21261113 T set combustion chamber Set 2 at max expected gas quality (Y-axis)` is assigned to the gas quality indicated in parameter `21380038 Maximum expected gas quality`.

Unit: °C

4.4.10 21261137 T set combustion chamber Set 2 at average expected gas quality (Y-axis)

Read permission: Level 100, Write permission: Level 100

The parameter is visible if parameter `20260431 T combustion chamber Set 2 control type` is not deactivated ⇒ `Engine` ⇒ `T combustion chamber control`.

This parameter is used to set the combustion chamber temperature (Set 2) as a function (Set 2) of the current power.

This parameter stands for the Y-axis, of the set temperature. The characteristic curve has ten sampling points. Interpolation takes place between the sampling points.

The X-axis can be set via parameter `21261100 T set combustion chamber Set 2 (X-axis)`.

Unit: °C

4.4.11 21261121 T set combustion chamber Set 2 at min expected gas quality (Y-axis)

Read permission: Level 100, Write permission: Level 100

The parameter is visible if parameter `20260431 T combustion chamber Set 2 control type` is not deactivated ⇒ `Engine` ⇒ `T combustion chamber control`.

This parameter is used to set the combustion chamber temperature (Set 2) as a function of the current power.

This parameter stands for the Y-axis, of the set temperature. The characteristic curve has ten sampling points. Interpolation takes place between the sampling points.

The X-axis can be set via parameter `21261100 T set combustion chamber Set 2 (X-axis)`.

Unit: °C

4.5 T combustion chamber control

4.5.1 20260431 T combustion chamber Set 2 control type

Read permission: Level 0, Write permission: Level 100

This parameter defines whether it is possible to switch over to T combustion chamber Set 2 or how to switch over to T combustion chamber Set 2. T combustion chamber Set 1 and T combustion chamber Set 2 can be used to switch between different NOx values depending on operational conditions.

The parameterization of Set 1 and Set 2 is done in section T set combustion chamber.

Deactivated

T combustion chamber set 1 is used.

Protocol

Switching is done via protocol.

HMI

Activates parameter `20260444 T set combustion chamber Set 2 (HMI)`.

Switching is done via the HMI.

TPEM IO

The signal at digital input 110K6-DI16 of the TPEM IO is checked.

Signal low: T set combustion chamber Set 1 is activated.

Signal high: T combustion chamber Set 2 is activated.

Switching is done via the digital input.

Mains parallel / Island changeover

The switchover between T combustion chamber set 1 in grid-parallel operation and T combustion chamber set 2 in island operation takes place automatically.

4.5.2 20260444 T set combustion chamber Set 2 (HMI)

Read permission: Level 0, Write permission: Level 50

The parameter is only visible if the parameter `20260431 T combustion chamber Set 2 control type` is parameterized to `HMI`.

Set 1

T set combustion chamber Set 1 is activated.

Set 2

T set combustion chamber Set 2 is activated.

4.5.3 21261019 T combustion chamber control P proportional gain mains parallel mode (Y-axis)

Read permission: Level 100, Write permission: Level 100

This characteristic curve shows the P proportional gain of the combustion chamber controller depending on the current power in mains parallel mode.

The 9 sampling points on the X-axis [0, 0.2, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1] have been programmed to a fixed value.

4.5.4 21261024 T combustion chamber control I proportional gain mains parallel mode (Y-axis)

Read permission: Level 100, Write permission: Level 100

This characteristic curve shows the I proportional gain of the combustion chamber controller depending on the current power in mains parallel mode.

The 9 sampling points on the X-axis [0, 0.2, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1] have been programmed to a fixed value.

4.5.5 21261056 T combustion chamber control P proportional gain island mode (Y-axis)

Read permission: Level 100, Write permission: Level 100

This characteristic curve shows the P proportional gain of the combustion chamber controller depending on the current power in island mode.

The 9 sampling points on the X-axis [0, 0.2, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1] have been programmed to a fixed value.

4.5.6 21261062 T combustion chamber control I proportional gain island mode (Y-axis)

Read permission: Level 100, Write permission: Level 100

This characteristic curve shows the I proportional gain of the combustion chamber controller depending on the current power in island mode.

The 9 sampling points on the X-axis [0, 0.2, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1] have been programmed to a fixed value.

4.6 Power decrease

4.6.1 `21131029 Warming-up phase in island mode`

Read permission: Level 100, Write permission: Level 200

The parameter indicates whether a warming-up phase should be carried out with cold engine after the synchronization in island mode.

Deactivated:

The rated power is approved immediately after the synchronization.

Activated:

If the lube oil temperature has not yet reached the value provided by parameter `21151212 Cold engine to T208 lube oil` after the synchronization, the approved engine power is limited to 40 %.

4.6.2 `21131010 Warming-up phase in mains parallel mode`

Read permission: Level 100, Write permission: Level 200

The parameter indicates whether a warming-up phase for cold engine is to be carried out after the synchronization in mains parallel mode.

Deactivated:

The rated power is approved immediately after the synchronization.

Activated:

If the lube oil temperature has not yet reached the value provided by parameter `21151212 Cold engine to T208 lube oil` after the synchronization, the approved engine power is limited to 40 %.

4.6.3 `21151212 Cold engine to T208 lube oil`

Read permission: Level 100, Write permission: Level 200

Lube oil temperature at engine inlet up to which the engine is classified as cold.

⇒ Parameter `21131029 Warming-up phase in island mode`

⇒ Parameter `21131010 Warming-up phase in mains parallel mode`

Unit: °C

4.6.4 `21202511 RP from T207 coolant`

Read permission: Level 100, Write permission: Level 200

Limit value of the coolant temperature at the engine inlet. If the limit value is exceeded, a power decrease occurs.

The maximum power decrease reduces to 60 % load.

Unit: °C

4.6.5 `21202212 RP from T201 receiver gas type A`

Read permission: Level 100, Write permission: Level 200

Limit value of the mixture temperature in the receiver for Gas type A. If the limit value is exceeded, a power decrease occurs.

The maximum power decrease reduces to 60 % load.

Unit: °C

4.6.6 `21202236 RP from T201 receiver gas type B`

Read permission: Level 100, Write permission: Level 200

Limit value of the mixture temperature in the receiver for Gas type B. If the limit value is exceeded, a power decrease occurs.

The maximum power decrease reduces to 60 % load.

The parameter only operates in dual gas operation. If gas mixing is operated with shares of gas types A and B, the lower value from the parameter pair `21202212 RP from T201 receiver gas type A` and `21202236 RP from T201 receiver gas type B` is always used.

Unit: °C

4.6.7 `21351002 T203 Power decrease due to intake air temperature`

Read permission: Level 100, Write permission: Level 200

This parameter gives a limit value for the intake air temperature. If the value falls below the limit value, a power decrease occurs. The maximum power decrease reduces to 60 % load.

Unit: °C

4.6.8 `21202110 RP gas supply gas quality (X-axis)`

Read permission: Level 100, Write permission: Level 200

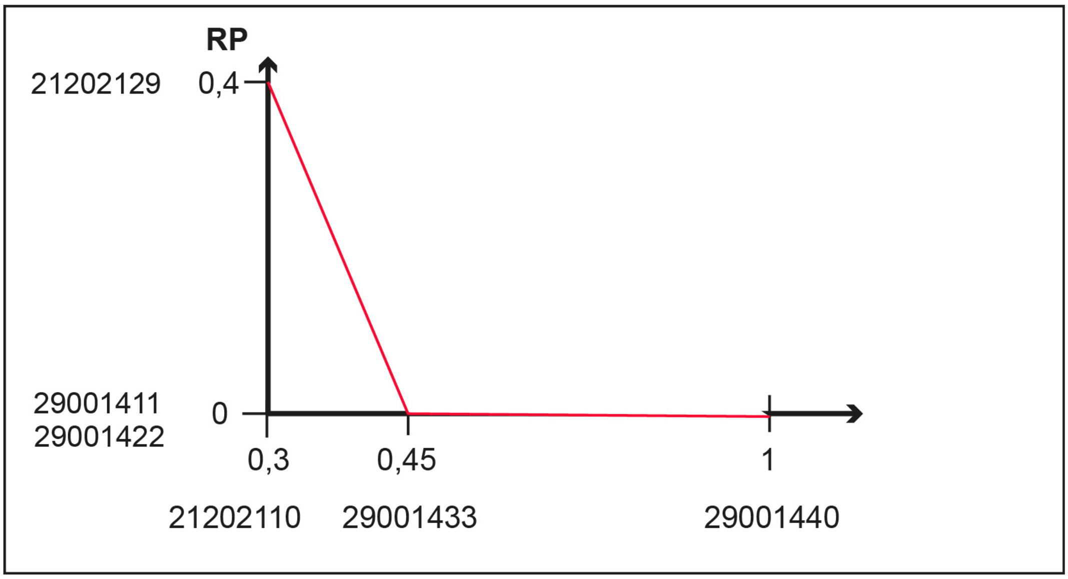
The parameter is visible if at least one of the following parameters is activated:

- `21380023 Dual gas operation⇒Engine⇒Variable gas quality`
- `20130014 CH4 compensation⇒Initial setup`

This parameter represents the X-axis of the characteristic curve for reduced power due to the gas quality. The X-axis here stands for the division of the gas quality. The gas quality can take values from 0 to 1, where 1 stands for very good quality and 0 for very poor quality. The X-axis consists of three sampling points. The values of the sampling points must increase, i.e. each entry must be greater than the previous one. Interpolation takes place between the sampling points.

The values of the Y-axis that represents the corresponding power decrease for the gas qualities can be modified via parameter `21202129 RP gas supply gas quality (Y-axis).`

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL



74701-001 Power decrease depending on the gas quality (example)

4.6.9 21202129 RP gas supply gas quality (Y-axis)

Read permission: Level 100, Write permission: Level 200

The parameter is visible if at least one of the following parameters is activated:

- 21380023 Dual gas operation⇒Engine⇒Variable gas quality
- 20130014 CH4 compensation⇒Initial setup

This parameter represents the Y-axis of the characteristic curve for reduced power due to the gas quality. The Y-axis here stands for the division of the reduced power based on the current gas quality. There are three sampling points. Interpolation takes place between the sampling points.

The division of the X-axis (the gas quality) is set via parameter 21202110 RP gas supply gas quality (X-axis).

4.7 Power control

4.7.1 21135012 Rated power

Read permission: Level 0, Write permission: Level 200

Electrical rated power of the specific plant. The plant-specific rated power is usually parameterized to smaller than the rated power of the model series. Influencing variables can be the installation height or the air humidity at the installation location.

The order-specific documents contain the rated power.

Unit: kW

4.7.2 21100023 Set power maximum value

Read permission: Level 0, Write permission: Level 200

The parameter is visible when parameter `21380023 Dual gas operation` is set to `Deactivated` or to `Switch over operation`.

This parameter is a factor modifying the maximal rated power. The factor is multiplied by the rated power of the generator. For full-load operation, the factor can be set to 1 = 100 %. For overload operation, the factor can be set to a value greater than 1.

The parameter takes effect if the genset is operated exclusively with gas type A (no Admix operation or Full-mix operation). If a gas mixture is used (Admix operation, Full-mix operation), the following parameters are used:

- `21100046 Set power maximum value in Admix operation / Full-mix operation (X-axis)`
- `21100067 Set power maximum value in Admix operation / Full-mix operation (Y-axis)`

4.7.3 21100038 Set power maximum value gas type B

Read permission: Level 0, Write permission: Level 200

The parameter is visible when parameter `21380023 Dual gas operation` is parameterized to `Switch over operation`.

The parameter is a factor for modifying the maximum rated power for gas type B. The factor is multiplied by the rated power of the generator. For full-load operation, the factor can be set to 1 = 100 %. For overload operation, the factor can be set to a value greater than 1.

The parameter is only effective in switch over operation for gas type B. If a gas mixture is used (Admix operation, Full-mix operation), the following parameters are used:

- `21100046 Set power maximum value in Admix operation / Full-mix operation (X-axis)`
- `21100067 Set power maximum value in Admix operation / Full-mix operation (Y-axis)`

4.7.4 21100046 Set power maximum value in Admix operation / Full-mix operation (X-axis)

Read permission: Level 0, Write permission: Level 200

The parameter is visible when parameter `21380023 Dual gas operation` is set to `Admix operation` or to `Dual gas operation`.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

This parameter represents the X-axis of the characteristic curve for modifying the maximum power as a function of the mixing proportion of gas type B in Admix operation or Dual gas operation. The parameter represents the X-axis with the mixing proportions of gas type B. The X-axis consists of seven sampling points. The system interpolates between the sampling points. The parameter `21100067 Set power maximum value in Admix operation / Full-mix operation (Y-axis)` represents the Y-axis with the maximum power.

The characteristic curve takes effect when a gas mixture is used. If only one gas type is used, the following parameters are used:

- `21100023 Set power maximum value`
- `21100038 Set power maximum value gas type B`

4.7.5 21100067 Set power maximum value in Admix operation / Full-mix operation (Y-axis)

Read permission: Level 0, Write permission: Level 200

The parameter is visible when parameter `21380023 Dual gas operation` is set to `Admix operation` or to `Dual gas operation`.

This parameter represents the Y-axis of the characteristic curve for modifying the maximum output as a function of the mixing proportion of gas type B in Admix operation or Full-mix operation. The Y-axis is multiplied by the rated power of the engine. The Y-axis consists of 7 sampling points. The system interpolates between the sampling points. Parameter `21100046 Set power maximum value in Admix operation / Full-mix operation (X-axis)` represents the X-axis with the mixture proportions of gas type B.

The characteristic curve takes effect when a gas mixture is used. If only one gas type is used, the following parameters are used:

- `21100023 Set power maximum value`
- `21100038 Set power maximum value gas type B`

4.7.6 21241068 Power control P proportional gain (X-axis)

Read permission: Level 100

P proportional gain of the power controller. The P proportional gain is a characteristic curve that consists of an X-axis and Y-axis. This parameter corresponds to the X-axis and represents the sampling points of the respective power.

The characteristic curve consists of five sampling points. The values of the sampling points must increase, i.e. each entry must be greater than the previous one. Interpolation takes place between the sampling points.

The Y-axis assigns the associated P proportional gains to the corresponding powers. ⇒ Parameter `21241013 Power control P proportional gain (Y-axis)`.

4.7.7 21241013 Power control P proportional gain (Y-axis)

Read permission: Level 100, Write permission: Level 100

P proportional gain of the power controller. The P proportional gain is a characteristic curve that consists of an X-axis and Y-axis. This parameter corresponds to the Y-axis and represents the amount of the P proportional gain.

The characteristic curve consists of five sampling points. Interpolation takes place between the sampling points.

The X-axis describes the respective power section which assigns a P proportional gain to each power. ⇒ Parameter `21241068 Power control P proportional gain (X-axis)`.

4.7.8 `21241059 Power control I proportional gain (X-axis)`

Read permission: Level 100

I proportional gain of the power controller. The I proportional gain is a characteristic curve that consists of an X-axis and Y-axis. This parameter corresponds to the X-axis and represents the sampling points of the respective power.

The characteristic curve consists of five sampling points. The values of the sampling points must increase, i.e. each entry must be greater than the previous one. Interpolation takes place between the sampling points.

The Y-axis assigns the associated I proportional gains to the corresponding powers. ⇒ Parameter `21241021 Power control I proportional gain (Y-axis)`.

4.7.9 `21241021 Power control I proportional gain (Y-axis)`

Read permission: Level 100, Write permission: Level 100

I proportional gain of the power controller. The I proportional gain is a characteristic curve that consists of an X-axis and Y-axis. This parameter corresponds to the Y-axis and represents the amount of the I proportional gain.

The characteristic curve consists of five sampling points. Interpolation takes place between the sampling points.

The X-axis describes the respective power section which is assigned the I proportional gain. ⇒ Parameter `21241059 Power control I proportional gain (X-axis)`.

4.7.10 `21241076 Power control D proportional gain (X-axis)`

Read permission: Level 100

D proportional gain of the power controller. The D proportional gain is a characteristic curve that consists of an X-axis and Y-axis. This parameter corresponds to the X-axis and represents the sampling points of the respective power.

The characteristic curve consists of five sampling points. The values of the sampling points must increase, i.e. each entry must be greater than the previous one. Interpolation takes place between the sampling points.

The Y-axis assigns the associated D proportional gains to the corresponding powers. ⇒ Parameter `21241037 Power control D proportional gain (Y-axis)`.

4.7.11 `21241037 Power control D proportional gain (Y-axis)`

Read permission: Level 100, Write permission: Level 100

D proportional gain of the power controller. The D proportional gain is a characteristic curve that consists of an X-axis and Y-axis. This parameter corresponds to the Y-axis and represents the amount of the D proportional gain.

The characteristic curve consists of five sampling points. Interpolation takes place between the sampling points.

The X-axis describes the respective power section which is assigned the D proportional gain. ⇒ Parameter `21241076 Power control D proportional gain (X-axis)`.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

4.8 Speed control

4.8.1 21100014 Rated speed

Read permission: Level 0, Write permission: Level 200

Rated speed of the engine in accordance with the order-specific documents.

⇒ Parameter `21225108 Initial set speed`

Unit: 1 rpm

4.8.2 21225108 Initial set speed

Read permission: Level 100, Write permission: Level 100

This parameter indicates the initial setpoint speed. To avoid excessive overshoot during a quick start process, the start process is divided into two ramps. This parameter represents the setpoint speed of ramp 1. The setpoint speed of ramp 2 corresponds to the nominal speed, which can be set via parameter `21100014 Rated speed`.

Unit: 1 rpm

4.8.3 21224018 Power load share P reduction

Read permission: Level 100, Write permission: Level 100

Percentage share of the speed that is included in the calculation of the control deviation of the speed based on the generator power.

Unit: %

4.8.4 21221105 Speed control P proportional gain idle

Read permission: Level 100, Write permission: Level 100

This parameter presets the P proportional gain of the speed controller

- in the start phase before synchronization via the generator circuit breaker
- in no-load mode
- after desynchronization of the generator circuit breaker

4.8.5 21221096 Speed control I proportional gain idle

Read permission: Level 100, Write permission: Level 100

This parameter presets the I proportional gain of the speed controller

- in the start phase before synchronization via the generator circuit breaker
- in no-load mode
- after desynchronization of the generator circuit breaker

4.8.6 21221082 Speed control D proportional gain idle

Read permission: Level 100, Write permission: Level 100

This parameter presets the D proportional gain of the speed controller

- in the start phase before synchronization via the generator circuit breaker
- in no-load mode
- after desynchronization of the generator circuit breaker

4.9 Charging pressure

4.9.1 `21130045 Wastegate (WG)`

Read permission: Level 100, Write permission: Level 200

This parameter indicates whether or not a wastegate is installed.

Activated

Wastegate installed

Deactivated

Wastegate not installed

4.10 Ignition angle

4.10.1 21330227 Global ignition angle (Y-axis)

Read permission: Level 100, Write permission: Level 100

Basic ignition angle of all spark plugs depending on the gas quality. This dependence is shown in a curve whose X-axis represents the gas quality and the Y-axis assigns the associated ignition angle to the corresponding gas qualities. This parameter corresponds to the Y-axis. The characteristic curve contains four sampling points. Interpolation takes place between the sampling points.

The X-axis has the values [0; 0.25; 0.75; 1] for the gas quality. The basic ignition angle is subjected to a power-dependent offset which can be set via parameter `21330242 Ignition angle offset power in mains parallel mode (Y-axis)`.

Unit: °crank angle

4.10.2 21330242 Ignition angle offset power in mains parallel mode (Y-axis)

Read permission: Level 100, Write permission: Level 200

This parameter describes the power-dependent ignition timing adjustment in mains parallel mode. In accordance with the power, an offset to the basic ignition angle to late can be added.

The offset represents a characteristic curve and corresponds to the Y-axis of this characteristic curve. The characteristic curve consists of five sampling points. Interpolation takes place between the sampling points.

The X-axis has the values [0.3; 0.5; 0.6; 0.7; 0.9] of the power.

Basic ignition angle: ⇒ Parameter `21330227 Global ignition angle (Y-axis)`

Unit: °crank angle

4.10.3 21330269 Ignition angle offset power in island mode (Y-axis)

Read permission: Level 100, Write permission: Level 200

This parameter describes the power-dependent ignition timing adjustment in island mode. In accordance with the power, an offset to the basic ignition angle to late can be added.

The offset represents a characteristic curve and corresponds to the Y-axis of this characteristic curve. The characteristic curve consists of five sampling points. Interpolation takes place between the sampling points.

The X-axis has the values [0.3; 0.5; 0.6; 0.7; 0.9] of the power.

Basic ignition angle: ⇒ parameter `21330227 Global ignition angle (Y-axis)`

Unit: °crank angle

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

4.11 Variable gas quality

4.11.1 20380169 Dual gas control type

Read permission: Level 0, Write permission: Level 50

Determines the type of the input signal for the desired mixture ratio between fuel gas A and fuel gas B (select IO or Protocol).

Activates a parameter for operation with fuel gas B (fixed value).

IO

Input signal via an analog input on the TPEM IO Controller in the HAS. Activates parameter 20310183 Input demand value gas type B extended input range.

Protocol

Input signal via the control system interface Modbus.

Fixed value

Activates parameter 20380175 Preselection gas type B, if Switch over operation has been selected in parameter 21380023 Dual gas operation.

Activates parameter 20380188 Gas mixing share gas type B, if Full mix mode or Admix mode has been selected in parameter 21380023 Dual gas operation.

4.11.2 20380175 Preselection gas type B

Read permission: Level 0, Write permission: Level 50

Activates/deactivates gas type B for the next genset start.

The following parameter settings are required:

- 21380023 Dual gas operation: Switch over operation selected
- 20380169 Dual gas control type: Fixed value selected

4.11.3 20380188 Gas mixing share gas type B

Read permission: Level 0, Write permission: Level 50

Specifies the proportion of gas type B. A change in proportion also becomes effective when the genset is running.

The following parameter settings are required:

- 21380023 Dual gas operation: Full mix mode or Admix mode selected
- 20380169 Dual gas control type: Fixed value selected

4.11.4 20380048 Dual gas operation

Read permission: Level 0, Write permission: Level 200

Activates/deactivates the following parameters:

- 20130401 GTR B leakage check
- 20130391 GTR B SSOV monitoring
- 20380073 P152 gas GTR B monitoring

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

- 20130388 GTR B temperature monitor
- 20380057 Gas share B min (at 4 mA)
- 20380061 Gas share B max (at 20 mA)
- 20750185 T202 set MCC inlet at 40 % power gas type B
- 20750199 T202 set MCC inlet at 100 % power gas type B
- 20750173 T405 set MCC RDTR outlet at 40 % power gas type B
- 20750161 T405 set MCC RDTR outlet at 100 % power gas type B
- 21380115 Max demand gas type B for active GTR A
- 21380128 Min demand gas type B for active GTR B

4.11.5 20380057 Gas share B min (at 4 mA)

Read permission: Level 0, Write permission: Level 200

Only valid for dual gas control type IO ⇒ parameter 20380169 Dual gas control type.

Minimum fuel gas share B that is assigned to the analog signal 4 mA.

Unit: %

4.11.6 20380061 Gas share B max (at 20 mA)

Read permission: Level 0, Write permission: Level 200

Only valid for dual gas control type IO ⇒ parameter 20380169 Dual gas control type.

Maximum fuel gas share B that is assigned to the analog signal 20 mA.

Unit: %

4.11.7 20310183 Input demand value gas type B extended input range

Read permission: Level 0, Write permission: Level 200

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

4.11.8 20380127 Gas metering valve A position feedback

Read permission: Level 0, Write permission: Level 200

Activates/deactivates a position feedback signal of the gas metering valve A to the TPEM control.

Activates or deactivates the following parameters:

- 20380085 Gas metering valve A position feedback max (at 20 mA)
- 20380103 Gas metering valve A position feedback min (at 4 mA)
- 20310194 Input gas metering valve A position feedback extended input range

4.11.9 20380085 Gas metering valve A position feedback max (at 20 mA)

Read permission: Level 0, Write permission: Level 200

Maximum valve opening assigned to analog signal 20 mA.

Unit: %

4.11.10 `20380103 Gas metering valve A position feedback min (at 4 mA)`

Read permission: Level 0, Write permission: Level 200

Minimum valve opening assigned to analog signal 4 mA.

Unit: %

4.11.11 `20310194 Input gas metering valve A position feedback extended input range`

Read permission: Level 0, Write permission: Level 200

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

4.11.12 `20380134 Gas metering valve B position feedback`

Read permission: Level 0, Write permission: Level 200

Activates/deactivates a position feedback signal of the gas metering valve B to the TPEM control.

Activates or deactivates the following parameters:

- `20380099 Gas metering valve B position feedback max (at 20 mA)`
- `20380116 Gas metering valve B position feedback min (at 4 mA)`
- `20310208 Input gas metering valve B position feedback extended input range`

4.11.13 `20380099 Gas metering valve B position feedback max (at 20 mA)`

Read permission: Level 0, Write permission: Level 200

Maximum valve opening assigned to analog signal 20 mA.

Unit: %

4.11.14 `20380116 Gas metering valve B position feedback min (at 4 mA)`

Read permission: Level 0, Write permission: Level 200

Minimum valve opening assigned to analog signal 4 mA.

Unit: %

4.11.15 `20310208 Input gas metering valve B position feedback extended input range`

Read permission: Level 0, Write permission: Level 200

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

4.11.16 21380401 CH4 sensor

Read permission: Level 100, Write permission: Level 100

This parameter indicates whether or not a CH4 sensor is installed.

Activated

CH4 sensor installed

Deactivated

CH4 sensor not installed

4.11.17 21380023 Dual gas operation

Read permission: Level 0, Write permission: Level 200

The parameter is used to configure the software for the installed dual gas variant.

Deactivated

Regardless of the type of gas and a possible CH4 measurement, only one gas control line with 2 gas shut-off valves is installed.

Full mix mode (mix mode)

The plant is configured in such a way that two different gases can be processed at the same time. Mixture ratios from 0 % to 100 % share of gas type A/B are possible here. A total of 4 gas shut-off valves and two gas metering valves are installed.

Activates the parameters:

- `21380211 Mix share gas B ramp positive`
- `21380222 Mix share gas B ramp negative`
- `21380316 Actuation current gas metering valve (X-axis)`
- `21380327 Actuation current gas metering valve A (Y-axis)`
- `21380334 Actuation current gas metering valve B (Y-axis)`

Admix mode

The plant is configured in such a way that two different gases can be processed at the same time. However, only mixture ratios from 0 - approx. 30 % share of gas type A or approx. 70-100 % share of gas type B are possible here. A total of three gas safety shut-off valves and one gas mixing valve are installed in the plant, as well as one fixed gap mixer.

The minimum share of gas type B – approx. 70 % – may vary depending on the plant. The exact value is set via parameter `21380233 Minimum share gas type B in admix mode`.

Activates the parameters as in full mix mode and in addition:

- `21380233 Minimum share gas type B in admix mode`

Switch over operation

There are two independent gas control lines, each fitted with two gas shut-off valves that can be switched between. A change to the gas type is only possible when the engine is not running.

4.11.18 21351258 Number of gas trains

Read permission: Level 0, Write permission: Level 200

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

The parameter is only visible when the parameter `21380023 Dual gas operation` is parameterized to `Switch over operation`.

The parameter provides the main control device with the number of installed gas trains in `Dual gas operation: switch over operation`.

Parameterization is necessary during commissioning in order to control the installed gas valves. Parameterization is only possible when the genset is stopped. If the parameter is parameterized during operation, the engine is stopped by an alarm.

Parameterization shall not be carried out after commissioning. An adjustment of the parameter leads to a prevention of engine start or use of the wrong gas type and therefore to limited engine performance up to the prevention of engine start.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

5 Generator

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5.1 Monitoring

5.1.1 `20130080 Temperature monitoring generator winding (GW)`

Read permission: Level 0, Write permission: Level 200

Activates the generator winding temperature monitoring.

If one of the winding temperatures exceeds the predefined limit, this generates a corresponding message. ⇒ Parameter `20750136 Temperature monitoring generator winding insulation class`.

5.1.2 `20750136 Temperature monitoring generator winding insulation class`

Read permission: Level 0, Write permission: Level 200

The parameter defines the maximum permissible temperature of the generator windings. The limit must correspond with the insulation class of the generator.

See the rating plate for the insulation class of the generator windings.

Insulation class	Permissible temperature
B	up to 120 °C
F	up to 140 °C
H	up to 165 °C

5.1.3 `20310387 Input generator winding U compensation measuring line`

Read permission: Level 0, Write permission: Level 200

⇒ Parameter `20310365 Input generator bearing A compensation measuring line`

5.1.4 `20310398 Input generator winding V compensation measuring line`

Read permission: Level 0, Write permission: Level 200

⇒ Parameter `20310365 Input generator bearing A compensation measuring line`

5.1.5 `20310404 Input generator winding W compensation measuring line`

Read permission: Level 0, Write permission: Level 200

⇒ Parameter `20310365 Input generator bearing A compensation measuring line`

5.1.6 `20750148 Temperature monitoring generator bearing max`

Read permission: Level 0, Write permission: Level 200

The parameter is only displayed when parameter `20130095 Temperature monitoring generator bearing` is activated in `Initial setup`.

Defines the maximum permissible temperature of the generator bearing A (T459) and generator bearing B (T460).

Unit: 1 °C

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

5.1.7 20310365 Input generator bearing A compensation measuring line

Read permission: Level 0, Write permission: Level 200

The temperature calculation is based on the resistance value. Long measuring lines can lead to distorted resistance values and incorrect temperatures. The measuring line resistance value can be measured and entered into the parameter. The resistance value entered is taken into account in the temperature calculation.

Unit: Ohm

5.1.8 20310379 Input generator bearing B compensation measuring line

Read permission: Level 0, Write permission: Level 200

⇒ Parameter `20310365 Input generator bearing A compensation measuring line`

5.1.9 20750157 Temperature monitoring generator air max

Read permission: Level 0, Write permission: Level 200

The parameter is only displayed when parameter `20130102 Temperature monitoring generator air` is activated in `Initial setup`.

Defines the maximum permissible temperature at the generator cooling air outlet (T488).

Maximum permissible temperature at the generator cooling air inlet (T487): T487 = T488 - 5 K.

Unit: 1 °C

5.1.10 20310412 Input air generator inlet compensation measuring line

Read permission: Level 0, Write permission: Level 200

⇒ Parameter `20310365 Input generator bearing A compensation measuring line`

5.1.11 20310420 Input air generator outlet compensation measuring line

Read permission: Level 0, Write permission: Level 200

⇒ Parameter `20310365 Input generator bearing A compensation measuring line`

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

6 Gas train (GTR)

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6.1 General

6.1.1 `20130166 GTR A leakage check`

Read permission: Level 0, Write permission: Level 200

Activates / deactivates the leakage check in gas train A.

Activated:

Except in the case of a black start, the control expects a successful leakage check within a defined time period for every genset start.

If the leakage check is not successful, an alarm sounds.

6.1.2 `20130401 GTR B leakage check`

Read permission: Level 0, Write permission: Level 200

Activates / deactivates the leakage check in gas train B.

Activated:

Except in the case of a black start, the control expects a successful leakage check within a defined time period for every genset start.

If the leakage check is not successful, an alarm sounds.

6.1.3 `20130342 GTR A SSOV monitoring`

Read permission: Level 0, Write permission: Level 200

Activates the monitoring of the safety shut-off valve in gas control line A.

Prerequisite:

Terminal 110K2: DI13 at the TPEM IO in the HAS is assigned a high signal.

Activated:

If the signal at the abovementioned input drops to Low, an alarm is issued: `GTR A SSOV released`.

6.1.4 `20130391 GTR B SSOV monitoring`

Read permission: Level 0, Write permission: Level 200

Activates the monitoring of the safety shut-off valve in gas control line B.

Prerequisite:

Terminal 110K2: DI16 at the TPEM IO in the HAS is assigned a high signal.

Activated:

If the signal at the abovementioned input drops to Low, an alarm is issued: `GTR B SSOV released`.

6.1.5 `20130350 P132 gas GTR A monitoring`

Read permission: Level 0, Write permission: Level 200

Activates the monitoring of the maximum gas pressure in gas control line A.

Prerequisite:

Terminal 110K4: DI16 at the TPEM IO in the HAS is assigned a high signal.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

Activated:

If the signal at the abovementioned input drops to Low, a warning is issued: `P132 GTR A too high`

6.1.6 20380073 P152 gas GTR B monitoring

Read permission: Level 0, Write permission: Level 200

Activates the monitoring of the maximum gas pressure in gas control line B.

Prerequisite:

Terminal 110K3: DI3 at the TPEM IO in the HAS is assigned a high signal.

Activated:

If the signal at the abovementioned input drops to Low, a warning is issued: `P152 GTR A too high`

6.1.7 20130298 GTR A temperature monitor

Read permission: Level 0, Write permission: Level 200

Activated:

Activates the temperature monitoring in gas control line A. If the temperature limit value is exceeded, an alarm sounds.

The temperature limit is not parameterizable on the TPEM TP.

6.1.8 20130388 GTR B temperature monitor

Read permission: Level 0, Write permission: Level 200

Activated:

Activates the temperature monitoring in gas control line B. If the temperature limit value is exceeded, an alarm sounds.

The temperature limit is not parameterizable on the TPEM Touch Panel.

6.1.9 20390009 CH4 value min (at 4 mA)

Read permission: Level 0, Write permission: Level 100

The parameter is only displayed when parameter `20130014 CH4 compensation` is activated in `Initial setup`.

Defines the minimum possible CH4 value in the fuel gas.

Unit: %

6.1.10 20390014 CH4 value max (at 20 mA)

Read permission: Level 0, Write permission: Level 100

The parameter is only displayed when parameter `20130014 CH4 compensation` is activated in `Initial setup`.

Defines the maximum possible CH4 value in the fuel gas.

Unit: %

6.1.11 `20310058 Input CH4 value extended input range`

Read permission: Level 0, Write permission: Level 100

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

7 Heating circuit (HC), cooling circuits (ECC, DCC, MCC)

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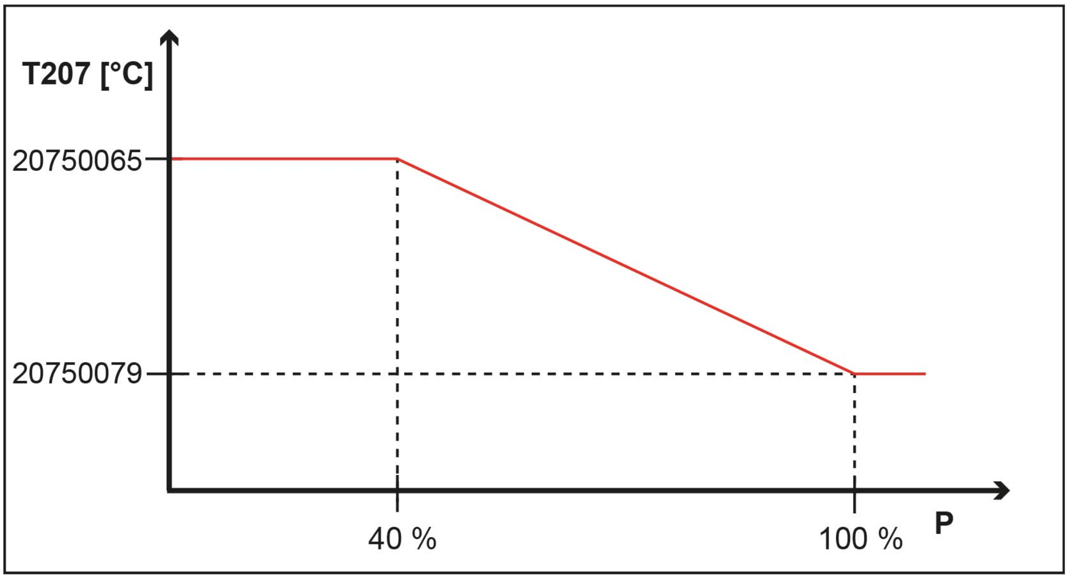
7.1 Heating circuit and engine cooling circuit (HC, ECC)

In mains parallel mode and at engine loads between 40 % and 100 %, the TPEM system determines the maximum value for the inlet temperature of the engine coolant (T207) through linear interpolation between these two values.

Depending on the flow temperature of the heating circuit, the control system can reduce the interpolated value by up to 10 K.

In island mode, the value parameterized for 100 % load always applies.

Raising the inlet temperature of the engine coolant at partial load leads to a load-independent flow temperature of the heating water.



60830-003 Characteristic curve desired value T207 for engine inlet temperature

7.1.1 Controller optimization

During controller optimization, only ever adjust one parameter and wait for the change to take effect before changing other parameters.

If the standard values do not lead to a satisfactory control behavior, proceed as follows:

- Run genset with standard settings until the inlet temperature of the engine coolant in normal operation takes on a constant value or fluctuates by a constant value.
- When the engine coolant inlet temperature changes too slowly, increase parameter `20430229 ECC control P proportional gain` or `20430101 ECC control P proportional gain` in small increments until the inlet temperature no longer fluctuates.
- When the engine coolant inlet temperature is unsteady, decrease parameter `20430229 ECC control P proportional gain` or `20430101 ECC control P proportional gain` in small increments until the inlet temperature no longer fluctuates.

- Set parameter `20430229 ECC control P proportional gain` or `20430101 ECC control P proportional gain` to the nearest 0.75 of the previously determined value.
- Operate genset with desired value jumps: Change inlet temperature of the engine coolant using the parameters `20750079 T207 set ECC engine inlet at 100 % power` or `20750065 T207 set ECC engine inlet at 40 % power`. Then change parameter `20430210 ECC control D proportional gain` or `20430117 ECC control D proportional gain` in small increments until the engine coolant inlet temperature quickly approaches the desired value without overshooting it.

Note

The runtime of the control valve influences the control behavior. Offset a long runtime using larger dynamic and static values.

7.1.2 20130265 T386 monitoring upstream of LHE

Read permission: Level 0, Write permission: Level 200

Activated

Measurement of the temperature in the heating circuit upstream of the lube oil heat exchanger.

7.1.3 20430229 ECC control P proportional gain

Read permission: Level 0, Write permission: Level 100

Valid at **deactivated** parameter `60008997 Return temperature increase`

The parameter influences the controller's proportional gain (stationary behavior).

The greater the numerical value, the better the controller reacts to control deviations.

Unit: none

7.1.4 20430101 ECC control P proportional gain

Read permission: Level 0, Write permission: Level 100

Valid at **activated** parameter `60008997 Return temperature increase`

The parameter influences the controller's proportional gain (stationary behavior).

The greater the numerical value, the better the controller reacts to control deviations.

Unit: none

7.1.5 20430210 ECC control D proportional gain

Read permission: Level 0, Write permission: Level 100

Valid at **deactivated** parameter `60008997 Return temperature increase`

The parameter influences the control behavior in the event of fast-paced control deviations (dynamic behavior).

The parameter influences the controller's proportional gain (stationary behavior).

The greater the numerical value, the better the controller reacts to large fast-paced control deviations.

A higher D value dampens continuous vibrations.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

Unit: none

7.1.6 `20430117 ECC control D proportional gain`

Read permission: Level 0, Write permission: Level 100

Valid at **activated** parameter `60008997 Return temperature increase`

The parameter influences the control behavior in the event of fast-paced control deviations (dynamic behavior).

The parameter influences the controller's proportional gain (stationary behavior).

The greater the numerical value, the better the controller reacts to large fast-paced control deviations.

A higher D value dampens continuous vibrations.

Unit: none

7.1.7 `20430255 ECC control low pass time`

Read permission: Level 0, Write permission: Level 200

Valid at **deactivated** parameter `60008997 Return temperature increase`

A high value corresponds to a strong filter. For filtering fast (high-frequency) changes.

Unit: ms

7.1.8 `20430196 ECC control low pass time`

Read permission: Level 0, Write permission: Level 200

Valid at **activated** parameter `60008997 Return temperature increase`

A high value corresponds to a strong filter. For filtering fast (high-frequency) changes.

Unit: ms

7.1.9 `20430232 ECC control dead band`

Read permission: Level 0, Write permission: Level 200

Valid at **deactivated** parameter `60008997 Return temperature increase`

The parameter influences the controller's output sensitivity. The parameter defines the area within which a controlled variable (± y_{min}) has no effect on the position of the control valve. The dead band therefore defines the smallest travel time of the control valve.

Too small a dead band leads to frequent readjustment of the control valve. Too large a dead band makes it difficult for the desired value to be adhered to.

Unit: %

7.1.10 `20430174 ECC control dead band`

Read permission: Level 0, Write permission: Level 200

Valid at **activated** parameter `60008997 Return temperature increase`

The parameter influences the controller's output sensitivity. The parameter defines the area within which a controlled variable (± y_{min}) has no effect on the position of the control valve. The dead band therefore defines the smallest travel time of the control valve.

Too small a dead band leads to frequent readjustment of the control valve. Too large a dead band makes it difficult for the desired value to be adhered to.

Unit: %

7.1.11 `20750065 T207 set ECC engine inlet at 40 % power`

Read permission: Level 0, Write permission: Level 200

Setpoint value for the control of the engine coolant inlet temperature (T207) at 40 % power.

Unit: °C

7.1.12 `20750079 T207 set ECC engine inlet at 100 % power`

Read permission: Level 0, Write permission: Level 200

Setpoint value for the control of the engine coolant inlet temperature (T207) at 100 % power.

Unit: °C

7.1.13 `20430092 HC supply flow control T291 set`

Read permission: Level 0, Write permission: Level 200

Set value for the control of the heating water flow temperature (T291).

When exceeding the set value, the set value for the inlet temperature of the engine coolant is slowly reduced.

Unit: °C

7.1.14 `20430076 HC supply flow control P proportional gain`

Read permission: Level 0, Write permission: Level 200

The parameter influences the controller's proportional gain (stationary behavior).

The greater the numerical value, the better the controller reacts to control deviations.

Unit: none

7.1.15 `20430084 HC supply flow control I proportional gain`

Read permission: Level 0, Write permission: Level 200

The parameter influences the control behavior in the event of stationary control deviations.

The greater the numerical value, the better and faster the controller reacts to stationary control deviations.

Unit: none

7.1.16 `20430207 HC supply flow control low pass time`

Read permission: Level 0, Write permission: Level 200

A high value corresponds to a strong filter. For filtering fast (high-frequency) changes.

Unit: ms

7.1.17 `20430130 ECC pump switch-off delay`

Read permission: Level 0, Write permission: Level 200

The circulation pump can be damaged when it is switched on and off too frequently.

To protect the circulation pump, a switch-off delay can be parameterized.

If the circulation pump is switched back on while the delay time is elapsing, the delay is aborted and restarted when it is switched off again.

If the switch-off delay is parameterized to the value 0 seconds, no switch-off delay takes place.

Unit: s

7.1.18 `20430158 HC pump switch-off delay`

Read permission: Level 0, Write permission: Level 200

The circulation pump can be damaged when it is switched on and off too frequently.

To protect the circulation pump, a switch-off delay can be parameterized.

If the circulation pump is switched back on while the delay time is elapsing, the delay is aborted and restarted when it is switched off again.

If the switch-off delay is parameterized to the value 0 seconds, no switch-off delay takes place.

Unit: s

7.1.19 `20430125 T207 set CPH`

Read permission: Level 0, Write permission: Level 200

This parameter is only available on the TPEM TP if parameter `20130009 Coolant preheating (CPH)` is activated. ⇒ Initial setup

If the coolant temperature falls below the desired value, the coolant preheating switches on.

If the coolant temperature reaches the desired value +5 K, the coolant preheating switches off.

If a switch-off delay is defined via parameter `20430130 ECC pump switch-off delay`, the circulation pump switches off once the delay time has elapsed.

Unit: °C

7.1.20 `20430264 T207 set CPH flex module`

Read permission: Level 0, Write permission: Level 200

This parameter is only available on the TPEM TP if parameter `20133842 Coolant preheating (CPH) flex module` is not deactivated. ⇒ Initial setup

If the coolant temperature falls below the desired value, the coolant preheating switches on.

If the coolant temperature reaches the desired value +5 K, the coolant preheating switches off.

If a switch-off delay is defined via parameter `20430130 ECC pump switch-off delay`, the circulation pump switches off once the delay time has elapsed.

Unit: °C

7.2 Time periods

7.2.1 `20750104 Pump run-on time`

Read permission: Level 0, Write permission: Level 200

To protect the engine and the exhaust heat exchanger from overheating, the engine cooling circuit pump, mixture cooling circuit pump and heating circuit pump and their controls must continue running for a certain time period after shutdown of the engine.

Unit: min

If a switch-off delay is defined via the following parameters, the circulation pumps switch off once the pump run-on time plus the corresponding delay time have elapsed.

- `20430130 ECC pump switch-off delay`
- `20480071 MCC pump switch-off delay`
- `20430158 HC pump switch-off delay`

For information on the cabin ventilation run-on time, see

- Section 8.1 General ⇒ parameter `20420064 CV cabin ventilation run-on time`

7.3 Dump cooling circuit or dual core radiator (DCC/DCR)

Depending on how the parameters `201030474 DCR type` and `201030425 DCC RDTR type` are parameterized in the Initial setup section, the parameters marked with + in the columns of the following table are available.

Parameter `201030474 DCR type` parameterized for:

- Frequency control, 2nd column
- Stage switching, 3rd column

Parameter `201030474 DCR type` deactivated

Parameter `201030425 DCC RDTR type` parameterized for

- Frequency control, 4th column
- Stage switching, 5th column

Parameters	DCR Fre-quen-cy	DCR Level	DCC RDTR Fre-quency	DCC RDTR Level
20430045 DCC control P proportional gain	-	-	+	+
20430059 DCC control D proportional gain	-	-	+	+
20430182 DCC control low pass time	-	-	+	+
20430163 DCC control dead band	-	-	+	+
20430149 DCC pump switch-off delay	-	-	+	+
20750022 T419 set DCC RDTR outlet at 40 % power	+	+	+	+
20750033 T419 set DCC RDTR outlet at 100 % power	+	+	+	+
20470091 DCC RDTR/DCR max stage number	-	+	-	+
20470114 DCC RDTR/DCR temperature difference	-	+	-	+
20470109 DCC RDTR/DCR downtime	-	+	-	+
20470123 DCC RDTR/DCR reaction time	-	+	-	+
20470042 DCC RDTR/DCR control P proportional gain	+	-	+	-
20470075 DCC RDTR/DCR control I proportional gain	+	-	+	-
20470050 DCC RDTR/DCR control D proportional gain	+	-	+	-
20470088 DCC RDTR/DCR control low pass time	+	-	+	-

7.3.1 Controller optimization

During controller optimization, only ever adjust one parameter and wait for the change to take effect before changing other parameters.

If the standard values do not lead to a satisfactory control behavior, proceed as follows:

- Run genset with standard settings until the inlet temperature of the engine coolant in emergency cooling operation takes on a constant value or fluctuates by a constant value.
- When the engine coolant inlet temperature changes too slowly, increase parameter `20430045 DCC control P proportional gain` in small increments until the inlet temperature no longer fluctuates.
- When the engine coolant inlet temperature is unsteady, decrease parameter `20430045 DCC control P proportional gain` in small increments until the inlet temperature no longer fluctuates.
- Parameter `20430045 DCC control P proportional gain` to the nearest 0.75 of the previously determined value.
- Run genset with setpoint jumps:Change inlet temperature of the engine coolant using the parameters `20750079 T207 set ECC engine inlet at 100 % power` or `20750065 T207 set ECC engine inlet at 40 % power`. Then change the parameter `20430059 DCC control D proportional gain` in small increments until the engine coolant inlet temperature quickly approaches the setpoint value without overshooting it.

Note

The runtime of the control valve influences the control behavior. Offset a long runtime using larger dynamic and static values.

7.3.2 `20430045 DCC control P proportional gain`

Read permission: Level 0, Write permission: Level 100

The parameter influences the controller's proportional gain (stationary behavior).

The greater the numerical value, the better the controller reacts to control deviations.

7.3.3 `20430059 DCC control D proportional gain`

Read permission: Level 0, Write permission: Level 100

The parameter influences the control behavior in the event of fast-paced control deviations (dynamic behavior).

The greater the numerical value, the better the controller reacts to large fast-paced control deviations.

A higher D value dampens continuous vibrations.

7.3.4 `20430182 DCC control low pass time`

Read permission: Level 0, Write permission: Level 200

A high value corresponds to a strong filter. For filtering fast (high-frequency) changes.

Unit: ms

7.3.5 `20430163 DCC control dead band`

Read permission: Level 0, Write permission: Level 200

The parameter influences the controller's output sensitivity. The parameter defines the area within which a controlled variable (± y_{min}) has no effect on the position of the control valve. The dead band therefore defines the smallest travel time of the control valve.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

Too small a dead band leads to frequent readjustment of the control valve. Too large a dead band makes it difficult for the setpoint value to be adhered to.

Unit: %

7.3.6 `20430149 DCC pump switch-off delay`

Read permission: Level 0, Write permission: Level 200

The circulation pump can be damaged when it is switched on and off too frequently.

To protect the circulation pump, a switch-off delay can be parameterized.

If the circulation pump is switched back on while the delay time is elapsing, the delay is aborted and restarted when it is switched off again.

If the switch-off delay is parameterized to the value 0 seconds, no switch-off delay takes place.

Unit: s

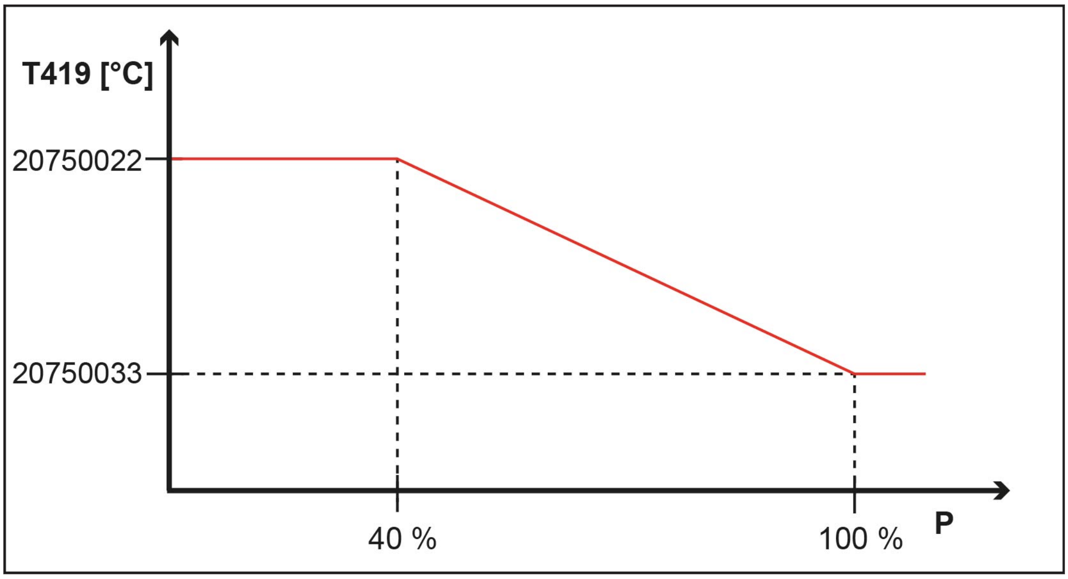
7.3.7 `20750022 T419 set DCC RDTR outlet at 40 % power`

Read permission: Level 0, Write permission: Level 200

Desired value for the control of the outlet temperature at the dump cooling circuit recooler or dual core radiator (T419) at 40 % load.

Unit: °C

For engine loads between 40% and 100%, the desired value for the outlet temperature at the recooler is interpolated between these two values.



60983-003 Characteristic curve desired value T419 for outlet temperature of dump cooling circuit recooler

7.3.8 `20750033 T419 set DCC RDTR outlet at 100 % power`

Read permission: Level 0, Write permission: Level 200

Desired value for the control of the outlet temperature at the dump cooling circuit recooler or dual core radiator (T419) at 100 % load.

Unit: °C

7.3.9 20470091 DCC RDTR/DCR max stage number

Read permission: Level 0, Write permission: Level 200

For parameterizing the maximum number of cooling stages available.

7.3.10 20470114 DCC RDTR/DCR temperature difference

Read permission: Level 0, Write permission: Level 200

Temperature difference between the calculated setpoint T419 and the measured actual value T419. The temperature difference triggers a switchover to higher or lower cooling stages.

T419: Dump cooling circuit recooler outlet temperature

Unit: °C

7.3.11 20470109 DCC RDTR/DCR downtime

Read permission: Level 0, Write permission: Level 200

If the measured actual temperature T419 is longer than the reaction time (parameter `20470123`) and the temperature difference (parameter `20470114`) is greater than the calculated desired value T419, cooler groups are activated at downtime intervals.

Unit: s

7.3.12 20470123 DCC RDTR/DCR reaction time

Read permission: Level 0, Write permission: Level 200

If the measured actual temperature T419 is longer than the reaction time (parameter `20470123`) and the temperature difference (parameter `20470114`) is greater than the calculated desired value T419, cooler groups are activated at downtime intervals.

Unit: s

7.3.13 20470042 DCC RDTR/DCR control P proportional gain

Read permission: Level 0, Write permission: Level 100

The parameter influences the controller's proportional gain (stationary behavior).

The greater the numerical value, the better the controller reacts to control deviations.

7.3.14 20470075 DCC RDTR/DCR control I proportional gain

Read permission: Level 0, Write permission: Level 100

The parameter influences the control behavior in the event of stationary control deviations.

The greater the numerical value, the better and faster the controller reacts to stationary control deviations.

7.3.15 20470050 DCC RDTR/DCR control D proportional gain

Read permission: Level 0, Write permission: Level 100

The parameter influences the control behavior in the event of fast-paced control deviations (dynamic behavior).

The greater the numerical value, the better the controller reacts to large fast-paced control deviations.

A higher D value dampens continuous vibrations.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

7.3.16 `20470088 DCC RDTR/DCR control low pass time`

Read permission: Level 0, Write permission: Level 200

A high value corresponds to a strong filter. For filtering fast (high-frequency) changes.

Unit: ms

7.4 Mixture cooling circuit (MCC)

Depending on how the parameters 201030474 DCR type and 201030417 MCC RDTR type are parameterized in the Initial setup section, the parameters marked with + in the columns of the following table are available.

Parameter 201030474 DCR type parameterized for:

- Frequency control, 2nd column
- Stage switching, 3rd column

Parameter 201030474 DCR type deactivated

Parameter 201030417 MCC RDTR type parameterized for

- Frequency control, 4th column
- Stage switching, 5th column

Parameters	DCR Frequency	DCR Level	MCC RDTR Frequency	MCC RDTR Level
20750040 T202 set MCC inlet at 40 % power	+	+	+	+
20750054 T202 set MCC inlet at 100 % power	+	+	+	+
20750185 T202 set MCC inlet at 40 % power gas type B	+	+	+	+
20750199 T202 set MCC inlet at 100 % power gas type B	+	+	+	+
20480047 MCC control P proportional gain	+	+	+	+
20480052 MCC control D proportional gain	+	+	+	+
20480094 MCC control low pass time	+	+	+	+
20480083 MCC control dead band	+	+	+	+
20480071 MCC pump switch-off delay	+	+	+	+
20750006 T405 set MCC RDTR outlet at 40 % power	+	+	+	+
20750011 T405 set MCC RDTR outlet at 100 % power	+	+	+	+
20750173 T405 set MCC RDTR outlet at 40 % power gas type B	+	+	+	+
20750161 T405 set MCC RDTR outlet at 100 % power gas type B	+	+	+	+
20490096 MCC RDTR max stage number	-	-	-	+
20490118 MCC RDTR temperature difference	-	-	-	+
20490105 MCC RDTR downtime	-	-	-	+
20490126 MCC RDTR reaction time	-	-	-	+
20490049 MCC RDTR control P proportional gain	-	-	+	-
20490074 MCC RDTR control I proportional gain	-	-	+	-

Parameters	DCR Fre-quen-cy	DCR Level	MCC RDTR Fre-quency	MCC RDTR Level
20490058 MCC RDTR control D proportional gain	-	-	+	-
20490082 MCC RDTR control low pass time	-	-	+	-

7.4.1 Controller optimization

During controller optimization, only ever adjust one parameter and wait for the change to take effect before changing other parameters.

If the standard values do not lead to a satisfactory control behavior, proceed as follows:

- Run genset with standard settings until the inlet temperature of the mixture cooler in normal operation takes on a constant value or fluctuates by a constant value.
- When the mixture cooler inlet temperature changes too slowly, increase parameter `20480047 MCC control P proportional gain` in small increments until the inlet temperature of the mixture cooler no longer fluctuates.
- When the mixture cooler inlet temperature is unsteady, decrease parameter `20480047 MCC control P proportional gain` in small increments until the inlet temperature of the mixture cooler no longer fluctuates.
- Parameter `20480047 MCC control P proportional gain` to the nearest 0.75 of the previously determined value.
- Run genset with setpoint jumps: Change inlet temperature of the mixture cooler using the parameter `20750054 T202 set MCC inlet at 100 % power`. Then change the parameter `20480052 MCC control D proportional gain` in small increments until the mixture cooler inlet temperature quickly approaches the setpoint value without overshooting it.

7.4.2 `20750040 T202 set MCC inlet at 40 % power`

Read permission: Level 0, Write permission: Level 200

Setpoint value for the control of the inlet temperature of the coolant into the mixture cooler at 40 % load.

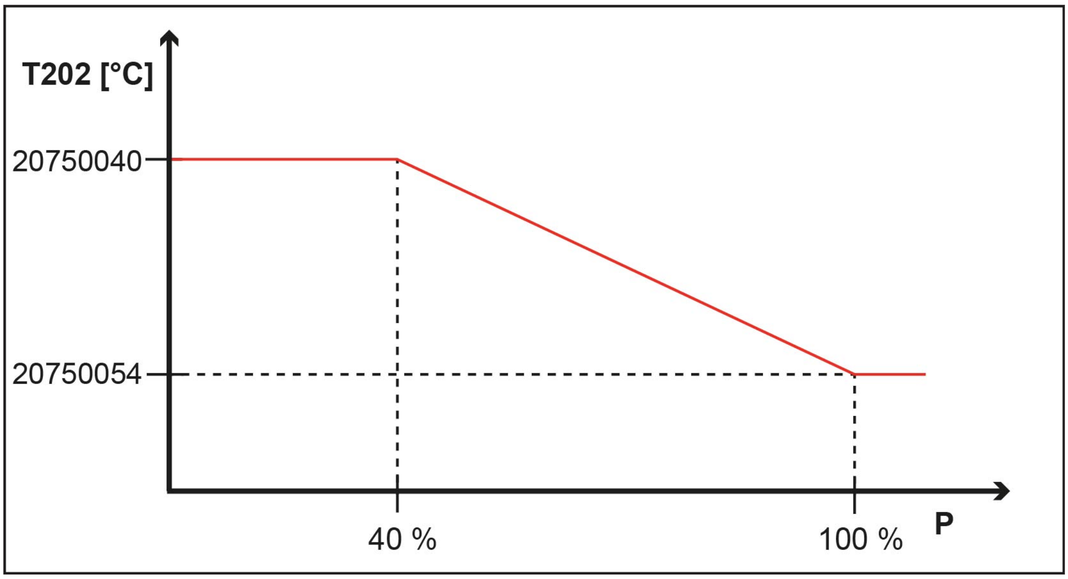
Unit: °C

Risk of destruction of components

Always set the value according to the demands of the planning, otherwise the engine may be damaged.

For engine loads between 40 % and 100 %, the desired value for the inlet temperature is interpolated between these two values.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL



60984-004 Characteristic curve desired value T202 for mixture cooler gas type A inlet temperature

7.4.3 `20750054 T202 set MCC inlet at 100 % power`

Read permission: Level 0, Write permission: Level 200

Setpoint value for the control of the inlet temperature of the coolant into the mixture cooler at 100 % load.

Unit: °C

Risk of destruction of components

Always set the value according to the demands of the planning, otherwise the engine may be damaged.

7.4.4 `20750185 T202 set MCC inlet at 40 % power gas type B`

Read permission: Level 0, Write permission: Level 200

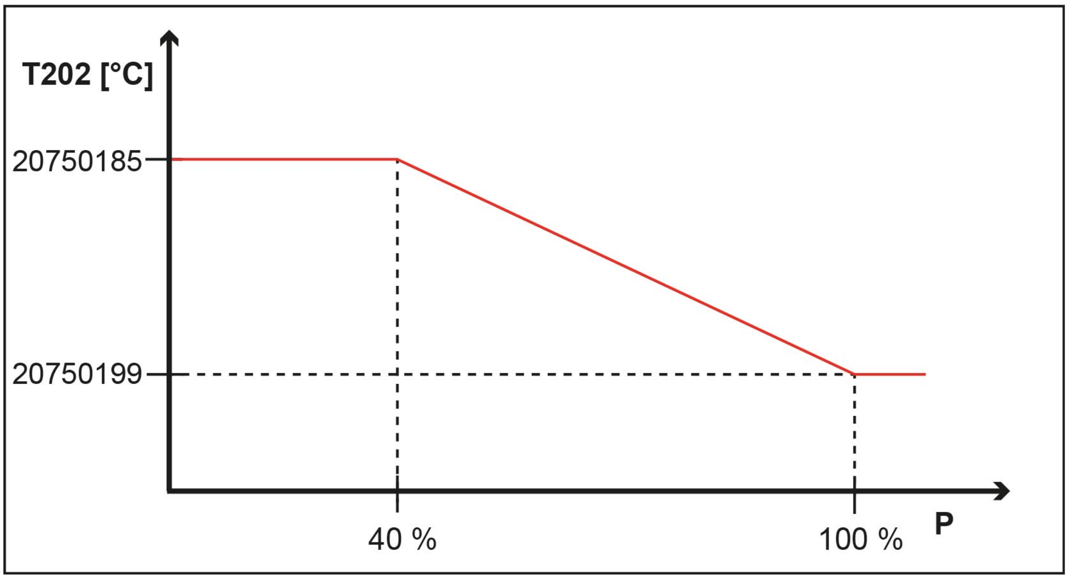
Setpoint value for the control of the inlet temperature of the coolant into the mixture cooler at 40 % load.

Unit: °C

Risk of destruction of components

Always set the value according to the demands of the planning, otherwise the engine may be damaged.

For engine loads between 40 % and 100 %, the desired value for the inlet temperature is interpolated between these two values.



67699-002 Characteristic curve desired value T202 for mixture cooler gas type B inlet temperature

7.4.5 `20750199 T202 set MCC inlet at 100 % power gas type B`

Read permission: Level 0, Write permission: Level 200

Setpoint value for the control of the inlet temperature of the coolant into the mixture cooler at 100 % load.

Unit: °C

Risk of destruction of components

Always set the value according to the demands of the planning, otherwise the engine may be damaged.

7.4.6 `20480047 MCC control P proportional gain`

Read permission: Level 0, Write permission: Level 100

The parameter influences the controller's proportional gain (stationary behavior).

The greater the numerical value, the better the controller reacts to control deviations.

7.4.7 `20480052 MCC control D proportional gain`

Read permission: Level 0, Write permission: Level 100

The parameter influences the control behavior in the event of fast-paced control deviations (dynamic behavior).

The greater the numerical value, the better the controller reacts to large fast-paced control deviations.

A higher D value dampens continuous vibrations.

7.4.8 `20480094 MCC control low pass time`

Read permission: Level 0, Write permission: Level 200

A high value corresponds to a strong filter. For filtering fast (high-frequency) changes.

Unit: ms

7.4.9 `20480083 MCC control dead band`

Read permission: Level 0, Write permission: Level 200

The parameter influences the controller's output sensitivity. The parameter defines the area within which a controlled variable (± y_{min}) has no effect on the position of the control valve. The dead band therefore defines the smallest travel time of the control valve.

Too small a dead band leads to frequent readjustment of the control valve. Too large a dead band makes it difficult for the setpoint value to be adhered to.

Unit: %

7.4.10 `20480071 MCC pump switch-off delay`

Read permission: Level 0, Write permission: Level 200

The circulation pump can be damaged when it is switched on and off too frequently.

To protect the circulation pump, a switch-off delay can be parameterized.

If the circulation pump is switched back on while the delay time is elapsing, the delay is aborted and restarted when it is switched off again.

If the switch-off delay is parameterized to the value 0 seconds, no switch-off delay takes place.

Unit: s

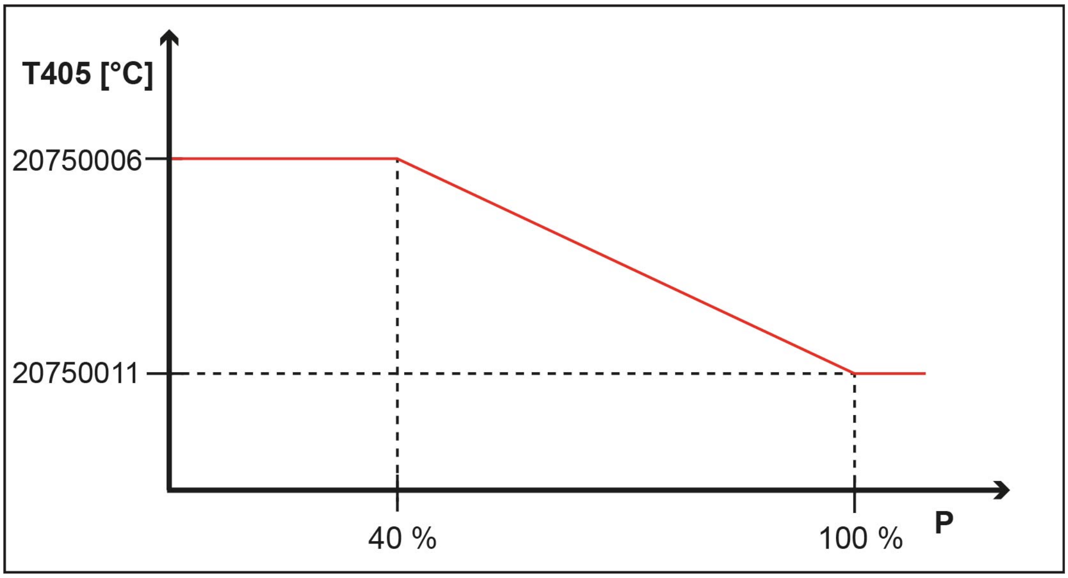
7.4.11 `20750006 T405 set MCC RDTR outlet at 40 % power`

Read permission: Level 0, Write permission: Level 200

Desired value for the control of the coolant outlet temperature at the recooler in mixture cooling circuit at 40 % load.

Unit: °C

For engine loads between 40 % and 100 %, the desired value for the outlet temperature is interpolated between these two values.



60982-004 Characteristic curve desired value T405 for mixture cooling circuit recooler gas type A outlet temperature

7.4.12 `20750011 T405 set MCC RDTR outlet at 100 % power`

Read permission: Level 0, Write permission: Level 200

Desired value for the control of the coolant outlet temperature at the recooler in mixture cooling circuit at 100 % load.

Unit: °C

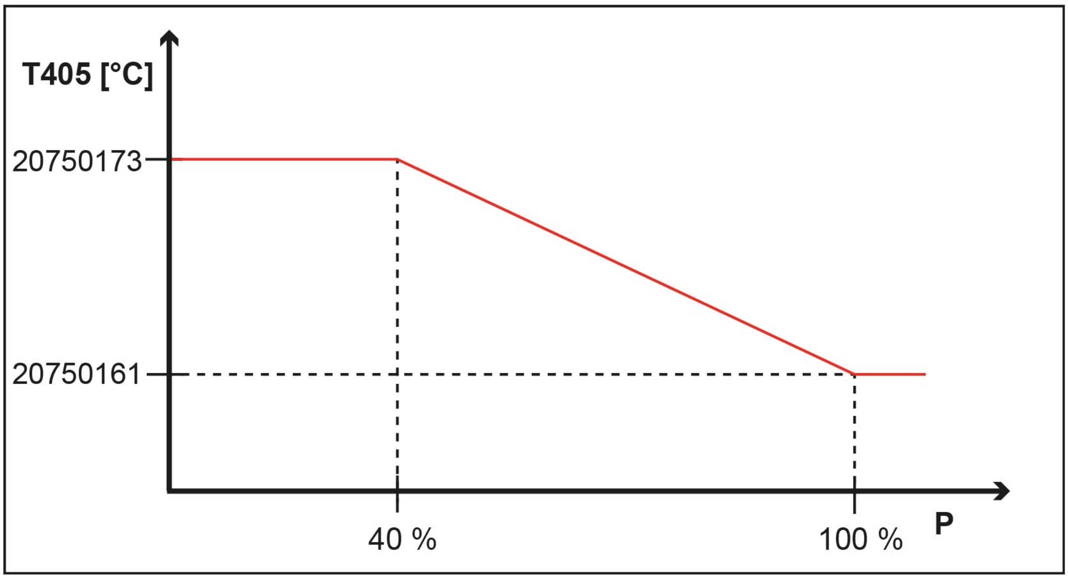
7.4.13 `20750173 T405 set MCC RDTR outlet at 40 % power gas type B`

Read permission: Level 0, Write permission: Level 200

Desired value for the control of the coolant outlet temperature at the recooler in mixture cooling circuit at 40 % load.

Unit: °C

For engine loads between 40 % and 100 %, the desired value for the outlet temperature is interpolated between these two values.



67700-002 Characteristic curve desired value T405 for mixture cooling circuit recooler gas type B outlet temperature

7.4.14 `20750161 T405 set MCC RDTR outlet at 100 % power gas type B`

Read permission: Level 0, Write permission: Level 200

Desired value for the control of the coolant outlet temperature at the recooler in mixture cooling circuit at 100 % load.

Unit: °C

7.4.15 `20490096 MCC RDTR max stage number`

Read permission: Level 0, Write permission: Level 200

For parameterizing the maximum number of cooling stages available.

7.4.16 `20490118 MCC RDTR temperature difference`

Read permission: Level 0, Write permission: Level 200

Temperature difference between the calculated setpoint T405 and the measured actual value T405. The temperature difference triggers a switchover to higher or lower cooling stages.

T405: Mixture cooling circuit - recooler outlet temperature

Unit: °C

7.4.17 `20490105 MCC RDTR downtime`

Read permission: Level 0, Write permission: Level 200

If the measured actual temperature T405 is longer than the reaction time (parameter `20490126`) and the temperature difference (parameter `20490118`) is greater than the calculated desired value T405, cooler groups are activated at downtime intervals.

Unit: s

7.4.18 `20490126 MCC RDTR reaction time`

Read permission: Level 0, Write permission: Level 200

If the measured actual temperature T405 is longer than the reaction time (parameter `20490126`) and the temperature difference (parameter `20490118`) is greater than the calculated desired value T405, cooler groups are activated at downtime intervals.

Unit: s

7.4.19 `20490049 MCC RDTR control P proportional gain`

Read permission: Level 0, Write permission: Level 100

The parameter influences the controller's proportional gain (stationary behavior).

The greater the numerical value, the better the controller reacts to control deviations.

7.4.20 `20490074 MCC RDTR control I proportional gain`

Read permission: Level 0, Write permission: Level 100

The parameter influences the control behavior in the event of stationary control deviations.

The greater the numerical value, the better and faster the controller reacts to stationary control deviations.

7.4.21 `20490058 MCC RDTR control D proportional gain`

Read permission: Level 0, Write permission: Level 100

The parameter influences the control behavior in the event of fast-paced control deviations (dynamic behavior).

The parameter influences the controller's proportional gain (stationary behavior).

The greater the numerical value, the better the controller reacts to large fast-paced control deviations.

A higher D value dampens continuous vibrations.

7.4.22 `20490082 MCC RDTR control low pass time`

Read permission: Level 0, Write permission: Level 200

A high value corresponds to a strong filter. For filtering fast (high-frequency) changes.

Unit: ms

8 Cabin ventilation (CV)

Table of contents

8.1 General

8.1.1 `20420170 CV control at genset standstill`

Read permission: Level 0, Write permission: Level 100

Deactivated

The supply air temperature and the outlet air temperature of the genset room are not controlled after the genset has been shut down and after the expiry of the follow-up time (parameter 20420064).

Activated

The supply air temperature and the outlet air temperature of the genset room are controlled by the setpoint values of the following parameters, after the genset has been shut down and after the expiry of the follow-up time (parameter 20420064):

- `20420181 T404 set CV supply air at genset standstill`
- `20420197 T604 set CV exhaust air at genset standstill`

8.1.2 `20420181 T404 set CV supply air at genset standstill`

Read permission: Level 0, Write permission: Level 100

Setpoint temperature for the supply air downstream of the air inlet into the genset room when the genset is stopped and after the expiry of the follow-up time (parameter 20420064). The cabin air temperature (TIC+404) functions as a control variable.

The parameter controls the position of the circulation flap and the outlet flap.

Unit: °C

The control behavior of the PID controller can be influenced by the following parameters:

- `20420029 CV supply air control P proportional gain`
- `20420032 CV supply air control D proportional gain`
- `20420124 CV supply air control low pass time`
- `20420108 CV supply air control dead band`

8.1.3 `20420197 T604 set CV exhaust air at genset standstill`

Read permission: Level 0, Write permission: Level 100

Setpoint temperature for the outlet air upstream of the air inlet into the genset room when the genset is stopped and after the expiry of the follow-up time (parameter 20420064). (TIC 604) functions as a control variable. The ventilator speed is regulated.

Unit: °C

The control behavior of the PID controller can be influenced by the following parameters:

- `20420007 CV exhaust air control P proportional gain`
- `20420078 CV exhaust air control I proportional gain`
- `20420010 CV exhaust air control D proportional gain`
- `20420119 CV exhaust air control low pass time`

8.1.4 `20420064 CV cabin ventilation run-on time`

Read permission: Level 0, Write permission: Level 100

During the follow-up time, the control of the cabin ventilation is still active with the desired values from the following parameters:

- `20420041 T set CV supply air during operation`
- `20420055 T604 set CV exhaust air during operation`

The run-on time of the cabin ventilation starts after the genset has stopped.

Unit: min

8.1.5 **20420041 T set CV supply air during operation**

Read permission: Level 0, Write permission: Level 100

Setpoint temperature for the supply air after the air inlet into the genset room. The cabin air temperature (TIC+404) or, when the circuit breaker is closed, the engine inlet temperature (TIC+203), functions as a control variable.

The parameter influences the control of the circulation flap and outlet flap position.

The setpoint value is active between the genset start requirement and the end of the follow-up time.

Unit: °C

The control behavior of the PID controller can be influenced by the following parameters:

- `20420029 CV supply air control P proportional gain`
- `20420032 CV supply air control D proportional gain`
- `20420124 CV supply air control low pass time`
- `20420108 CV supply air control dead band`

8.1.6 **20420029 CV supply air control P proportional gain**

Read permission: Level 0, Write permission: Level 100

The parameter influences:

- The control of the circulation flap and outlet flap position
- The controller's proportional gain (stationary behavior)

The greater the numerical value, the better the controller reacts to control deviations.

Unit: none

8.1.7 **20420032 CV supply air control D proportional gain**

Read permission: Level 0, Write permission: Level 100

The parameter influences:

- The control of the circulation flap and outlet flap position
- The control behavior in the event of fast-paced control deviations (dynamic behavior)
- The controller's proportional gain (stationary behavior)

The greater the numerical value, the better the controller reacts to large fast-paced control deviations.

A higher D value can be used to dampen continuous vibrations.

Unit: none

8.1.8 `20420124 CV supply air control low pass time`

Read permission: Level 0, Write permission: Level 200

A high value corresponds to a strong filter. Fast (high-frequency) changes are filtered.

Unit: ms

8.1.9 `20420108 CV supply air control dead band`

Read permission: Level 0, Write permission: Level 200

The parameter influences the controller's output sensitivity. The parameter defines the area within which a controlled variable (± y_{min}) has no effect on the position of the actuator. The dead band therefore defines the smallest travel time of the actuator.

Too small a dead band leads to frequent readjustment of the actuator. Too large a dead band makes it difficult for the setpoint value to be adhered to.

Unit: %

8.1.10 `20420055 T604 set CV exhaust air during operation`

Read permission: Level 0, Write permission: Level 100

Set temperature for the outlet air upstream of the air outlet from the genset room. (TIC 604) functions as a control variable. The ventilator speed is regulated.

The setpoint value is active between the genset start requirement and the end of the follow-up time.

Unit: °C

The control behavior of the PID controller can be influenced by the following parameters:

- `20420007 CV exhaust air control P proportional gain`
- `20420078 CV exhaust air control I proportional gain`
- `20420010 CV exhaust air control D proportional gain`
- `20420119 CV exhaust air control low pass time`

8.1.11 `20420007 CV exhaust air control P proportional gain`

Read permission: Level 0, Write permission: Level 100

The parameter influences:

- The ventilator speed control
- The controller's proportional gain (stationary behavior)

The greater the numerical value, the better the controller reacts to control deviations.

Unit: none

8.1.12 `20420078 CV exhaust air control I proportional gain`

Read permission: Level 0, Write permission: Level 100

The parameter influences:

- The ventilator speed control
- The control behavior in the event of stationary control deviations

The greater the numerical value, the better and faster the controller reacts to stationary control deviations.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

Unit: none

8.1.13 `20420010 CV exhaust air control D proportional gain`

Read permission: Level 0, Write permission: Level 100

The parameter influences:

- The ventilator speed control
- The control behavior in the event of fast-paced control deviations (dynamic behavior)
- The controller's proportional gain (stationary behavior)

The greater the numerical value, the better the controller reacts to large fast-paced control deviations.

A higher D value is used to dampen continuous vibrations.

Unit: none

8.1.14 `20420119 CV exhaust air control low pass time`

Read permission: Level 0, Write permission: Level 100

A high value corresponds to a strong filter. Filters fast (high-frequency) changes.

Unit: ms

8.1.15 `20420135 994 Ventilator minimum speed at 40 % power`

Read permission: Level 0, Write permission: Level 100

A minimum ventilator speed is calculated based on the current set load point (E198.5) of the genset.

The ventilator speed is linearly interpolated and extrapolated between the defined speed points for 40 % and 100 % of the rated power.

Unit: %

8.1.16 `20420143 994 Ventilator minimum speed at 100 % power`

Read permission: Level 0, Write permission: Level 200

A minimum ventilator speed is calculated based on the current set load point (E198.5) of the genset.

The ventilator speed is linearly interpolated and extrapolated between the defined speed points for 40 % and 100 % of the rated power.

Unit: %

8.2 Intake air preheating

8.2.1 `20410015 T203 set intake air`

Read permission: Level 0, Write permission: Level 200

Setpoint value for the intake air temperature, which activates the intake air preheating when undercut.

Unit: °C

8.2.2 `20410028 T203 set intake air gas type B`

Read permission: Level 0, Write permission: Level 200

Setpoint value for the intake air temperature for gas type B, which activates the intake air preheating when undercut.

Unit: °C

8.2.3 `20410031 T203 set intake air dead band deactivation`

Read permission: Level 0, Write permission: Level 200

Value by which the intake air temperature T203 must exceed the active setpoint value in order to deactivate the control. Additionally, the valve stop `864 Air preheater control valve stop position cold (closed)` must be reached.

Unit: °C

8.2.4 `20410044 IAP control minimum signal length`

Read permission: Level 0, Write permission: Level 200

Minimal signal length for adjustment of the 3-way valve.

Too short a signal length leads to frequent readjustment of the control valve.

Too long a signal length makes it difficult for the setpoint value to be adhered to.

Unit: ms

8.2.5 `20410089 IAP control delay time activation`

Read permission: Level 0, Write permission: Level 200

Delay time, which passes after activation until the control begins.

Unit: s

8.2.6 `20410090 IAP control delay time deactivation`

Read permission: Level 0, Write permission: Level 200

Delay time, which passes after deactivation until the control stops.

Unit: s

8.2.7 `20410053 IAP control P proportional gain`

Read permission: Level 0, Write permission: Level 200

The parameter influences the controller's proportional gain (stationary behavior).

The greater the numerical value, the better the controller reacts to control deviations.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

8.2.8 `20410066 IAP control D proportional gain`

Read permission: Level 0, Write permission: Level 200

The parameter influences the control behavior in the event of fast-paced control deviations (dynamic behavior).

The greater the numerical value, the better the controller reacts to large fast-paced control deviations.

A higher D value dampens continuous vibrations.

9 Exhaust gas

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9.1 Exhaust heat exchanger (EHE)

9.1.1 `20750087 T288 max EHE outlet at 40 % power`

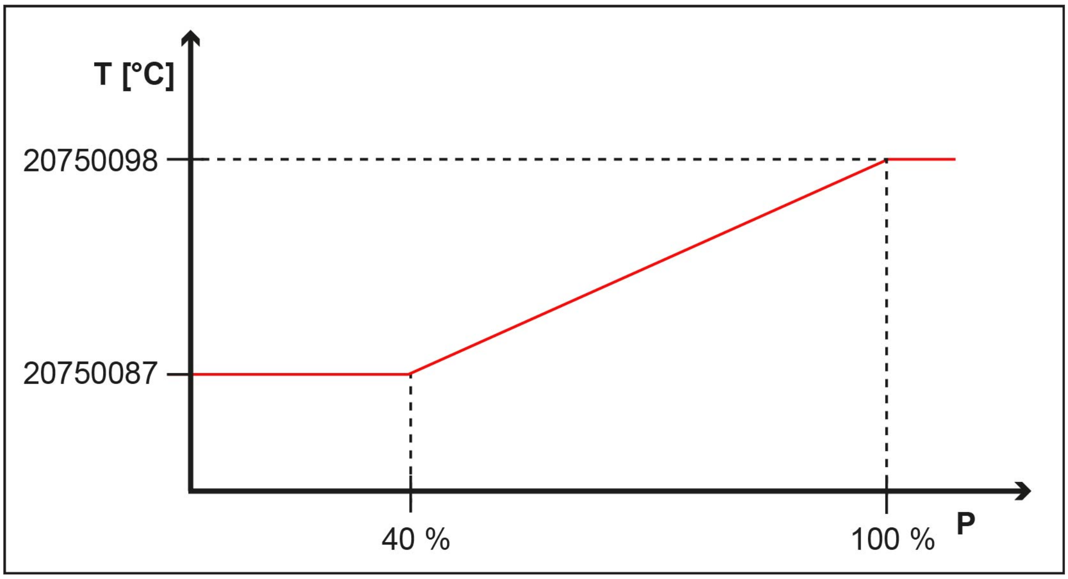
Read permission: Level 0, Write permission: Level 200

Maximum exhaust temperature downstream of the exhaust heat exchanger (T288) at 40 % load.

Unit: 1 °C

For engine loads between 40 % and 100 %, the maximum value for the exhaust gas temperature is interpolated between the two values for 40 % load and 100 % load.

If the exhaust temperature exceeds the maximum value, the genset performs a quick stop.



60985-003 Characteristic curve T288 max EHE outlet

9.1.2 `20750098 T288 max EHE outlet at 100 % power`

Read permission: Level 0, Write permission: Level 200

Maximum exhaust temperature downstream of the exhaust heat exchanger (T288) at 100 % load.

Unit: 1 °C

10 Grid code

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200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.1 General

Grid code regulates, among other things, the behavior of generating plants for electrical energy in the public electricity network under defined operating conditions.

The relevant mains operator defines the grid code with consideration of the regulations coordinated in associations, national, European or international committees.

The grid code corresponds to the requirements of the considered mains network and covers requirements for the control of the active and reactive power output of the gensets, among others.

10.1.1 `20105612 Grid code mode`

Read permission: Level 0, Write permission: Level 230

The customer plant can be connected to the mains of the general supply (public mains) according to one of the following rules.

BDEW

BDEW medium voltage directive, 2008 version, incl. 4th amendment

The required parameters are activated.

AR-N 4110

VDE-AR-N 4110:2018-11

The required parameters are activated.

General Grid Code

Expanded parameter set for the general grid code

The required parameters are activated.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.2 General (Grid code mode: BDEW)

10.2.1 20105051 Reactive power mode

Read permission: Level 0, Write permission: Level 230

PF demand

With parameter 20251826 PF demand source, the source can be parameterized as fixed value, analog or via Modbus.

⇒ Section 10.13 Offset factor PF (Grid code mode: BDEW).

PF(P)

The offset factor characteristic curve PF(P) is defined by eight sampling points, twice.

⇒ Section 10.13 Offset factor PF (Grid code mode: BDEW).

Q(U)

The reactive power voltage characteristic curve Q(U) is defined by eight sampling points, twice.

⇒ Section 10.16 Reactive power Q (Grid code mode: BDEW)

Q demand

With parameter 20910033 Reactive power demand source, the source can be parameterized as fixed value, analog or via Modbus.

⇒ Section 10.16 Reactive power Q (Grid code mode: BDEW).

10.2.2 20105131 Normal active power ramp with power decrease

Read permission: Level 0, Write permission: Level 200

Slope of the active power ramp between the actual power and the demanded power at power decrease.

Possible in mains parallel mode if neither the fast active power ramp nor the slow active power ramp is requested by the mains operator.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Input as a percentage of the rated power per second.

Unit: % P_{Rated}/s

Range of application: 100 % to 0 % power

For further information on the fast active power ramp and the slow active power ramp, see

- ⇒Behavior after mains decoupling (Grid code mode: BDEW)
- ⇒Mains-dependent power decrease (Grid code mode: BDEW)

10.2.3 20105128 Normal active power ramp with power increase

Read permission: Level 0, Write permission: Level 200

Slope of the active power ramp between the actual power and the demanded power at power increase.

Possible in mains parallel mode if neither the fast active power ramp nor the slow active power ramp is requested by the mains operator.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Input as a percentage of the rated power per second.

Unit: % P_{Rated}/s

Range of application: 100 % to 0 % power

For further information on the fast active power ramp and the slow active power ramp, see

- ⇒Behavior after mains decoupling (Grid code mode: BDEW)
- ⇒Mains-dependent power decrease (Grid code mode: BDEW)

10.2.4 20105206 Test mode Grid code functions

Read permission: Level 0, Write permission: Level 100

For testing the function of the frequency-dependent active power reduction and the voltage-dependent reactive power functions.

Activates/deactivates the following parameters:

- 20105935 Source for mains frequency offset
- 20105211 P(f): Displacement to the current mains frequency
- 20252259 Mains frequency source
- 20105350 Q(U): Mains voltage as an absolute value
- 20105908 P(f): Mains frequency offset mode

10.2.5 20105935 Source for mains frequency offset

Read permission: Level 0, Write permission: Level 100

Fixed value

For test purposes, an offset to the mains frequency can be entered as a fixed value.

Activates the parameter:

- 20105211 P(f): Displacement to the current mains frequency

Analog

An analog input is not available for Grid code mode: BDEW.

Modbus

For test purposes, an offset to the current mains frequency can be specified by Modbus from a higher-level control station.

10.2.6 `20105211 P(f): Displacement to the current mains frequency`

Read permission: Level 0, Write permission: Level 100

Offset, which is added to the actual mains frequency in order to test the frequency-dependent active power reduction.

Unit: Hz

10.2.7 `20252259 Mains frequency source`

Read permission: Level 0, Write permission: Level 100

Selection of the basis for generating the frequency deviation in test mode.

Frequency measurement

The currently measured mains frequency is used as a basis.

Rated frequency

The rated frequency is used as a basis.

10.2.8 `20105350 Q(U): Mains voltage as an absolute value`

Read permission: Level 0, Write permission: Level 100

Demand of an artificial value instead of the currently measured phase-phase voltage of the mains for testing the Q(U) characteristic curve.

Unit: V

10.2.9 `20105908 P(f): Mains frequency offset mode`

Read permission: Level 0, Write permission: Level 100

Step

Mains frequency changes occur abruptly to the new value.

Ramp

Mains frequency changes occur evenly via a ramp to the new value.

Activates parameter `20105919 Slope of frequency change`.

10.2.10 `20105919 Slope of frequency change`

Read permission: Level 0, Write permission: Level 100

Slope of the ramp at frequency change with the `ramp` selection in parameter `20105908 P(f): Mains frequency offset mode`.

Unit: Hz/s

10.3 General (Grid code mode: AR-N 4110)

10.3.1 `20105807 Lower mains voltage limit mains connection`

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization in normal operation. Minimum voltage at the mains connection point at which a connection and synchronization of the genset with the higher-ranking mains is permitted. The parameter value refers to the smallest concatenated voltage.

Indicated as a percentage of the agreed supply voltage. The mains voltage measured by the TPEM MFR is analyzed. The value in % thus relates to parameter `22017682 Rated voltage` (Mains). The analog input -128K1/AI3 `Measured voltage value for reactive power modes` is not analyzed to determine the voltage amplitude.

Unit: % U_c

10.3.2 `20105792 Upper mains voltage limit mains connection`

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization in normal operation. Maximum voltage at the mains connection point at which a connection and synchronization of the genset with the higher-ranking mains is permitted. The parameter value refers to the smallest concatenated voltage.

Indicated as a percentage of the agreed supply voltage. The mains voltage measured by the TPEM MFR is analyzed. The value in % thus relates to parameter `22017682 Rated voltage` (Mains). The analog input -128K1/AI3 `Measured voltage value for reactive power modes` is not analyzed to determine the voltage amplitude.

Unit: % U_c

10.3.3 `20105829 Lower mains frequency limit mains connection`

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization in normal operation. Minimum mains frequency at which a connection and synchronization of the genset with the higher-ranking mains is permitted.

Unit: % f_n

10.3.4 `20105810 Upper mains frequency limit mains connection`

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization in normal operation. Maximum mains frequency at which a connection and synchronization of the genset with the higher-ranking mains is permitted.

Unit: % f_n

10.3.5 `20105131 Normal active power ramp with power decrease`

Read permission: Level 0, Write permission: Level 200

Slope of the active power ramp between the actual power and the demanded power at power decrease.

Possible in mains parallel mode if neither the fast active power ramp nor the slow active power ramp is requested by the mains operator.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

In mains parallel mode, the active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Input as a percentage of the rated power per second.

Unit: % P_{Rated}/s

Range of application: 100 % to 0 % power

10.3.6 `20105128 Normal active power ramp with power increase`

Read permission: Level 0, Write permission: Level 200

Slope of the active power ramp between the actual power and the demanded power at power increase.

Possible in mains parallel mode if neither the fast active power ramp nor the slow active power ramp is requested by the mains operator.

In mains parallel mode, the active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Input as a percentage of the rated power per second.

Unit: % P_{Rated}/s

Range of application: 0 % to 100 % power

10.3.7 `20105661 Option direct marketing`

Read permission: Level 0, Write permission: Level 230

In order for the power demand to be implemented by third parties (direct marketing), supply voltage must be applied to 127K1/DI1 `Direct marketing demand` (see TPEM IO wiring diagram).

Activates or deactivates the following parameters:

- `20105620 Direct marketing active power ramp`
- `20251024 Direct marketing power demand AI (at 4 mA)`
- `20251035 Direct marketing power demand AI (at 20 mA)`

10.3.8 `20105620 Direct marketing active power ramp`

Read permission: Level 0, Write permission: Level 230

Slope of the active power ramp in the case of an active power specification by third parties (e.g. a direct marketer). The active power ramp is used for the power increase and the power decrease.

Input as a percentage of the rated active power per second.

Unit: % P_{Rated}/s

10.3.9 `20105206 Test mode Grid code functions`

Read permission: Level 0, Write permission: Level 100

For testing the function of the frequency-dependent active power reduction and the voltage-dependent reactive power functions.

Activates/deactivates the following parameters:

- `20105935 Source for mains frequency offset`
- `20105211 P(f): Displacement to the current mains frequency`
- `20252259 Mains frequency source`
- `20105350 Q(U): Mains voltage as an absolute value`
- `20105908 P(f): Mains frequency offset mode`

10.3.10 `20105935 Source for mains frequency offset`

Read permission: Level 0, Write permission: Level 100

Fixed value

For test purposes, an offset to the mains frequency can be entered as a fixed value.

Activates the parameter:

- `20105211 P(f): Displacement to the current mains frequency`

Analog

For test purposes, an offset to the mains frequency can be entered as an analog value.

⇒ Inputs and outputs (Grid code mode: AR-N 4110 and General Grid Code):

- `20105970 Input offset mains frequency min (at 4 mA)`
- `20105962 Input offset mains frequency max (at 20 mA)`

Modbus

For test purposes, an offset to the current mains frequency can be specified by Modbus from a higher-level control station.

10.3.11 `20105211 P(f): Displacement to the current mains frequency`

Read permission: Level 0, Write permission: Level 100

Offset, which is added to the actual mains frequency in order to test the frequency-dependent active power reduction.

Unit: Hz

10.3.12 `20252259 Mains frequency source`

Read permission: Level 0, Write permission: Level 100

Selection of the basis for generating the frequency deviation in test mode.

Frequency measurement

The currently measured mains frequency is used as a basis.

Rated frequency

The rated frequency is used as a basis.

10.3.13 `20105350 Q(U): Mains voltage as an absolute value`

Read permission: Level 0, Write permission: Level 100

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

Demand of an artificial value instead of the currently measured phase-phase voltage of the mains for testing the Q(U) characteristic curve.

Unit: V

10.3.14 `20105908 P(f): Mains frequency offset mode`

Read permission: Level 0, Write permission: Level 100

Step

Mains frequency changes occur abruptly to the new value.

Ramp

Mains frequency changes occur evenly via a ramp to the new value.

Activates parameter `20105919 Slope of frequency change`.

10.3.15 `20105919 Slope of frequency change`

Read permission: Level 0, Write permission: Level 100

Slope of the ramp at frequency change with the `ramp` selection in parameter `20105908 P(f): Mains frequency offset mode`.

Unit: Hz/s

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.4 General (Grid code mode: General Grid Code)

10.4.1 `20105072 Reactive power mode`

Read permission: Level 0, Write permission: Level 230

Selection via DI

The digital inputs are evaluated across all modes.

PF demand

With parameter `20250998 PF demand source`, the source can be parameterized as fixed value, analog, digital (active high), digital (active low), or via Modbus.

⇒ Section 10.15 Offset factor PF (Grid code mode: General Grid Code).

Q(P)

Reactive power is provided according to the reactive power characteristic curve as based on the active power.

⇒ Section 10.17 Reactive power (Grid code mode: AR-N 4110 and General Grid Code)

Q(U)+Qref

Reactive power is provided according to the reactive power demand Q with voltage limitation function.

⇒ Section 10.17 Reactive power (Grid code mode: AR-N 4110 and General Grid Code)

Q(U)+UQ0

Reactive power is provided according to the reactive power voltage characteristic curve Q(U) + UQ0.

⇒ Section 10.17 Reactive power (Grid code mode: AR-N 4110 and General Grid Code)

Q setpoint mode

Reactive power is provided according to the reactive power demand.

⇒ Section 10.17 Reactive power (Grid code mode: AR-N 4110 and General Grid Code)

PF(P)

The offset factor characteristic curve PF(P) is defined by four sampling points.

⇒ Section 10.15 Offset factor PF (Grid code mode: General Grid Code).

Voltage setpoint mode U

Reactive power is provided according to the mains voltage demand procedure.

⇒ Section 10.18 Voltage setpoint mode U (Grid code mode: General Grid Code).

PF(U)

The offset factor characteristic curve PF(U) is defined by four sampling points.

⇒ Section 10.15 Offset factor PF (Grid code mode: General Grid Code).

Three digital inputs -127K1/DI2, DI3 and DI11 are provided on the TPEM IO Controller for the switchover and digital outputs -129K1/DO, DO2 and DO3 are provided for the feedback (see TPEM IO wiring diagram).

Allocation is defined according to the following table:

Demand / Charac-teristic curve	127K1/DI2, 129K1/DO1	127K1/DI3, 129K1/DO2	127K1/DI11, 129K1/DO3
PF demand	0	0	0
Q(U) + Qref	1	0	0
Q(P)	0	1	0
Q(U) + UQ0	1	1	0
Q setpoint mode	0	0	1
PF(P)	1	0	1
Voltage setpoint mode U	0	1	1
PF(U)	1	1	1

10.4.2 20105807 Lower mains voltage limit mains connection

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization in normal operation. Minimum voltage at the mains connection point at which a connection and synchronization of the genset with the higher-ranking mains is permitted. The parameter value refers to the smallest concatenated voltage.

Indicated as a percentage of the agreed supply voltage. The mains voltage measured by the TPEM MFR is analyzed. The value in % thus relates to parameter `22017682 Rated voltage` (Mains). The analog input -128K1/AI3 `Measured voltage value for reactive power modes` is not analyzed to determine the voltage amplitude.

Unit: % U_c

10.4.3 20105792 Upper mains voltage limit mains connection

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization in normal operation. Maximum voltage at the mains connection point at which a connection and synchronization of the genset with the higher-ranking mains is permitted. The parameter value refers to the smallest concatenated voltage.

Indicated as a percentage of the agreed supply voltage. The mains voltage measured by the TPEM MFR is analyzed. The value in % thus relates to parameter `22017682 Rated voltage` (Mains). The analog input -128K1/AI3 `Measured voltage value for reactive power modes` is not analyzed to determine the voltage amplitude.

Unit: % U_c

10.4.4 20105829 Lower mains frequency limit mains connection

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization in normal operation. Minimum mains frequency at which a connection and synchronization of the genset with the higher-ranking mains is permitted.

Unit: % f_n

10.4.5 20105810 Upper mains frequency limit mains connection

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization in normal operation. Maximum mains frequency at which a connection and synchronization of the genset with the higher-ranking mains is permitted.

Unit: % f_n

10.4.6 20251679 Activation of active power ramp after mains coupling

Read permission: Level 0, Write permission: Level 230

Activates/deactivates the parameter `20251665 Active power ramp after mains coupling`

10.4.7 20251665 Active power ramp after mains coupling

Read permission: Level 0, Write permission: Level 230

Requirement: parameter `20251679 Activation of active power ramp after mains coupling` is activated.

Slope of the active power ramp between the actual power and the demanded power during normal mains coupling.

Unit: % P_{Rated}/s

10.4.8 20252495 Power ramp limitation

Read permission: Level 0, Write permission: Level 230

Defines a minimum and maximum for the following active power ramps:

- Normal ramp power increase
- Normal ramp power decrease
- Mains operator limitation ramp
- Mains operator setpoint ramp power decrease
- Mains operator setpoint ramp power increase
- P(U) ramp
- Third-party marketer ramp
- Connection ramp
- Reconnection ramp

Activates or deactivates the following parameters:

- `20252508 Maximum active power ramp`
- `20252519 Minimum active power ramp`

10.4.9 20252508 Maximum active power ramp

Read permission: Level 0, Write permission: Level 230

Defines the maximum active power ramp.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Unit: % P_{Rated}/s

10.4.10 `20252519 Minimum active power ramp`

Read permission: Level 0, Write permission: Level 230

Defines the minimum active power ramp.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Unit: % P_{Rated}/s

10.4.11 `20251591 Monitoring time before mains connection`

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization in normal operation:

Time span in which the mains voltage and mains frequency have to remain within the defined limits before a mains connection may occur.

Unit: s

10.4.12 `20106780 LVRT detection threshold`

Read permission: Level 0, Write permission: Level 230

Detection threshold for FRT detection due to excessively low voltage (LVRT).

The selection options are:

- Deactivated
- MTDVM 1 initial limit
- MTDVM 2 initial limit
- MTDVM 3 initial limit

Activates the following parameters:

- `20106805 LVRT deactivation delay`

10.4.13 `20106805 LVRT deactivation delay`

Read permission: Level 0, Write permission: Level 230

The parameter extends the reaction to the LVRT case. The measured frequency before the LVRT case is used for all frequency-dependent active power functions.

Unit: s

10.4.14 `20106795 HVRT detection threshold`

Read permission: Level 0, Write permission: Level 230

Detection threshold for FRT detection due to excessively high voltage (HVRT).

The selection options are:

- Deactivated
- MTDVM 1 initial limit
- MTDVM 2 initial limit
- MTDVM 3 initial limit

Activates the following parameters:

- `20106826 HVRT deactivation delay`

10.4.15 20106826 HVRT deactivation delay

Read permission: Level 0, Write permission: Level 230

The parameter delays the reaction to the HVRT case. The measured frequency before the HVRT case is used for all frequency-dependent active power functions.

Unit: s

10.4.16 20252185 Active power ramp priority 1

Read permission: Level 0, Write permission: Level 230

Selection of the priority of the active power functions listed below among each other. The function selected for priority 1 has the highest priority, the function selected for priority 8 has the lowest priority. The result is the demand value and the slope of the currently active function with the highest priority. The normal power demand (⇒ Parameter `20530006 Start demand type and power demand type`) always has the lowest priority.

Mains connection

Slope the the active power during normal mains coupling (⇒ parameter `20251679 Activation of active power ramp after mains coupling`).

Mains reconnection

Slope of the active power during mains recoupling after a previous mains decoupling (see `parameter 20251860 Activation of active power ramp after mains recoupling`).

P(U)

Voltage-induced power decrease (⇒ Parameter `20251493 Voltage-induced power decrease`).

LFSM B

Slope after an active power adjustment due to overfrequency or underfrequency (⇒ Parameter `20105759 Duration LFSM-B`).

LFSM A

Active power adjustment due to overfrequency or underfrequency (⇒ Parameter `20105713 Option LFSM`).

Mains operator

Power demand by the mains operator (⇒ Parameter `20106709 Option Mains operator power demand`).

Power decrease by the mains operator (⇒ Parameter `20105685 Option Mains operator power limitation`).

Direct marketer

Power demand by a third party, for example a direct marketer (⇒ Parameter `20105661 Option direct sales`).

10.4.17 20252199 Active power ramp priority 2

Read permission: Level 0, Write permission: Level 230

⇒`20252185 Active power ramp priority 1`

10.4.18 20252200 Active power ramp priority 3

Read permission: Level 0, Write permission: Level 230

⇒`20252185 Active power ramp priority 1`

10.4.19 20252213 Active power ramp priority 4

Read permission: Level 0, Write permission: Level 230

⇒`20252185 Active power ramp priority 1`

10.4.20 20252221 Active power ramp priority 5

Read permission: Level 0, Write permission: Level 230

⇒`20252185 Active power ramp priority 1`

10.4.21 20252237 Active power ramp priority 6

Read permission: Level 0, Write permission: Level 230

⇒`20252185 Active power ramp priority 1`

10.4.22 20252245 Active power ramp priority 7

Read permission: Level 0, Write permission: Level 230

⇒`20252185 Active power ramp priority 1`

10.4.23 20252383 Active power ramp priority 8

Read permission: Level 0, Write permission: Level 230

⇒`20252185 Active power ramp priority 1`

10.4.24 20025225 Change of active power ramps via Modbus

Read permission: Level 0, Write permission: Level 230

Deactivated

Deactivates the recording of the active power ramp via Modbus.

All ramps

Activates the recording of the following active power ramps via Modbus:

- `20105131 Normal active power ramp with power decrease`
- `20105128 Normal active power ramp with power increase`
- `20105636 Mains operator active power ramp with power limitation`
- `20106738 Mains operator active power ramp at power decrease`
- `20106723 Mains operator active power ramp with power increase`
- `20251527 Maximum active power ramp P(U)`
- `20105620 Direct sales active power ramp`
- `20251665 Active power ramp after mains coupling`
- `20251654 Active power ramp after mains recoupling`
- `20252508 Maximum active power ramp`
- `20252519 Minimum active power ramp`

Only power ramp limitation

Activates the recording of the following active power ramps via Modbus:

- `20252508 Maximum active power ramp`
- `20252519 Minimum active power ramp`

10.4.25 20105131 Normal active power ramp with power decrease

Read permission: Level 0, Write permission: Level 200

Slope of the active power ramp between the actual power and the demanded power at power decrease.

Possible in mains parallel mode if neither the fast active power ramp nor the slow active power ramp is requested by the mains operator.

In mains parallel mode, the active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Input as a percentage of the rated power per second.

Unit: % P_{Rated}/s

Range of application: 100 % to 0 % power

10.4.26 20105128 Normal active power ramp with power increase

Read permission: Level 0, Write permission: Level 200

Slope of the active power ramp between the actual power and the demanded power at power increase.

Possible in mains parallel mode if neither the fast active power ramp nor the slow active power ramp is requested by the mains operator.

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In mains parallel mode, the active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Input as a percentage of the rated power per second.

Unit: % P_{Rated}/s

Range of application: 0 % to 100 % power

10.4.27 `20105661 Option direct marketing`

Read permission: Level 0, Write permission: Level 230

In order for the power demand to be implemented by third parties (direct marketing), supply voltage must be applied to 127K1/DI1 `Direct marketing demand` (see TPEM IO wiring diagram).

Activates or deactivates the following parameters:

- `20105620 Direct marketing active power ramp`
- `20251024 Direct marketing power demand AI (at 4 mA)`
- `20251035 Direct marketing power demand AI (at 20 mA)`

10.4.28 `20105620 Direct marketing active power ramp`

Read permission: Level 0, Write permission: Level 230

Slope of the active power ramp in the case of an active power specification by third parties (e.g. a direct marketer). The active power ramp is used for the power increase and the power decrease.

Input as a percentage of the rated active power per second.

Unit: % P_{Rated}/s

10.4.29 `20105206 Test mode Grid code functions`

Read permission: Level 0, Write permission: Level 100

For testing the function of the frequency-dependent active power reduction and the voltage-dependent reactive power functions.

Activates/deactivates the following parameters:

- `20105935 Source for mains frequency offset`
- `20105211 P(f): Displacement to the current mains frequency`
- `20252259 Mains frequency source`
- `20105350 Q(U): Mains voltage as an absolute value`
- `20105908 P(f): Mains frequency offset mode`

10.4.30 `20105935 Source for mains frequency offset`

Read permission: Level 0, Write permission: Level 100

Fixed value

For test purposes, an offset to the mains frequency can be entered as a fixed value.

Activates the parameter:

- `20105211 P(f): Displacement to the current mains frequency`

Analog

For test purposes, an offset to the mains frequency can be entered as an analog value.

⇒ Inputs and outputs (Grid code mode: AR-N 4110 and General Grid Code):

- `20105970 Input offset mains frequency min (at 4 mA)`
- `20105962 Input offset mains frequency max (at 20 mA)`

Modbus

For test purposes, an offset to the current mains frequency can be specified by Modbus from a higher-level control station.

10.4.31 20105211 P(f): Displacement to the current mains frequency

Read permission: Level 0, Write permission: Level 100

Offset, which is added to the actual mains frequency in order to test the frequency-dependent active power reduction.

Unit: Hz

10.4.32 20252259 Mains frequency source

Read permission: Level 0, Write permission: Level 100

Selection of the basis for generating the frequency deviation in test mode.

Frequency measurement

The currently measured mains frequency is used as a basis.

Rated frequency

The rated frequency is used as a basis.

10.4.33 20105350 Q(U): Mains voltage as an absolute value

Read permission: Level 0, Write permission: Level 100

Demand of an artificial value instead of the currently measured phase-phase voltage of the mains for testing the Q(U) characteristic curve.

Unit: V

10.4.34 20105908 P(f): Mains frequency offset mode

Read permission: Level 0, Write permission: Level 100

Step

Mains frequency changes occur abruptly to the new value.

Ramp

Mains frequency changes occur evenly via a ramp to the new value.

Activates parameter `20105919 Slope of frequency change`.

10.4.35 `20105919 Slope of frequency change`

Read permission: Level 0, Write permission: Level 100

Slope of the ramp at frequency change with the `ramp` selection in parameter `20105908 P(f): Mains frequency offset mode`.

Unit: Hz/s

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10.5 Inputs and outputs (Grid code mode: BDEW)

10.5.1 20250075 Min PF output set (at 4 mA)

Read permission: Level 0, Write permission: Level 230

The lowest setpoint value of the power factor corresponds to the value 4 mA.

The setpoint value on the generator controller (AVR) is specified as offset factor PF via 115K3/AO4 (see TPEM IO wiring diagram). The allocation of the PF values at 4...20 mA must match for TPEM IO and the generator controller. The maximum underexcited and overexcited PF values must be selected so that the reactive power control range of the generator is not exceeded, but the required reactive power range is covered.

10.5.2 20250088 Max PF output set (at 20 mA)

Read permission: Level 0, Write permission: Level 230

The highest setpoint value of the PF corresponds to the value 20 mA.

10.5.3 20250260 Input Qset min (at 4 mA)

Read permission: Level 0, Write permission: Level 230

Specification of the minimum setpoint value at 4 mA at analog input -112K6 AI4 of the TPEM IO (see wiring diagram).

Underexcited values must be entered with a negative sign.

Unit: kvar

For required information on the reactive power demand see

- ⇒ Reactive power (Grid code mode: BDEW) ⇒ Reactive power demand Q demand

Analog must be selected for parameter `20910033 Reactive power demand source`.

10.5.4 20250271 Input Qset max (at 20 mA)

Read permission: Level 0, Write permission: Level 230

Specification of the maximum setpoint value at 20 mA at analog input -112K6 AI4 of the TPEM IO (see wiring diagram).

Underexcited values must be entered with a negative sign.

Unit: kvar.

For required information on the reactive power demand see

- ⇒ Reactive power (Grid code mode: BDEW) ⇒ Reactive power demand Q demand

Analog must be selected for parameter `20910033 Reactive power demand source`.

10.5.5 20310152 Input Qset extended input range

Read permission: Level 0, Write permission: Level 230

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

10.5.6 `20250283 Input Qset low pass time`

Read permission: Level 0, Write permission: Level 230

For dampening fast (high-frequency) changes. A high value corresponds to a low cutoff frequency.

Unit: ms

10.5.7 `20250027 PF demand min (at 4 mA)`

Read permission: Level 0, Write permission: Level 230

Specification of the minimum setpoint value at 4 mA at analog input -112K6 AI4 of the TPEM IO (see wiring diagram).

Underexcited values must be entered with a negative sign.

10.5.8 `20250034 PF demand max (at 20 mA)`

Read permission: Level 0, Write permission: Level 230

Specification of the maximum setpoint value at 20 mA at analog input -112K6 AI4 of the TPEM IO (see wiring diagram).

Underexcited values must be entered with a negative sign.

10.5.9 `20310219 Input set PF extended input range`

Read permission: Level 0, Write permission: Level 230

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

10.5.10 `20250042 PF demand low pass time`

Read permission: Level 0, Write permission: Level 230

For dampening fast (high-frequency) changes. A high value corresponds to a low cutoff frequency.

Unit: ms

10.6 Inputs and outputs (Grid code mode: AR-N 4110 and General Grid Code)

When operating with Grid code mode AR-N 4110 and General Grid Code, the desired demand to the generator controller (AVR) must be a reactive power value.

⇒ Parameters

- `20251019 Output Qset min (at 4 mA)`
- `20251008 Output Qset max (at 20 mA)`

10.6.1 **`20250075 Min PF output set (at 4 mA)`**

Read permission: Level 0, Write permission: Level 230

The lowest setpoint value of the power factor corresponds to the value 4 mA.

The setpoint value on the generator controller (AVR) is specified as offset factor PF via 115K3/AO4 (see TPEM IO wiring diagram). The allocation of the PF values at 4...20 mA must match for TPEM IO and the generator controller. The maximum underexcited and overexcited PF values must be selected so that the reactive power control range of the generator is not exceeded, but the required reactive power range is covered.

10.6.2 **`20250088 Max PF output set (at 20 mA)`**

Read permission: Level 0, Write permission: Level 230

The highest setpoint value of the PF corresponds to the value 20 mA.

10.6.3 **`20251019 Output Qset min (at 4 mA)`**

Read permission: Level 0, Write permission: Level 230

Lower limit of the reactive power specification of the TPEM to the generator controller (AVR) via the analog output 130K1/AO1 `Reactive power desired value - generator controller` of the TPEM IO (see wiring diagram). Reactive power specifications between 4 mA and 20 mA are interpolated linearly based on the lower limits and upper limits.

The setpoint value is specified on the generator controller as a reactive power value. The allocation of the reactive power values at 4...20 mA must match for TPEM IO and the generator controller. On the generator controller side, the absolute values of the reactive power must be converted into relative values by dividing them by the corresponding reference values. The maximum underexcited and overexcited reactive power values must be selected so that the reactive power control range of the generator is not exceeded, but the required reactive power range is covered.

Unit: kvar

10.6.4 **`20251008 Output Qset max (at 20 mA)`**

Read permission: Level 0, Write permission: Level 230

Lower limit of the reactive power specification of the TPEM to the generator controller (AVR) via the analog output 130K1/AO1 `Reactive power desired value - generator controller` of the TPEM IO (see wiring diagram). Reactive power specifications between 4 mA and 20 mA are interpolated linearly based on the lower limits and upper limits.

Unit: kvar

10.6.5 **`20105970 Input offset mains frequency min (at 4 mA)`**

Read permission: Level 0, Write permission: Level 100

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

Offset to the current mains frequency if at analog input -128K2/AI2 `Grid code test mode specification of mains frequency displacement` an input current of 4 mA is measured on the TPEM IO (see wiring diagram). The range between 4 mA and 20 mA is interpolated linearly.

Unit: Hz

For required information on offset to the current mains frequency see

- ⇒ General (Grid code mode: AR-N-4110 or Grid code mode: General Grid Code)

Analog must be selected for parameter `20105935 Source for mains frequency offset`.

10.6.6 20105962 Input offset mains frequency max (at 20 mA)

Read permission: Level 0, Write permission: Level 100

Offset to the actual mains frequency in order to test the frequency-dependent active power reduction.

Offset to the current mains frequency if at analog input -128K2/AI2 `Grid code test mode specification of mains frequency displacement` an input current of 20 mA is measured on the TPEM IO (see wiring diagram). The range between 4 mA and 20 mA is interpolated linearly.

Unit: Hz

For required information on offset to the current mains frequency see

- ⇒ General (Grid code mode: AR-N-4110 or Grid code mode: General Grid Code)

Analog must be selected for parameter `20105935 Source for mains frequency offset`.

10.6.7 20310311 Input offset mains frequency extended input range

Read permission: Level 0, Write permission: Level 100

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

10.6.8 20251202 Input Qset/ref min (at 4 mA)

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q demand:

Setpoint value for the reactive power value Qref or Qset, if an input current of 4 mA is measured at the analog input -128K2/AI1 of the TPEM IO (see wiring diagram). Underexcited operation is identified by a negative sign before the reactive power. The range between 4 mA and 20 mA is interpolated linearly.

Input as a percentage of the rated active power

Unit: % P_{Rated}

For required information on the reactive power demand see

- ⇒ Reactive power (Grid code mode: AR-N 4110 and General Grid Code) ⇒ Q(U) + Q setpoint mode

Analog must be selected for the following parameters.

- `20250922 Q demand Qref offset source`
- `20251429 Reactive power demand source`

10.6.9 **`20251192 Input Qset/ref max (at 20 mA)`**

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q demand:

Setpoint value for the reactive power value Qref or Qset, if an input current of 20 mA is measured at the analog input -128K2/AI1 of the TPEM IO (see wiring diagram). Underexcited operation is identified by a negative sign before the reactive power. The range between 4 mA and 20 mA is interpolated linearly.

Input as a percentage of the rated active power.

Unit: % P_{Rated}

For required information on the reactive power demand see

- ⇒ Reactive power (Grid code mode: AR-N 4110 and General Grid Code) ⇒ Q(U) + Q setpoint mode

Analog must be selected for the following parameters.

- `20250922 Q demand Qref offset source`
- `20251429 Reactive power demand source`

10.6.10 **`20310306 Input Qset/ref extended input range`**

Read permission: Level 0, Write permission: Level 230

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

10.6.11 **`20250548 Input Uset/ref min (at 4 mA)`**

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q(U) characteristic curve:

Voltage setpoint value or specified voltage U_{Q0}, if at analog input -128K1/AI4 `Q(U) UQ0` an input current of 4 mA is measured on the TPEM IO (see wiring diagram). The range between 4 mA and 20 mA is interpolated linearly.

Indicated as a percentage of the agreed supply voltage.

Unit: % U_c

For required information on the voltage setpoint demand or the characteristic Q(U)+UQ0 see

- ⇒ Reactive power (Grid code mode: AR-N 4110 and General Grid Code) ⇒ Q(U) + UQ0. Analog must be selected for parameter `20250520 Q(U) UQ0 source`.
- ⇒ Voltage setpoint mode (Grid code mode: General Grid Code) ⇒ Analogue must be selected for parameter `20251290 Source U demand value`.

10.6.12 **`20250557 Input Uset/ref max (at 20 mA)`**

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q(U) characteristic curve:

Voltage setpoint value or specified voltage UQ0, if at analog input -128K1/AI4 `Q(U) UQ0` an input current of 20 mA is measured on the TPEM IO (see wiring diagram). The range between 4 mA and 20 mA is interpolated linearly.

Indicated as a percentage of the agreed supply voltage.

Unit: % U_c

For required information on the voltage setpoint demand or the characteristic Q(U)+UQ0 see

- ⇒ Reactive power (Grid code mode: AR-N 4110 and General Grid Code) ⇒ Q(U) + UQ0. Analog must be selected for parameter `20250520 Q(U) UQ0 source`.
- ⇒ Voltage setpoint mode (Grid code mode: General Grid Code) ⇒ Analogue must be selected for parameter `20251290 Source U demand value`.

10.6.13 **`20310297 Input Uset/ref extended input range`**

Read permission: Level 0, Write permission: Level 230

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

10.6.14 **`20250027 PF demand min (at 4 mA)`**

Read permission: Level 0, Write permission: Level 230

Specification of the minimum setpoint value at 4 mA at analog input -112K6 AI4 of the TPEM IO (see wiring diagram).

Underexcited values must be entered with a negative sign.

10.6.15 **`20250034 PF demand max (at 20 mA)`**

Read permission: Level 0, Write permission: Level 230

Specification of the maximum setpoint value at 20 mA at analog input -112K6 AI4 of the TPEM IO (see wiring diagram).

Underexcited values must be entered with a negative sign.

10.6.16 **`20310219 Input set PF extended input range`**

Read permission: Level 0, Write permission: Level 230

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

10.6.17 `20250042 PF demand low pass time`

Read permission: Level 0, Write permission: Level 230

For dampening fast (high-frequency) changes. A high value corresponds to a low cutoff frequency.

Unit: ms

10.6.18 `20250470 Voltage measurement reactive power mode`

Read permission: Level 0, Write permission: Level 230

MFR

The mains voltage measured value of the TPEM MFR is used to determine the reactive power desired value if a voltage-dependent reactive power function is active.

Analog

The mains voltage measured value of the external mains voltage measured value of the analog input K128K1/AI3, scaled to 4...20 mA, `Measured voltage value for reactive power modes` of the TPEM IO (see TPEM IO wiring diagram) is used to determine the reactive power desired value.

Activates the following parameters:

- `20250481 Measured voltage value for reactive power modes (at 4 mA)`
- `20250497 Measured voltage value for reactive power modes (at 20 mA)`
- `20310281 Input voltage measurement reactive power mode extended input range`

10.6.19 `20250481 Measured voltage value for reactive power modes (at 4 mA)`

Read permission: Level 0, Write permission: Level 230

External voltage measurement if an input current of 4 mA is measured at the analog input 128K1/AI3 `Measured voltage value for reactive power modes` of the TPEM IO. The range between 4 mA and 20 mA is interpolated linearly.

Unit: V

10.6.20 `20250497 Measured voltage value for reactive power modes (at 20 mA)`

Read permission: Level 0, Write permission: Level 230

External voltage measurement if an input current of 20 mA is measured at the analog input 128K1/AI3 `Measured voltage value for reactive power modes` of the TPEM IO. The range between 4 mA and 20 mA is interpolated linearly.

Unit: V

10.6.21 `20310281 Input voltage measurement reactive power mode extended input range`

Read permission: Level 0, Write permission: Level 230

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The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

10.6.22 `20106751 Input mains operator demand min (at 4 mA)`

Read permission: Level 0, Write permission: Level 230

Lower limit of the possible active power specification by the mains operator via analog input -128K1/AI4 Mains operator power demand (see wiring diagram). Active power specifications between 4 mA and 20 mA are interpolated linearly based on the lower limits and upper limits.

Input as a percentage of the rated active power of the genset.

Unit: % P_{Rated}

10.6.23 `20251024 Direct marketing power demand AI (at 4 mA)`

Read permission: Level 0, Write permission: Level 230

Lower limit of the active power specification of third parties (e.g. a direct marketer) via the analog input -128K1/AI1 `Direct marketing power demand` (see TPEM IO wiring diagram). Active power specifications are interpolated linearly based on the lower limit and upper limit between 4 mA and 20 mA.

Input as a percentage of the rated active power.

Unit: % P_{Rated}

10.6.24 `20310262 Input direct marketing power demand extended input range`

Read permission: Level 0, Write permission: Level 230

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

10.6.25 `20251035 Direct marketing power demand AI (at 20 mA)`

Read permission: Level 0, Write permission: Level 230

Upper limit of the active power specification of third parties (e.g. a direct marketer) via the analog input -128K1/AI1 `Direct marketing power demand` (see TPEM IO wiring diagram). Active power specifications are interpolated linearly based on the lower limit and upper limit between 4 mA and 20 mA.

Input as a percentage of the rated active power.

Unit: % P_{Rated}

10.6.26 `20106746 Input mains operator demand max (at 20mA)`

Read permission: Level 0, Write permission: Level 230

Upper limit of the possible active power demand by the mains operator via analog input -128K1/AI4 Mains operator power demand (see wiring diagram). Active power specifications between 4 mA and 20 mA are interpolated linearly based on the lower limits and upper limits.

Input as a percentage of the rated active power of the genset.

Unit: % P_{Rated}

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.6.27 `20310333 Input mains operator demand extended input range`

Read permission: Level 0, Write permission: Level 230

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

10.6.28 `20250793 Agreed Uc`

Read permission: Level 0, Write permission: Level 230

Reference for the voltage parameters of the Q(U) characteristic curve and the reactive power specification with voltage limitation. This voltage is usually the supply voltage that was agreed between the mains operator and subscriber. The desired value of Uc must refer to the same voltage level as the measured voltage values that are received via the TPEM MFR or the parameterized analog input 128K1/AI3 `Measured voltage value for reactive power modes` (see TPEM IO wiring diagram). The current measured voltage value is divided by Uc. The result of the division is the input signal for the relevant reactive power function.

Unit: V

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.7 Mains-dependent power change (Grid code mode: BDEW)

The following options are available in critical mains situations:

- Limiting the output power
- Deselecting the genset
- Initiating an immediate disconnection from the mains

The genset must automatically reduce the output active power in the event of overfrequency, and raise it in the event of underfrequency. Mains-dependent power changes must take place at the required rates of change.

10.7.1 `20540133 RP due to overfrequency`

Read permission: Level 0, Write permission: Level 230

Activates or deactivates the active power reduction.

For plants that must comply with the specifications of the BDEW medium voltage directive, 2008 version, incl. 4th amendment:

10.7.2 `20540122 Power limitation by mains operator via digital inputs`

Read permission: Level 0, Write permission: Level 230

Activates the power limitation by the mains operator via the parameterizable digital inputs power limitation 1 to 4 provided for this on the TPEM IO Controller.

Activates the following parameters:

- `20105153 Power limitation level 1, at`
- `20105166 Power limitation level 2, at`
- `20105177 Power limitation level 3, at`
- `20105189 Power limitation level 4, at`

10.7.3 `20105153 Power limitation level 1, at`

Read permission: Level 0, Write permission: Level 230

Value of the power limitation for the input -110K3/DI9 `Power limitation 1` at the TPEM IO Controller. If this digital input takes on a logically true status, the output active power is limited to the entered value.

The power decrease in the event of power limitation by the mains operator and the power increase upon cancellation is performed with the ramps entered under the following parameters:

- `20105115 Fast active power ramp with power decrease`
- `20105102 Fast active power ramp with power increase`

The order-specific documents contain the specifications of the mains operator.

Input as a percentage of the rated power.

Unit: % P_{Rated}

10.7.4 `20105166 Power limitation level 2, at`

Read permission: Level 0, Write permission: Level 230

Value of the power limitation for the input -110K3/DI10 `Power limitation 2` at the TPEM IO Controller. If this digital input takes on a logically true status, the output active power is limited to the entered value.

The power decrease in the event of power limitation by the mains operator and the power increase upon cancellation is performed with the ramps entered under the following parameters:

- `20105115 Fast active power ramp with power decrease`
- `20105102 Fast active power ramp with power increase`

The order-specific documents contain the specifications of the mains operator.

Input as a percentage of the rated power.

Unit: % P_{Rated}

10.7.5 20105177 Power limitation level 3, at

Read permission: Level 0, Write permission: Level 230

Value of the power limitation for the input -110K3/DI11 `Power limitation 3` at the TPEM IO Controller. If this digital input takes on a logically true status, the output active power is limited to the entered value.

The power decrease in the event of power limitation by the mains operator and the power increase upon cancellation is performed with the ramps entered under the following parameters:

- `20105115 Fast active power ramp with power decrease`
- `20105102 Fast active power ramp with power increase`

The order-specific documents contain the specifications of the mains operator.

Input as a percentage of the rated power.

Unit: % P_{Rated}

10.7.6 20105189 Power limitation level 4, at

Read permission: Level 0, Write permission: Level 230

Value of the power limitation for the input -110K3/DI12 `Power limitation 4` at the TPEM IO Controller. If this digital input takes on a logically true status, the output active power is limited to the entered value.

The power decrease in the event of power limitation by the mains operator and the power increase upon cancellation is performed with the ramps entered under the following parameters:

- `20105115 Fast active power ramp with power decrease`
- `20105102 Fast active power ramp with power increase`

The order-specific documents contain the specifications of the mains operator.

Input as a percentage of the rated power.

Unit: % P_{Rated}

10.7.7 20105115 Fast active power ramp with power decrease

Read permission: Level 0, Write permission: Level 230

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

All mains-dependent power decreases are made with the active power ramp entered here.

Rated power of the genset	Default value
Up to and including 2 MW	70 % P_{Rated}/min
Over 2 MW	30 % P_{Rated}/min

Slope of the active power ramp between the actual power and the demanded power.

For systems which must comply with the specifications of the BDEW medium voltage directive, 2008 version, incl. 4th amendment, the standard values must be selected based on the rated power of the genset.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Input as a percentage of the rated power per minute.

Unit: % P_{Rated}/min

Range of application: 100 % to 0 % power

10.7.8 20105102 Fast active power ramp with power increase

Read permission: Level 0, Write permission: Level 230

All power increases after mains-dependent power decreases are made with the active power ramp entered here. Power increases after mains decoupling are made with the slow active power ramp.

Rated power of the genset	Default value
Up to and including 2 MW	70 % P_{Rated}/min
Over 2 MW	30 % P_{Rated}/min

Slope of the active power ramp between the actual power and the demanded power.

For systems which must comply with the specifications of the BDEW medium voltage directive, 2008 version, incl. 4th amendment, the standard values must be selected based on the rated power of the genset.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Input as a percentage of the rated power per minute.

Unit: % P_{Rated}/min

Range of application: 0 % to 100 % power

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.8 Mains-dependent power change (Grid code mode: AR-N 4110)

The following options are available in critical mains situations:

- Limiting the output power
- Deselecting the genset
- Initiating an immediate disconnection from the mains

The genset must automatically reduce the output active power in the event of overfrequency and also increase it in the event of underfrequency if the relevant limit values are exceeded (Limited Frequency Sensitive Mode (LFSM)). Mains-dependent power changes must take place at the required rates of change.

10.8.1 `20105685 Option Mains operator power limitation`

Read permission: Level 0, Write permission: Level 230

Mains operator power can be decreased according to one of the following types.

Deactivated

The power limitation by the mains operator is deactivated.

Modbus

The power limitation takes place by the mains operator via Modbus.

Analog

Activates the following parameters:

- `20105700 Mains operator power limitation AI (at 20 mA)`
- `20105699 Mains operator power limitation AI (at 4 mA)`
- `20310270 Input mains operator power limitation extended input range`

Digital (active high)

Activates the following parameters:

- `20105153 Power limitation level 1, at`
- `20105166 Power limitation level 2, at`
- `20105177 Power limitation level 3, at`
- `20105189 Power limitation level 4, at`

When voltage is present, the digital inputs take on a logically true status.

Digital (active low)

Activates the following parameters:

- `20105153 Power limitation level 1, at`
- `20105166 Power limitation level 2, at`
- `20105177 Power limitation level 3, at`
- `20105189 Power limitation level 4, at`

When no voltage is present, the digital inputs adopt a logically true status.

10.8.2 20105700 Mains operator power limitation AI (at 20 mA)

Read permission: Level 0, Write permission: Level 230

Upper limit of the possible active power limitation by the mains operator via analog input -128K1/AI2 `Mains operator power limitation` (see wiring diagram). Active power specifications between 4 mA and 20 mA are interpolated linearly based on the lower limits and upper limits.

Input as a percentage of the rated active power of the genset

Unit: % P_{Rated}

10.8.3 20105699 Mains operator power limitation AI (at 4 mA)

Read permission: Level 0, Write permission: Level 230

Lower limit of the possible active power limitation by the mains operator via analog input -128K1/AI2 `Mains operator power limitation` (see wiring diagram). Active power specifications between 4 mA and 20 mA are interpolated linearly based on the lower limits and upper limits.

Input as a percentage of the rated active power of the genset

Unit: % P_{Rated}

10.8.4 20310270 Input mains operator power limitation extended input range

Read permission: Level 0, Write permission: Level 230

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

10.8.5 20105153 Power limitation level 1, at

Read permission: Level 0, Write permission: Level 230

Value of the power limitation for the input -110K3/DI9 `Power limitation 1` at the TPEM IO Controller -110K3/DI9 (see wiring diagram). If this digital input takes on a logically true status, the output active power is limited to the entered value.

The power decrease in the event of power limitation by the mains operator and the power increase upon cancellation is performed with the ramp entered under the following parameter ⇒ `20105636 Mains operator active power ramp with power limitation`.

The order-specific documents contain the specifications of the mains operator.

Input as a percentage of the rated power.

Unit: % P_{Rated}

10.8.6 20105166 Power limitation level 2, at

Read permission: Level 0, Write permission: Level 230

Value of the power limitation for the input -110K3/DI10 `Power limitation 2` at the TPEM IO Controller. If this digital input takes on a logically true status, the output active power is limited to the entered value.

The power decrease in the event of power limitation by the mains operator and the power increase upon cancellation is performed with the ramp entered under the following parameter ⇒ `20105636 Mains operator active power ramp with power limitation`.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

The order-specific documents contain the specifications of the mains operator.

Input as a percentage of the rated power.

Unit: % P_{Rated}

10.8.7 `20105177 Power limitation level 3, at`

Read permission: Level 0, Write permission: Level 230

Value of the power limitation for the input -110K3/DI11 `Power limitation 3` at the TPEM IO Controller. If this digital input takes on a logically true status, the output active power is limited to the entered value.

The power decrease in the event of power limitation by the mains operator and the power increase upon cancellation is performed with the ramp entered under the following parameter ⇒ `20105636 Mains operator active power ramp with power limitation`.

The order-specific documents contain the specifications of the mains operator.

Input as a percentage of the rated power.

Unit: % P_{Rated}

10.8.8 `20105189 Power limitation level 4, at`

Read permission: Level 0, Write permission: Level 230

Value of the power limitation for the input -110K3/DI12 `Power limitation 4` at the TPEM IO Controller. If this digital input takes on a logically true status, the output active power is limited to the entered value.

The power decrease in the event of power limitation by the mains operator and the power increase upon cancellation is performed with the ramp entered under the following parameter ⇒ `20105636 Mains operator active power ramp with power limitation`.

The order-specific documents contain the specifications of the mains operator.

Input as a percentage of the rated power.

Unit: % P_{Rated}

10.8.9 `20105713 Option LFSM`

Read permission: Level 0, Write permission: Level 230

Activates or deactivates the following parameters:

- `20105648 LFSM A active power ramp at power increase`
- `20106698 LFSM A active power ramp at power decrease`
- `20105721 LFSM threshold power increase`
- `20105737 LFSM threshold power decrease`
- `20251056 LFSM-U power gradient P(f)`
- `20251043 LFSM-O power gradient P(f)`
- `20105759 Duration LFSM-B`
- `20105657 LFSM B active power ramp`

10.8.10 `20105648 LFSM A active power ramp at power increase`

Read permission: Level 0, Write permission: Level 230

Slope of the active power ramp in case of a power increase due to the overfrequency or underfrequency (LFSM).

Rated power of the genset	Default value
Up to and including 2 MW	1.2 % P_{Rated}/s
Over 2 MW	0.4 % P_{Rated}/s

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Unit: % P_{Rated}/s

10.8.11 `20105721 LFSM threshold power increase`

Read permission: Level 0, Write permission: Level 230

Limit value for the frequency that leads to a frequency-dependent active power increase of the genset if undercut.

If there are no other project-specific specifications, then the default value must be set.

Unit: % fn

10.8.12 `20105737 LFSM threshold power decrease`

Read permission: Level 0, Write permission: Level 230

Limit value for the frequency that leads to a frequency-dependent active power reduction of the genset if exceeded.

If there are no other project-specific specifications, then the default value must be set.

Unit: % fn

10.8.13 `20251056 LFSM-U power gradient P(f)`

Read permission: Level 0, Write permission: Level 230

Power gradient with which the active power output of the genset is increased in the event of underfrequency.

If there are no other project-specific specifications, then the default value must be set.

Input as a percentage of the rated active power of the genset per Hertz

Unit: % P_{Rated}/Hz

10.8.14 `20251043 LFSM-O power gradient P(f)`

Read permission: Level 0, Write permission: Level 230

Power gradient with which the active power output of the genset is reduced in the event of overfrequency.

If there are no other project-specific specifications, then the default value must be set.

Input as a percentage of the rated active power of the genset per Hertz

Unit: % P_{Rated}/Hz

10.8.15 `20105759 Duration LFSM-B`

Read permission: Level 0, Write permission: Level 230

Time span after an active power adjustment caused by overfrequency or underfrequency (LFSM), in which the mains frequency has to be uninterrupted within the tolerance band in order to effect a transition into normal operation. Parameter `20105657 LFSM B active power ramp` is active during the timer sequence

Unit: min

10.8.16 `20105657 LFSM B active power ramp`

Read permission: Level 0, Write permission: Level 230

Slope of the loading and unloading ramp of the genset after an active power adjustment due to overfrequency or underfrequency (LFSM).

If there are no other project-specific specifications, then the default value must be set.

Unit: % P_{Rated}/s

10.8.17 `20105636 Mains operator active power ramp with power limitation`

Read permission: Level 0, Write permission: Level 230

Slope of the active power ramp in case of a power change as part of the network safety management and for power increase during mains recoupling.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Input as a percentage of the rated active power per second.

Unit: % P_{Rated}/s

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.9 Mains-dependent power change (Grid code mode: General Grid Code)

The following options are available in critical mains situations:

- Limiting the output power
- Deselecting the genset
- Initiating an immediate disconnection from the mains

The genset must automatically reduce the output active power in the event of overfrequency and also increase it in the event of underfrequency if the relevant limit values are exceeded (Limited Frequency Sensitive Mode (LFSM)). Mains-dependent power changes must take place at the required rates of change.

10.9.1 `20105685 Option Mains operator power limitation`

Read permission: Level 0, Write permission: Level 230

Mains operator power can be decreased according to one of the following types.

Deactivated

The power limitation by the mains operator is deactivated.

Modbus

The power limitation takes place by the mains operator via Modbus.

Analog

Activates the following parameters:

- `20105700 Mains operator power limitation AI (at 20 mA)`
- `20105699 Mains operator power limitation AI (at 4 mA)`
- `20310270 Input mains operator power limitation extended input range`

Digital (active high)

Activates the following parameters:

- `20105153 Power limitation level 1, at`
- `20105166 Power limitation level 2, at`
- `20105177 Power limitation level 3, at`
- `20105189 Power limitation level 4, at`

When voltage is present, the digital inputs take on a logically true status.

Digital (active low)

Activates the following parameters:

- `20105153 Power limitation level 1, at`
- `20105166 Power limitation level 2, at`
- `20105177 Power limitation level 3, at`
- `20105189 Power limitation level 4, at`

When no voltage is present, the digital inputs adopt a logically true status.

10.9.2 20105700 Mains operator power limitation AI (at 20 mA)

Read permission: Level 0, Write permission: Level 230

Upper limit of the possible active power limitation by the mains operator via analog input -128K1/AI2 `Mains operator power limitation` (see wiring diagram). Active power specifications between 4 mA and 20 mA are interpolated linearly based on the lower limits and upper limits.

Input as a percentage of the rated active power of the genset

Unit: % P_{Rated}

10.9.3 20105699 Mains operator power limitation AI (at 4 mA)

Read permission: Level 0, Write permission: Level 230

Lower limit of the possible active power limitation by the mains operator via analog input -128K1/AI2 `Mains operator power limitation` (see wiring diagram). Active power specifications between 4 mA and 20 mA are interpolated linearly based on the lower limits and upper limits.

Input as a percentage of the rated active power of the genset

Unit: % P_{Rated}

10.9.4 20310270 Input mains operator power limitation extended input range

Read permission: Level 0, Write permission: Level 230

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

10.9.5 20105153 Power limitation level 1, at

Read permission: Level 0, Write permission: Level 230

Value of the power limitation for the input -110K3/DI9 `Power limitation 1` at the TPEM IO Controller -110K3/DI9 (see wiring diagram). If this digital input takes on a logically true status, the output active power is limited to the entered value.

The power decrease in the event of power limitation by the mains operator and the power increase upon cancellation is performed with the ramp entered under the following parameter ⇒ `20105636 Mains operator active power ramp with power limitation`.

The order-specific documents contain the specifications of the mains operator.

Input as a percentage of the rated power.

Unit: % P_{Rated}

10.9.6 20105166 Power limitation level 2, at

Read permission: Level 0, Write permission: Level 230

Value of the power limitation for the input -110K3/DI10 `Power limitation 2` at the TPEM IO Controller. If this digital input takes on a logically true status, the output active power is limited to the entered value.

The power decrease in the event of power limitation by the mains operator and the power increase upon cancellation is performed with the ramp entered under the following parameter ⇒ `20105636 Mains operator active power ramp with power limitation`.

The order-specific documents contain the specifications of the mains operator.

Input as a percentage of the rated power.

Unit: % P_{Rated}

10.9.7 **`20105177 Power limitation level 3, at`**

Read permission: Level 0, Write permission: Level 230

Value of the power limitation for the input -110K3/DI11 `Power limitation 3` at the TPEM IO Controller. If this digital input takes on a logically true status, the output active power is limited to the entered value.

The power decrease in the event of power limitation by the mains operator and the power increase upon cancellation is performed with the ramp entered under the following parameter ⇒ `20105636 Mains operator active power ramp with power limitation`.

The order-specific documents contain the specifications of the mains operator.

Input as a percentage of the rated power.

Unit: % P_{Rated}

10.9.8 **`20105189 Power limitation level 4, at`**

Read permission: Level 0, Write permission: Level 230

Value of the power limitation for the input -110K3/DI12 `Power limitation 4` at the TPEM IO Controller. If this digital input takes on a logically true status, the output active power is limited to the entered value.

The power decrease in the event of power limitation by the mains operator and the power increase upon cancellation is performed with the ramp entered under the following parameter ⇒ `20105636 Mains operator active power ramp with power limitation`.

The order-specific documents contain the specifications of the mains operator.

Input as a percentage of the rated power.

Unit: % P_{Rated}

10.9.9 **`20105713 Option LFSM`**

Read permission: Level 0, Write permission: Level 230

Activates or deactivates the following parameters:

- `20105648 LFSM A active power ramp at power increase`
- `20106698 LFSM A active power ramp at power decrease`
- `20105721 LFSM threshold power increase`
- `20105737 LFSM threshold power decrease`
- `20251056 LFSM-U power gradient P(f)`
- `20251043 LFSM-O power gradient P(f)`
- `20105759 Duration LFSM-B`
- `20105657 LFSM B active power ramp`
- `20251894 LFSM-O limit value mode`
- `20251974 Setpoint source`

- `20251852 Activation delay LFSM-U`
- `20251588 Activation delay LFSM-O`

10.9.10 **`20105648 LFSM A active power ramp at power increase`**

Read permission: Level 0, Write permission: Level 230

Slope of the active power ramp in case of a power increase due to the overfrequency or underfrequency (LFSM).

Rated power of the genset	Default value
Up to and including 2 MW	1.2 % P_{Rated}/s
Over 2 MW	0.4 % P_{Rated}/s

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Unit: % P_{Rated}/s

10.9.11 **`20106698 LFSM A active power ramp at power decrease`**

Read permission: Level 0, Write permission: Level 230

Slope of the active power ramp in case of a power decrease due to the overfrequency or underfrequency (LFSM).

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Unit: % P_{Rated}/s

10.9.12 **`20105721 LFSM threshold power increase`**

Read permission: Level 0, Write permission: Level 230

Limit value for the frequency that leads to a frequency-dependent active power increase of the genset if undercut.

If there are no other project-specific specifications, then the default value must be set.

Unit: % fn

10.9.13 **`20105737 LFSM threshold power decrease`**

Read permission: Level 0, Write permission: Level 230

Limit value for the frequency that leads to a frequency-dependent active power reduction of the genset if exceeded.

If there are no other project-specific specifications, then the default value must be set.

Unit: % fn

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.9.14 20251056 LFSM-U power gradient P(f)

Read permission: Level 0, Write permission: Level 230

Power gradient with which the active power output of the genset is increased in the event of underfrequency.

If there are no other project-specific specifications, then the default value must be set.

Input as a percentage of the rated active power of the genset per Hertz

Unit: % P_{Rated}/Hz

10.9.15 20251043 LFSM-O power gradient P(f)

Read permission: Level 0, Write permission: Level 230

Power gradient with which the active power output of the genset is reduced in the event of overfrequency.

If there are no other project-specific specifications, then the default value must be set.

Input as a percentage of the rated active power of the genset per Hertz

Unit: % P_{Rated}/Hz

10.9.16 20105759 Duration LFSM-B

Read permission: Level 0, Write permission: Level 230

Time span after an active power adjustment caused by overfrequency or underfrequency (LFSM), in which the mains frequency has to be uninterrupted within the tolerance band in order to effect a transition into normal operation. Parameter `20105657 LFSM B active power ramp` is active during the timer sequence

Unit: min

10.9.17 20105657 LFSM B active power ramp

Read permission: Level 0, Write permission: Level 230

Slope of the loading and unloading ramp of the genset after an active power adjustment due to overfrequency or underfrequency (LFSM).

If there are no other project-specific specifications, then the default value must be set.

Unit: % P_{Rated}/s

10.9.18 20025249 Change of the LFSM settings via Modbus

Read permission: Level 0, Write permission: Level 230

Activates or deactivates the writing via Modbus for the following parameters:

- `20105713 Option LFSM`

10.9.19 20251852 Activation delay LFSM-U

Read permission: Level 0, Write permission: Level 230

If the mains frequency falls below the limit (parameter `20105721 LFSM threshold power increase`), the active power is not increased until the set activation delay has expired.

Unit: s

10.9.20 `20251588 Activation delay LFSM-O`

Read permission: Level 0, Write permission: Level 230

If the mains frequency exceeds the limit (parameter `20105737 LFSM threshold power decrease`), the active power is not reduced until the set activation delay has expired.

Unit: s

10.9.21 `20105636 Mains operator active power ramp with power limitation`

Read permission: Level 0, Write permission: Level 230

Slope of the active power ramp in case of a power change as part of the network safety management and for power increase during mains recoupling.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Input as a percentage of the rated active power per second.

Unit: % P_{Rated}/s

10.9.22 `20251767 Option FSM`

Read permission: Level 0, Write permission: Level 230

For activating a frequency-dependent active power characteristic curve if frequency deviations occur.

Similar to the LFSM functionality, the FSM is used to respond to low frequency changes. Outside of a specified dead band, the genset must deliver changes in its actual active power. The change in active power is used to compensate for the frequency change in the mains.

The FSM functionality uses an additional digital input for activation from the mains provider.

After synchronization, FSM remains inactive until the genset has reached its target power.

Activates or deactivates the following parameters:

- `20251714 FSM active power ramp`
- `20251723 Maximum slope with summed active power ramps`
- `20251772 FSM dead band`
- `20251738 Keep FSM control band clear`
- `20251883 Primary control power restore`
- `20251709 FSM Power gradient`
- `20252524 Option FSM sliding dead band`
- `20252543 FSM sliding dead band`
- `20252535 Time constant 3Tau FSM sliding dead band`
- `20251746 FSM active power range power increase`
- `20252371 FSM active power range power decrease`

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.9.23 `20251714 FSM active power ramp`

Read permission: Level 0, Write permission: Level 230

Slope of the loading and unloading ramp of the genset if FSM is active.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Unit: % P_{Rated}/s

10.9.24 `20251723 Maximum slope with summed active power ramps`

Read permission: Level 0, Write permission: Level 230

Maximum slope allowed by the genset if several active power ramps are active at the same time.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Unit: % P_{Rated}/s

10.9.25 `20251772 FSM dead band`

Read permission: Level 0, Write permission: Level 230

Dead band of the frequency-dependent active power adjustment.

Unit: Hz

10.9.26 `20251738 Keep FSM control band clear`

Read permission: Level 0, Write permission: Level 230

If this parameter is activated, the active power setpoints at mains frequency are limited to the following values:

- Maximum power minus FSM active power range
- Minimum power (30 %) plus FSM active power range

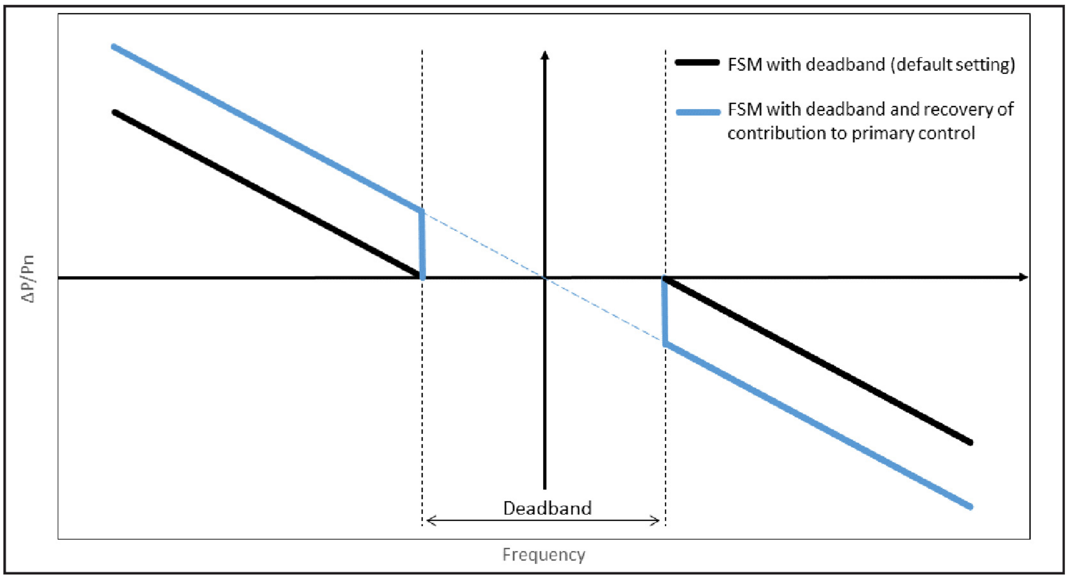
See parameter `20251745 FSM active power range`

10.9.27 `20251883 Restoration of primary control power`

Read permission: Level 0, Write permission: Level 230

Option to activate an alternative FSM characteristic when using a dead band. If this option is activated, the demand value of the FSM function jumps to a characteristic curve parameterized via the statics when leaving the dead band, which always runs through the zero point at rated frequency (shown in blue in the graphic).

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL



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10.9.28 20251709 FSM Power gradient

Read permission: Level 0, Write permission: Level 230

Power gradient with which the active power output of the genset is increased or decreased in the event of frequency deviations.

Unit: % P_{Rated}/Hz

10.9.29 20252524 Option FSM sliding dead band

Read permission: Level 0, Write permission: Level 230

Activates or deactivates the sliding dead band for the FSM function and the following parameters:

- 20252543 FSM sliding dead band
- 20252535 Time constant 3Tau FSM sliding dead band

10.9.30 20252543 FSM sliding dead band

Read permission: Level 0, Write permission: Level 230

Defines the dead band within which the input frequency of the FSM function does not change.

Unit: Hz

10.9.31 20252535 Time constant 3Tau FSM sliding dead band

Read permission: Level 0, Write permission: Level 230

Defines the time constant for the PT1 function of the frequency filtering.

Unit: s

10.9.32 20251746 FSM active power range power increase

Read permission: Level 0, Write permission: Level 230

Upper active power range used by the FSM function.

Unit: % P_{Rated}

10.9.33 `20252371 FSM active power range power decrease`

Read permission: Level 0, Write permission: Level 230

Lower active power range used by the FSM function.

Unit: % P_{Rated}

10.9.34 `20025230 Change of FSM settings via Modbus`

Read permission: Level 0, Write permission: Level 230

Activates or deactivates the writing via Modbus for the following parameters:

- `20251746 FSM active power range power increase`
- `20252371 FSM active power range power decrease`
- `20251709 FSM Power gradient`
- `20251772 FSM dead band`

10.9.35 `20251493 Voltage induced power decrease`

Read permission: Level 0, Write permission: Level 230

Activates or deactivates the following parameters:

- `20251503 Activation of power ramps P(U) at power decrease`
- `20251527 Maximum active power ramp P(U)`
- `20251516 Power decrease response time`
- `20251534 Sampling point P(U) U1`
- `20251542 Sampling point P(U) U2`
- `20251550 Sampling point P(U1)`
- `20251569 Sampling point P(U2)`

10.9.36 `20251503 Activation of power ramps P(U) at power decrease`

Read permission: Level 0, Write permission: Level 230

Activates or deactivates the following parameters:

- `20251527 Maximum active power ramp P(U)`
- `20251516 Power decrease response time`

10.9.37 `20251527 Maximum active power ramp P(U)`

Read permission: Level 0, Write permission: Level 230

Parameterization of P(U)_V1:

Maximum slope with which the active power desired value changes due to a voltage change. The resulting active power increase of the P(U) function corresponds either to the slopes resulting from parameter `20251527 Maximum active power ramp P(U)` and `20251516 Power decrease response time`, or to the maximum of the P(U) function.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Unit: % P_{Rated}/s

10.9.38 `20251516 Power decrease response time`

Read permission: Level 0, Write permission: Level 230

Parameterization of P(U)_V1:

Corresponds to the time within which the active power desired value changes due to a voltage change. If the value is set to zero, the active power slope always corresponds to the value of parameter 20251527 `Maximum active power ramp P(U)`.

Unit: s

10.9.39 `20251534 Sampling point P(U) U1`

Read permission: Level 0, Write permission: Level 230

Parameterization of P(U)_V1 and P(U)_V2:

Voltage value of the first sampling point for definition of the characteristic curve. The parameter value corresponds to the voltage threshold from which there is a decrease in active power and is indicated in percent of the agreed supply voltage of the genset.

Unit: % Uc

10.9.40 `20251542 Sampling point P(U) (U2)`

Read permission: Level 0, Write permission: Level 230

Parameterization of P(U)_V1:

Voltage value of the second sampling point for definition of the characteristic curve. The parameter value corresponds to the voltage threshold from which the active power decrease remains constant and is indicated in percent of the agreed supply voltage of the genset.

Unit: % Uc

10.9.41 `20251550 Sampling point P(U1)`

Read permission: Level 0, Write permission: Level 230

Parameterization of P(U)_V1: Active power limitation of the first sampling point of the P(U)_V1 characteristic curve.

Unit: % P_{Rated}

10.9.42 `20251569 Sampling point P(U2)`

Read permission: Level 0, Write permission: Level 230

Parameterization of P(U)_V1: Active power limitation of the first sampling point of the P(U)_V1 characteristic curve.

Unit: % P_{Rated}

10.9.43 `20251894 LFSM-O limit value mode`

Read permission: Level 0, Write permission: Level 230

Option to activate a modified frequency-dependent active power characteristic curve if an overfrequency (LFSM-O) occurs. If this option is activated, the maximum achieved active power reduction is maintained until the frequency has normalized again or there is an appropriate enable signal present at -127K1/D15.

Activates or deactivates the following parameters:

- `20251901 LFSM-O limit value mode: frequency`
- `20251917 LFSM-O limit value mode: delay`

10.9.44 **`20251901 LFSM-O limit value mode: frequency`**

Read permission: Level 0, Write permission: Level 230

Frequency limit value below which the genset returns to normal operation.

Unit: % fn

10.9.45 **`20251917 LFSM-O limit value mode: delay`**

Read permission: Level 0, Write permission: Level 230

Time period during which the mains frequency must be permanently below the deactivation limit (parameter `20251901 LFSM-O limit value mode: frequency`) so that the genset returns to normal operation.

Unit: s

10.9.46 **`20251925 Secondary frequency control: setpoint`**

Read permission: Level 0, Write permission: Level 230

Option for specification of an active power offset for the provision of secondary control power.

Deactivated

The active power offset is not active.

Activated

The active power offset is permanently active

DI

The active power offset is active when the digital input -127K1/DI13 is set

Activates or deactivates the following parameters:

- `20251723 Maximum slope with summed active power ramps`
- `20251963 Secondary frequency control: Active power ramp slope`
- `20251930 Lower limit reserve`
- `20251949 Upper limit reserve`
- `20251958 Keep control band clear`

10.9.47 **`20251963 Secondary frequency control: Active power ramp slope`**

Read permission: Level 0, Write permission: Level 230

Slope for changes in active power when an active power offset is specified as part of the provision of secondary control power.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Unit: % P_{Rated}/s

10.9.48 `20251930 Lower limit reserve`

Read permission: Level 0, Write permission: Level 230

Lower limit of the active power reserve for the provision of secondary control power. This corresponds to the maximum power decrease (negative control power) to be provided as part of the secondary control.

Upon specification of the active power offset via the analog input -128K2/AI3, this is interpolated linearly based on the lower limit and upper limit between 4 mA and 20 mA.

Unit: % P_{Rated}

10.9.49 `20251949 Upper limit reserve`

Read permission: Level 0, Write permission: Level 230

Upper limit of the active power reserve for the provision of secondary control power. This corresponds to the maximum power increase (positive control power) to be provided as part of the secondary control.

Upon specification of the active power offset via the analog input -128K2/AI3, this is interpolated linearly based on the lower limit and upper limit between 4 mA and 20 mA.

Unit: % P_{Rated}

10.9.50 `20251958 Keep control band clear`

Read permission: Level 0, Write permission: Level 230

If this parameter is activated, the active power setpoint values (for example that of the plant operator) at rated frequency are limited to the following values:

- Maximum power minus secondary reserve (minus primary reserve, if applicable, ⇒ Parameter `20251738 Keep FSM control band clear`)
- Minimum power (30 %) plus secondary reserve (plus primary reserve, if applicable, ⇒ Parameter `20251738 Keep FSM control band clear`)

⇒ Parameter `20251930 Lower limit reserve` and `20251949 Upper limit reserve).`

10.9.51 `20251974 Setpoint source`

Read permission: Level 0, Write permission: Level 230

Fixed value

Activates the following parameter:

- `20251996 Fixed setpoint`

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

Analog

The analog preset is scaled using the following parameters:

- `20251930 Lower limit reserve`
- `20251949 Upper limit reserve`
- `20310322 Input secondary frequency control extended input range`

Modbus

Specification of a fixed setpoint via Modbus.

10.9.52 20310322 Input secondary frequency control extended input range

Read permission: Level 0, Write permission: Level 230

The analog signal must be in the permissible input range. Deviations between the analog signals sent by the sensors and the analog signals received by the TPEM IO can lead to incorrect error messages. If the parameter is activated, the input range for the analog signal is extended.

10.9.53 20251996 Fixed desired value

Read permission: Level 0, Write permission: Level 230

Fixed setpoint value of the secondary control power. This is specified as an offset to the current demand value.

Unit: % P_{Rated}

10.9.54 20106709 Option Mains operator power demand

Read permission: Level 0, Write permission: Level 230

Activates or deactivates the following parameters:

- `20106714 Mains operator power demand source`
- `20106723 Mains operator active power ramp with power increase`
- `20106738 Mains operator active power ramp with power reduction`

10.9.55 20106714 Mains operator power demand source

Read permission: Level 0, Write permission: Level 230

Fixed value

Activates the following parameter:

- `20106767 Mains operator power demand fixed value`

Analog

The analog preset is scaled using the following parameters:

- `20106751 Input mains operator demand min (at 4 mA)`
- `20106746 Input mains operator demand max (at 20mA)`

Modbus

Specification of a fixed setpoint via Modbus.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.9.56 20106767 Mains operator power demand fixed value

Read permission: Level 0, Write permission: Level 230

Fixed power demand by mains operator.

Unit: % P_{Rated}

10.9.57 20106723 Mains operator active power ramp with power increase

Read permission: Level 0, Write permission: Level 230

Slope of the active power ramp in case of an active power adjustment due to the power demand of the mains operator.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Unit: % P_{Rated}/s

10.9.58 20106738 Mains operator active power ramp with power reduction

Read permission: Level 0, Write permission: Level 230

Slope of the active power ramp in case of a power decrease due to the power demand of the mains operator.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Unit: % P_{Rated}/s

10.9.59 20252065 ILF mode

Read permission: Level 0, Write permission: Level 230

Option to activate the ILF function (integral local frequency control). This function is used to provide secondary control power in cases where central coordination of the provision of secondary control power is no longer possible.

Activates or deactivates the following parameters:

- `20252079 ILF control P proportional gain`
- `20252087 ILF control I proportional gain`
- `20252098 ILF control D proportional gain`
- `20251723 Maximum slope with summed active power ramps`
- `20252148 ILF active power ramp`
- `20252104 ILF overfrequency activation due to limit value`
- `20252112 ILF overfrequency blocking due to limit value`
- `20252120 ILF underfrequency activation due to limit value`
- `20252136 ILF underfrequency blocking due to limit value`
- `20252157 ILF reset mode`
- `20252173 ILF reset timeout`

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.9.60 `20252079 ILF control P proportional gain`

Read permission: Level 0, Write permission: Level 230

Parameterization of the frequency controller with active ILF function: Active weighting of the P component. This is not effective with the parameter value "0" and fully effective with the parameter value "1".

10.9.61 `20252087 ILF control I proportional gain`

Read permission: Level 0, Write permission: Level 230

Parameterization of the frequency controller with active ILF function: Active weighting of the I component. This is not effective with the parameter value "0" and fully effective with the parameter value "1".

10.9.62 `20252098 ILF control D proportional gain`

Read permission: Level 0, Write permission: Level 230

Parameterization of the frequency controller with active ILF function: Active weighting of the D component. This is not effective with the parameter value "0" and fully effective with the parameter value "1".

10.9.63 `20252148 ILF active power ramp`

Read permission: Level 0, Write permission: Level 230

Slope of the active power ramp in case of power change due to ILF function.

The active power ramp is set using the applicable grid code. Corresponding instructions are in the respective parameter value lists. If, in addition, demands for the active power ramp are made by the local mains operator, these should be taken into account. To protect the engine, the resulting rate of change of the active power desired value for the TPEM will be limited to a maximum value that cannot be exceeded.

Unit: % P_{Rated}/s

10.9.64 `20252104 ILF overfrequency activation due to limit value`

Read permission: Level 0, Write permission: Level 230

Limit value of the frequency, above which the local integral frequency control is activated. If local frequency control is active, the external setpoint of the secondary control power is ignored ⇒ `20251925 Secondary frequency control: desired value`.

Unit: % fn

10.9.65 `20252112 ILF overfrequency blocking due to limit value`

Read permission: Level 0, Write permission: Level 230

If the local integral frequency control is active due to an overfrequency, it is blocked when this limit value is not reached. The active power setpoint value of the ILF function at the moment of falling below the limit value remains active.

The local integral frequency control is reactivated when this limit value is exceeded again.

Unit: % fn

10.9.66 `20252120 ILF underfrequency activation due to limit value`

Read permission: Level 0, Write permission: Level 230

Limit value of the frequency, below which the local integral frequency control is activated. If local frequency control is active, the external setpoint of the secondary control power is ignored ⇒ `20251925 Secondary frequency control: desired value`.

Unit: % fn

10.9.67 20252136 ILF underfrequency blocking due to limit value

Read permission: Level 0, Write permission: Level 230

If the local integral frequency control is active due to an underfrequency, it is blocked when this limit value is exceeded. The active power setpoint value of the ILF function at the moment of exceeding the limit value remains active.

The local integral frequency control is reactivated when this limit value is undershot again.

Unit: % fn

10.9.68 20252157 ILF reset mode

Read permission: Level 0, Write permission: Level 230

Resetting the ILF function to its initial state can be done manually, automatically or both manually and automatically.

The digital input -127K1/DI14 is used for manual reset of the ILF function.

The conditions for the automatic reset of the ILF function are defined in the following parameters:

- `20252173 ILF reset timeout`

10.9.69 20252173 ILF reset timeout

Read permission: Level 0, Write permission: Level 230

Time period within which the mains frequency must remain continuously in the defined frequency band of +/- 30 mHz until the ILF function is reset to its initial state.

Unit: s

10.10 Behavior after mains decoupling (Grid code mode: BDEW)

Demanded power changes by the mains operator can be performed as required with the normal ramp, the slow ramp or the fast ramp. Here, the specifications of the mains operator must be met.

If the mains has failed or destabilized and the genset reconnects to the mains after mains decoupling, then the slow ramp may be necessary. An unstable mains should not be further destabilized by a significant change in power.

If the mains operator does not specify a slow ramp, it can be deactivated.

With the fast ramp, the mains operator can specify less power to be fed from the genset with a fast response time to stabilize the mains in the event of a mains destabilization. The power can also be quickly increased in order to respond to fluctuations in the mains, for example.

For further information on the normal ramp and fast ramp, see

- ⇒General (Grid code mode: BDEW)
- ⇒Mains-dependent power decrease (Grid code mode: BDEW)

10.10.1 20105046 Activation of slow active power ramp during mains recoupling

Read permission: Level 0, Write permission: Level 230

Activated

Parameter `20105080 Slope` is used for voltage return after a mains decoupling.

10.10.2 20105080 Slope

Read permission: Level 0, Write permission: Level 230

Slope of the setpoint power ramp between the actual power and the demanded power at voltage return after a mains decoupling.

Requirement: parameter `20105046 Activation of slow active power ramp during mains recoupling` is activated.

Input as a percentage of the rated power per minute.

The order-specific documents contain the specifications of the mains operator.

Unit: % P_{Rated}/min

Range of application: 30 % to 100 % power

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.11 Behavior after mains decoupling (Grid code mode: AR-N 4110)

If the mains has failed or destabilized and the genset reconnects to the mains after mains decoupling, then the slow ramp may be necessary. An unstable mains should not be further destabilized by a significant change in power.

10.11.1 `20105768 Monitoring time before mains recoupling`

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization after the genset is disconnected from the mains due to decoupling protection devices having been triggered: time span in which the mains voltage and mains frequency have to remain within the defined limit values before a mains recoupling may occur.

Unit: min

10.11.2 `20105841 Lower mains voltage limit mains recoupling`

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization after the genset is disconnected from the mains due to triggered circuit breakers or decoupling protection devices:

Minimum voltage at the mains connection point at which a connection and synchronization of the genset with the higher-ranking mains is permitted. The parameter value refers to the smallest concatenated voltage.

Indicated as a percentage of the agreed supply voltage. The mains voltage measured by the TPEM MFR is analyzed. The value in % thus relates to parameter `22017682 Rated voltage` (Mains). The analog input -128K1/AI3 `Measured voltage value for reactive power modes` is not analyzed to determine the voltage amplitude.

Unit: % U_c

10.11.3 `20105832 Upper mains voltage limit mains recoupling`

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization after the genset is disconnected from the mains due to triggered circuit breakers or decoupling protection devices:

Maximum voltage at the mains connection point at which a connection and synchronization of the genset with the higher-ranking mains is permitted. The parameter value refers to the smallest concatenated voltage.

Indicated as a percentage of the agreed supply voltage. The mains voltage measured by the TPEM MFR is analyzed. The value in % thus relates to parameter `22017682 Rated voltage` (Mains). The analog input -128K1/AI3 `Measured voltage value for reactive power modes` is not analyzed to determine the voltage amplitude.

Unit: % U_c

10.11.4 `20105864 Lower mains frequency limit mains recoupling`

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization after the genset is disconnected from the mains due to triggered decoupling protection devices:

Minimum mains frequency at which a connection and synchronization of the genset with the higher-ranking mains is permitted.

Unit: Hz

10.11.5 `20105855 Upper mains frequency limit mains recoupling`

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization after the genset is disconnected from the mains due to triggered circuit breakers or decoupling protection devices:

Maximum mains frequency at which a connection and synchronization of the genset with the higher-ranking mains is permitted.

Unit: Hz

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.12 Behavior after mains decoupling (Grid code mode: General Grid Code)

If the mains has failed or destabilized and the genset reconnects to the mains after mains decoupling, then the slow ramp may be necessary. An unstable mains should not be further destabilized by a significant change in power.

10.12.1 `20251687 Behavior after mains decoupling`

Read permission: Level 0, Write permission: Level 230

Settling time

Activates parameter `20105768 Monitoring time before mains recoupling`

Temporary resynchronization time

Activates parameter `20251698 Mains recoupling temporary permit`

10.12.2 `20105768 Monitoring time before mains recoupling`

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization after the genset is disconnected from the mains due to decoupling protection devices having been triggered: time span in which the mains voltage and mains frequency have to remain within the defined limit values before a mains recoupling may occur.

Unit: min

10.12.3 `20251698 Mains recoupling temporary permit`

Read permission: Level 0, Write permission: Level 230

If the frequency and voltage are within the permissible range before the set time has elapsed, mains recoupling may occur. If the time has elapsed without a mains recoupling successfully taking place, you must wait for an enable signal from the mains operator. Requirement: parameter `20105886 External release mains recoupling` is activated.

Unit: s

10.12.4 `20105841 Lower mains voltage limit mains recoupling`

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization after the genset is disconnected from the mains due to triggered circuit breakers or decoupling protection devices:

Minimum voltage at the mains connection point at which a connection and synchronization of the genset with the higher-ranking mains is permitted. The parameter value refers to the smallest concatenated voltage.

Indicated as a percentage of the agreed supply voltage. The mains voltage measured by the TPEM MFR is analyzed. The value in % thus relates to parameter `22017682 Rated voltage` (Mains). The analog input -128K1/AI3 `Measured voltage value for reactive power modes` is not analyzed to determine the voltage amplitude.

Unit: % U_c

10.12.5 `20105832 Upper mains voltage limit mains recoupling`

Read permission: Level 0, Write permission: Level 230

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

Connection conditions and synchronization after the genset is disconnected from the mains due to triggered circuit breakers or decoupling protection devices:

Maximum voltage at the mains connection point at which a connection and synchronization of the genset with the higher-ranking mains is permitted. The parameter value refers to the smallest concatenated voltage.

Indicated as a percentage of the agreed supply voltage. The mains voltage measured by the TPEM MFR is analyzed. The value in % thus relates to parameter `22017682 Rated voltage` (Mains). The analog input -128K1/AI3 `Measured voltage value for reactive power modes` is not analyzed to determine the voltage amplitude.

Unit: % U_c

10.12.6 20105864 Lower mains frequency limit mains recoupling

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization after the genset is disconnected from the mains due to triggered decoupling protection devices:

Minimum mains frequency at which a connection and synchronization of the genset with the higher-ranking mains is permitted.

Unit: Hz

10.12.7 20105855 Upper mains frequency limit mains recoupling

Read permission: Level 0, Write permission: Level 230

Connection conditions and synchronization after the genset is disconnected from the mains due to triggered circuit breakers or decoupling protection devices:

Maximum mains frequency at which a connection and synchronization of the genset with the higher-ranking mains is permitted.

Unit: Hz

10.12.8 20251860 Activation of active power ramp after mains recoupling

Read permission: Level 0, Write permission: Level 230

Activates/deactivates the parameter `20251654 Active power ramp after mains recoupling`

10.12.9 20251654 Active power ramp after mains recoupling

Read permission: Level 0, Write permission: Level 230

Requirement: parameter `20251860 Activation of active power ramp after mains recoupling` is activated.

Slope of the active power ramp between the actual power and the demanded power at voltage return after a mains decoupling.

The order-specific documents contain the specifications of the mains operator.

Unit: % P_{Rated}/s

Range of application: 30 % to 100 % power

10.13 Offset factor PF (Grid code mode: BDEW)

The provision of reactive power can occur according to one of the following procedures:

- Offset factor PF (PF demand)
- Offset factor characteristic curve PF(P)

The local mains operator specifies in the technical connection requirements or in the mains operator check sheet which procedure has to be selected, which settings are to be made and whether telecontrol system should perform a switchover between the reactive power procedures.

10.13.1 `PF demand`

The source of the offset factor PF can be specified with parameter `20251826 PF demand source`.

The following are available to choose from:

- Fixed value
- Via analog input
- Fixed value via Modbus

The corresponding setting of the TPEM MFR and the generator controller define the range that can be implemented by the genset based on the reactive power capacity of the generator. When commissioning, it must be ensured that no values of the reactive power can be reached during operation which thermally overload the generator or breach the stability limit.

`20251826 PF demand source`

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Fixed value

Activates the following parameter:

- `20250003 Fixed PF value`

Analog

Activates the following parameters ⇒ Section `Inputs and outputs (Grid code mode: BDEW)`:

- `20250027 PF demand min (at 4 mA)`
- `20250034 PF demand max (at 20 mA)`
- `20250042 PF demand low pass time`

Modbus

Fixed PF value specified by Modbus from a higher-level control station.

For necessary information on Fixed PF via Modbus, see

- Operating manual ⇒ Fieldbus Interface Modbus RTU
  - Reactive power demand for PF

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

20250003 Fixed PF value

Read permission: Level 0, Write permission: Level 230

Specification of the PF setpoint value for the generator controller. Unit: none

If the mains operator or plant operator has no specifications, then the PF setpoint value = 1 is to be selected.

Underexcited values must be entered with a negative sign.

The corresponding setting of the TPEM MFR and the generator controller define the range that can be implemented by the genset based on the reactive power capacity of the generator.

When commissioning, it must be ensured that no values of the reactive power can be reached during operation which thermally overload the generator or breach the stability limit.

10.13.2 PF(P)

To support the static voltage stability, the reactive power mode can be selected for a PF(P) characteristic curve. A PF setpoint value is formed according to the characteristic curve entered depending on the currently emitted active power. Linear interpolation takes place between the entered sampling points.

A pair of values must be entered for every sampling point. Several sampling points can be parameterized with the same pair of values. The characteristic curve must be parameterized according to the specifications of the mains operator.

The characteristic curve is defined by the following parameters:

- 20250302 1st sampling point for P
- 20250294 1st sampling point for PF
- 20250328 2nd sampling point for P
- 20250315 2nd sampling point for PF
- 20250344 3rd sampling point for P
- 20250331 3rd sampling point for PF
- 20250366 4th sampling point for P
- 20250353 4th sampling point for PF
- 20250389 5th sampling point for P
- 20250377 5th sampling point for PF
- 20250408 6th sampling point for P
- 20250390 6th sampling point for PF
- 20250424 7th sampling point for P
- 20250419 7th sampling point for PF
- 20250443 8th sampling point for P
- 20250435 8th sampling point for PF

20250302 1st sampling point for P

Read permission: Level 0, Write permission: Level 230

Entry of the active power value of the first sampling point.

Unit: % P_{Rated}

20250294 1st sampling point for PF

Read permission: Level 0, Write permission: Level 230

Entry of the value for PF of the first sampling point.

Underexcited operation is identified by a negative sign before the offset factor.

10.14 Offset factor PF (Grid code mode: AR-N 4110)

The provision of reactive power occurs according to the following procedure:

- Offset factor PF

The local mains operator specifies in the technical connection requirements or in the mains operator check sheet which procedure has to be selected, which settings are to be made and whether telecontrol system should perform a switchover between the reactive power procedures.

Three digital inputs 127K1/DI2, DI3 and DI11 are provided on the TPEM IO Controller for the switchover and digital outputs 129K1/DO, DO2 and DO3 are provided for the feedback (see TPEM IO wiring diagram).

Allocation is defined according to the following table:

Demand / Characteristic curve	Mode	127K1/DI2, 129K1DO1	127K1/DI3, 129K1DO2	127K1/DI11, 129K1DO3
PF demand	A	0	0	0

Moreover, the mains operator determines which method should be used with which desired value in case the telecontrol system should fail. In this regard, TPEM offers the Watchdog function with various setting options. Reactive power values are specified as a percentage of the rated active power; however, only the amount is relevant in this case.

10.14.1 PF demand

The source of the offset factor PF can be specified with parameter `20200998 PF demand source`.

The following are available to choose from:

- Fixed value
- One analog input
- Five digital inputs
- Fixed value via Modbus

Several Watchdog parameters are available as a reaction to a fault in the telecontrol connection to the mains operator.

Another reactive power mode can be switched to using parameter `20251100 Watchdog reaction reactive power mode PF demand`. Parameter `20251137 Watchdog substitute value mode PF demand` can be parameterized either to retain the value or to a fixed value ⇒ Parameter `20251168 Watchdog fixed substitute value PF demand`.

The reactive power exhibits a PT1 behavior qualitatively at desired value increments. The time constant 3Tau, or the time until 95 % of the desired value is attained, is defined via parameter `20250933 Time constant 3Tau PT1 PF demand`.

`20250998 PF demand source`

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Fixed value

Activates the following parameters:

- `20250003 Fixed PF value`
- `20250933 Time constant 3Tau PT1 PF demand`

Analog

Activates the following parameters ⇒ Inputs and outputs (Grid code mode: AR-N4110 and General Grid Code):

- `20250027 PF demand min (at 4 mA)`
- `20250034 PF demand max (at 20 mA)`
- `20250933 Time constant 3Tau PT1 PF demand`

Digital (active high or active low)

Activates the following parameters:

- `20250940 PF demand DI1 value`
- `20250954 PF demand DI2 value`
- `20250965 PF demand DI3 value`
- `20250979 PF demand DI4 value`
- `20250987 PF demand DI5 value`
- `20250933 Time constant 3Tau PT1 PF demand`

Modbus

Fixed PF value specified by Modbus from a higher-level control station.

For necessary information on Fixed PF via Modbus, see

- Operating manual ⇒ Fieldbus Interface Modbus RTU
  - Reactive power demand for PF

`20250003 Fixed PF value`

Read permission: Level 0, Write permission: Level 230

Specification of the PF setpoint value for the generator controller. Unit: none

If the mains operator or plant operator has no specifications, then the PF setpoint value = 1 is to be selected.

Underexcited values must be entered with a negative sign.

The corresponding setting of the TPEM MFR and the generator controller define the range that can be implemented by the genset based on the reactive power capacity of the generator.

When commissioning, it must be ensured that no values of the reactive power can be reached during operation which thermally overload the generator or breach the stability limit.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

20250940 PF demand DI1 value

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Setpoint value for the offset factor PF if for parameter `20250998 PF demand source` either `Digital (active high)` or `Digital (active low)` is selected and if at digital input -127K1/DI5 `PF demand DI1` the signal "1" is present on the TPEM IO (see wiring diagram). Underexcited operation is identified by a negative sign before the offset factor.

Unit: 1

20250954 PF demand DI2 value

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Setpoint value for the offset factor PF if for parameter `20250998 PF demand source` either `Digital (active high)` or `Digital (active low)` is selected and if at digital input -127K1/DI6 `PF demand DI2` the signal "1" is present on the TPEM IO (see wiring diagram). Underexcited operation is identified by a negative sign before the offset factor.

Unit: 1

20250965 PF demand DI3 value

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Setpoint value for the offset factor PF if for parameter `20250998 PF demand source` either `Digital (active high)` or `Digital (active low)` is selected and if at digital input -127K1/DI7 `PF demand DI3` the signal "1" is present on the TPEM IO (see wiring diagram). Underexcited operation is identified by a negative sign before the offset factor.

Unit: 1

20250979 PF demand DI4 value

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Setpoint value for the offset factor PF if for parameter `20250998 PF demand source` either `Digital (active high)` or `Digital (active low)` is selected and if at digital input -127K1/DI8 `PF demand DI4` the signal "1" is present on the TPEM IO (see wiring diagram). Underexcited operation is identified by a negative sign before the offset factor.

Unit: 1

20250987 PF demand DI5 value

Read permission: Level 0, Write permission: Level 230

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

Parameterization of the PF demand:

Setpoint value for the offset factor PF if for parameter `20250998 PF demand source` either `Digital (active high)` or `Digital (active low)` is selected and if at digital input -127K1/DI9 `PF demand DI5` the signal "1" is present on the TPEM IO (see wiring diagram). Underexcited operation is identified by a negative sign before the offset factor.

Unit: 1

`20250933 Time constant 3Tau PT1 PF demand`

Read permission: Level 0, Write permission: Level 230

Time until 95 % of the setpoint value (3Tau) of the reactive power at control corresponding to the PF demand is attained. The control behavior corresponds to that of a PT1 member.

Unit: s

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.15 Offset factor PF (Grid code mode: General Grid Code)

The provision of reactive power can occur according to one of the following procedures:

- Offset factor PF (PF demand)
- Offset factor PF dependent on active power PF(P)
- Offset factor PF dependent on voltage (PF(U))

The local grid operator specifies in the technical connection requirements or in the grid operator check sheet which procedure has to be selected, which settings are to be made and whether telecontrol system should perform a switchover between the reactive power procedures.

Three digital inputs -127K1/DI2, DI3 and DI11 are provided on the TPEM IO Controller for the switchover and digital outputs -129K1/DO, DO2 and DO3 are provided for the feedback (see TPEM IO wiring diagram).

Allocation is defined according to the following table:

Demand / Charac-teristic curve	Mode	127K1/DI2, 129K1DO1	127K1/DI3, 129K1DO2	127K1/DI11, 129K1DO3
PF demand	A	0	0	0
PF(P)	F	1	0	1
PF(U)	H	1	1	1

Moreover, the grid operator determines which method should be used with which desired value in case the telecontrol system should fail. In this regard, TPEM offers the Watchdog function with various setting options. Reactive power values are specified as a percentage of the rated active power; however, only the absolute value is relevant in this case.

10.15.1 `PF demand`

The source of the offset factor PF can be specified with parameter `20200998 PF demand source`.

The following are available to choose from:

- Fixed value
- One analog input
- Five digital inputs
- Fixed value via Modbus

Several Watchdog parameters are available as a reaction to a fault in the telecontrol connection to the mains operator.

Another reactive power mode can be switched to using parameter `20251100 Watchdog reaction reactive power mode PF demand`. Parameter `20251137 Watchdog substitute value mode PF demand` can be parameterized either to retain the value or to a fixed value ⇒ Parameter `20251168 Watchdog fixed substitute value PF demand`.

The reactive power exhibits a PT1 behavior qualitatively at desired value increments. The time constant 3τ, or the time until 95 % of the desired value is attained, is defined via parameter `20250933 Time constant 3Tau PT1 PF demand`.

20250998 PF demand source

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Fixed value

Activates the following parameters:

- 20250003 Fixed PF value
- 20250933 Time constant 3Tau PT1 PF demand

Analog

Activates the following parameters ⇒ Inputs and outputs (Grid code mode: AR-N4110 and General Grid Code):

- 20250027 PF demand min (at 4 mA)
- 20250034 PF demand max (at 20 mA)
- 20250933 Time constant 3Tau PT1 PF demand

Digital (active high or active low)

Activates the following parameters:

- 20250940 PF demand DI1 value
- 20250954 PF demand DI2 value
- 20250965 PF demand DI3 value
- 20250979 PF demand DI4 value
- 20250987 PF demand DI5 value
- 20250933 Time constant 3Tau PT1 PF demand

Modbus

Fixed PF value specified by Modbus from a higher-level control station.

For necessary information on Fixed PF via Modbus, see

- Operating manual ⇒ Fieldbus Interface Modbus RTU
  - Reactive power demand for PF

20250003 Fixed PF value

Read permission: Level 0, Write permission: Level 230

Specification of the PF setpoint value for the generator controller. Unit: none

If the mains operator or plant operator has no specifications, then the PF setpoint value = 1 is to be selected.

Underexcited values must be entered with a negative sign.

The corresponding setting of the TPEM MFR and the generator controller define the range that can be implemented by the genset based on the reactive power capacity of the generator.

When commissioning, it must be ensured that no values of the reactive power can be reached during operation which thermally overload the generator or breach the stability limit.

20250940 PF demand DI1 value

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Setpoint value for the offset factor PF if for parameter `20250998 PF demand source` either `Digital (active high)` or `Digital (active low)` is selected and if at digital input -127K1/DI5 `PF demand DI1` the signal "1" is present on the TPEM IO (see wiring diagram). Underexcited operation is identified by a negative sign before the offset factor.

Unit: 1

20250954 PF demand DI2 value

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Setpoint value for the offset factor PF if for parameter `20250998 PF demand source` either `Digital (active high)` or `Digital (active low)` is selected and if at digital input -127K1/DI6 `PF demand DI2` the signal "1" is present on the TPEM IO (see wiring diagram). Underexcited operation is identified by a negative sign before the offset factor.

Unit: 1

20250965 PF demand DI3 value

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Setpoint value for the offset factor PF if for parameter `20250998 PF demand source` either `Digital (active high)` or `Digital (active low)` is selected and if at digital input -127K1/DI7 `PF demand DI3` the signal "1" is present on the TPEM IO (see wiring diagram). Underexcited operation is identified by a negative sign before the offset factor.

Unit: 1

20250979 PF demand DI4 value

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Setpoint value for the offset factor PF if for parameter `20250998 PF demand source` either `Digital (active high)` or `Digital (active low)` is selected and if at digital input -127K1/DI8 `PF demand DI4` the signal "1" is present on the TPEM IO (see wiring diagram). Underexcited operation is identified by a negative sign before the offset factor.

Unit: 1

20250987 PF demand DI5 value

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Setpoint value for the offset factor PF if for parameter `20250998 PF demand source` either `Digital (active high)` or `Digital (active low)` is selected and if at digital input -127K1/DI9 `PF demand DI5` the signal "1" is present on the TPEM IO (see wiring diagram). Underexcited operation is identified by a negative sign before the offset factor.

Unit: 1

`20250933 Time constant 3Tau PT1 PF demand`

Read permission: Level 0, Write permission: Level 230

Time until 95 % of the setpoint value (3Tau) of the reactive power at control corresponding to the PF demand is attained. The control behavior corresponds to that of a PT1 member.

Unit: s

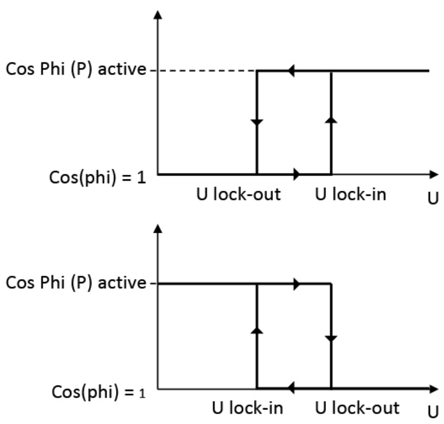
10.15.2 PF(P)

The PF(P) characteristic curve is defined based on four sampling points (parameters `20251320 Sampling point PF(P) P1`, `20251361 Sampling point PF(P1)` and the following.

The PF(P) characteristic curve can be optionally activated or deactivated depending on the voltage (parameters `20251407 PF(P) activation mains voltage` and `20251410 PF(P) deactivation mains voltage`.

If the characteristic curve is deactivated, the provision of reactive power is set to zero. Depending on whether the activation threshold (lock-in) is selected greater or lower than the deactivation limit value (lock-out), PF(P) is active at high or low voltages.

The following figure shows the activation of PF(P) depending on the voltage.

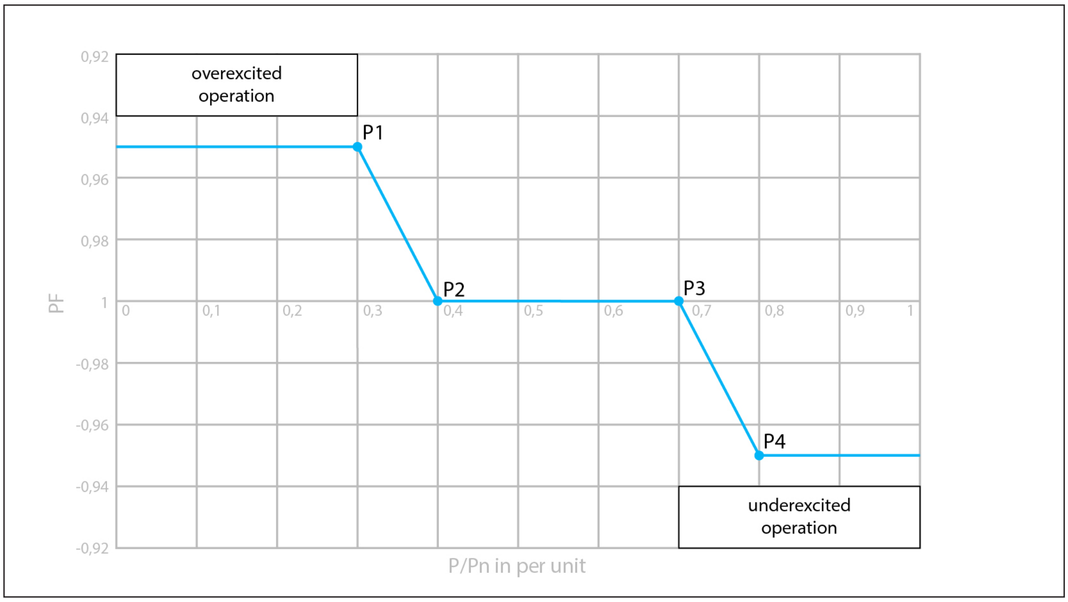


71425-003

Watchdog parameter `20251304 Watchdog reaction reactive power mode PF(P)` is available as a reaction to a fault in the telecontrol connection to the grid operator. This can be used to change to another reactive power mode.

The reactive power exhibits a PT1 behavior qualitatively at desired value increments. The time constant 3Tau, or the time until 95 % of the setpoint value is attained, is defined via parameter `20251312 Time constant 3Tau PF(P)`.

The following figure shows the PF(P) characteristic curve for the values P1(0.3/0.95), P2(0.4/1), P3(0.7/1) and P4(0.8/-0.95) (generator sign convention).



71426-004

Offset factor characteristic curve PF(P)

The characteristic curve is influenced by the following parameters:

- `20251320 Sampling point PF(P) P1`
- `20251361 Sampling point PF(P1)`
- `20251336 Sampling point PF(P) P2`
- `20251373 Sampling point PF(P2)`
- `20251348 Sampling point PF(P) P3`
- `20251385 Sampling point PF(P3)`
- `20251357 Sampling point PF(P) P4`
- `20251399 Sampling point PF(P4)`
- `20251312 Time constant 3Tau PF(P)`
- `20251407 PF(P) activation mains voltage`
- `20251410 PF(P) deactivation mains voltage`

`20251320 Sampling point PF(P) P1`

Read permission: Level 0, Write permission: Level 230

Active power indication of the first sampling point of the PF(P) characteristic curve. The characteristic curve has 4 sampling points. The sampling points must be parameterized in ascending order. The lowest active power is to be specified accordingly for sampling point P1 and the highest active power for sampling point P4.

Unit: % P_{Rated}

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

20251361 Sampling point PF(P1)

Read permission: Level 0, Write permission: Level 230

PF demand of the first sampling point of the PF(P) characteristic curve. The characteristic curve has 4 sampling points that must be parameterized accordingly. Underexcited operation is identified by a negative sign before the offset factor.

20251312 Time constant 3Tau PF(P)

Read permission: Level 0, Write permission: Level 230

Time until 95 % of the setpoint value (3Tau) of the reactive power at control corresponding to the PF(P) demand is attained. The control behavior corresponds to that of a PT1 member.

Unit: s

20251407 PF(P) activation mains voltage

Read permission: Level 0, Write permission: Level 230

When the set voltage threshold is reached, the provision reactive power follows the PF (P) characteristic curve. If the set activation threshold is greater than the deactivation threshold (parameter 20251410), the PF(P) characteristic curve is activated at high voltages and deactivated at low voltages. If the set activation threshold is lower than the deactivation threshold, the PF(P) characteristic curve is activated at low voltages and deactivated at high voltages.

Unit: % Uc

20251410 PF(P) deactivation mains voltage

Read permission: Level 0, Write permission: Level 230

When the set voltage threshold is reached, the provision of reactive power is set to zero. If the set activation threshold (parameter 20251407) is greater than the set deactivation threshold, the PF(P) characteristic curve is activated at high voltages and deactivated at low voltages. If the set activation threshold is lower than the set deactivation threshold, the PF(P) characteristic curve is activated at low voltages and deactivated at high voltages. The parameter value is indicated in per unit of the agreed supply voltage.

Unit: % Uc

10.15.3 PF(U)

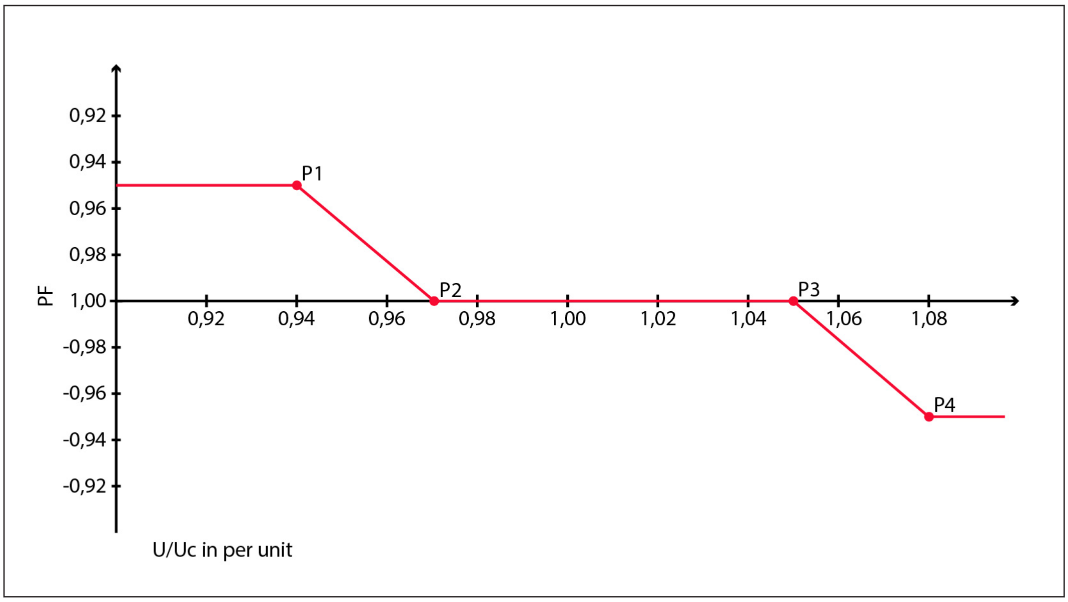
The PF(U) characteristic curve is defined based on four sampling points (parameters `20252394 Sampling point PF(U) U1`, `20252438 Sampling point PF(U1)` and the following.

If the characteristic curve is deactivated, the provision of reactive power is set to zero.

Watchdog parameter `20252480 Watchdog reaction reactive power mode PF(U)` is available as a reaction to a fault in the telecontrol connection to the mains operator. This can be used to change to another reactive power mode.

The reactive power exhibits a PT1 behavior qualitatively at desired value increments. The time constant 3Tau, or the time until 95 % of the setpoint is attained, is defined via parameter `20252472 Time constant 3Tau PF(U)`.

The following figure shows the PF(U) characteristic curve for the values P1(0.3/0.95), P2(0.4/1), P3(0.7/1) and P4(0.8/-0.95) (generator sign convention).



75435-001

Offset factor characteristic curve PF(U)

The characteristic curve is influenced by the following parameters:

- `20252394 Sampling point PF(U) U1`
- `20252438 Sampling point PF(U1)`
- `20252409 Sampling point PF(U) U2`
- `20252446 Sampling point PF(U2)`
- `20252414 Sampling point PF(U) U3`
- `20252451 Sampling point PF(U3)`
- `20252423 Sampling point PF(U) U4`
- `20252467 Sampling point PF(U4)`
- `20252472 Time constant 3Tau PF(U)`

`20252394 Sampling point PF(U) U1`

Read permission: Level 0, Write permission: Level 230

Voltage indication of the first sampling point of the PF(U) characteristic curve. The characteristic curve has 4 sampling points. The sampling points must be parameterized in ascending order. The lowest voltage is to be specified accordingly for sampling point U1 and the highest voltage for sampling point P4.

Unit: % P_{Rated}

`20252438 Sampling point PF(U1)`

Read permission: Level 0, Write permission: Level 230

PF demand of the first sampling point of the PF(U) characteristic curve. The characteristic curve has 4 sampling points that must be parameterized accordingly. Underexcited operation is identified by a negative sign before the offset factor.

20252409 Sampling point PF(U) U2

Read permission: Level 0, Write permission: Level 230

Voltage indication of the second sampling point of the PF(U) characteristic curve. The characteristic curve has 4 sampling points. The sampling points must be parameterized in ascending order. The lowest voltage is to be specified accordingly for sampling point U1 and the highest voltage for sampling point P4.

Unit: % P_{Rated}

20252446 Sampling point PF(U2)

Read permission: Level 0, Write permission: Level 230

PF demand of the second sampling point of the PF(U) characteristic curve. The characteristic curve has 4 sampling points that must be parameterized accordingly. Underexcited operation is identified by a negative sign before the offset factor.

20252414 Sampling point PF(U) U3

Read permission: Level 0, Write permission: Level 230

Voltage indication of the third sampling point of the PF(U) characteristic curve. The characteristic curve has 4 sampling points. The sampling points must be parameterized in ascending order. The lowest voltage is to be specified accordingly for sampling point U1 and the highest voltage for sampling point P4.

Unit: % P_{Rated}

20252451 Sampling point PF(U3)

Read permission: Level 0, Write permission: Level 230

PF demand of the third sampling point of the PF(U) characteristic curve. The characteristic curve has 4 sampling points that must be parameterized accordingly. Underexcited operation is identified by a negative sign before the offset factor.

20252423 Sampling point PF(U) U4

Read permission: Level 0, Write permission: Level 230

Voltage indication of the fourth sampling point of the PF(U) characteristic curve. The characteristic curve has 4 sampling points. The sampling points must be parameterized in ascending order. The lowest voltage is to be specified accordingly for sampling point U1 and the highest voltage for sampling point P4.

Unit: % P_{Rated}

20252467 Sampling point PF(U4)

Read permission: Level 0, Write permission: Level 230

PF demand of the fourth sampling point of the PF(U) characteristic curve. The characteristic curve has 4 sampling points that must be parameterized accordingly. Underexcited operation is identified by a negative sign before the offset factor.

20252472 Time constant 3Tau PF(U)

Read permission: Level 0, Write permission: Level 230

Time until 95 % of the setpoint value (3Tau) of the reactive power at control corresponding to the PF(U) demand is attained. The control behavior corresponds to that of a PT1 member.

Unit: s

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.16 Reactive power Q (Grid code mode BDEW)

The provision of reactive power can occur according to one of the following procedures:

- Reactive power voltage characteristic curve Q(U)
- Reactive power demand Q demand

The local mains operator specifies in the technical connection requirements or in the mains operator check sheet which procedure has to be selected, which settings are to be made and whether telecontrol system should perform a switchover between the reactive power procedures.

Moreover, the mains operator determines which method should be used with which setpoint value in case the telecontrol system should fail. In this regard, TPEM offers the "Watchdog" function with various setting options. Reactive power values are specified as a percentage of the rated active power; however, only the amount is relevant in this case.

10.16.1 Reactive power characteristic curve Q(U)

To support the static voltage stability, the reactive power mode can be selected for a Q(U) characteristic curve. A reactive power setpoint value is formed depending on the currently prevailing phase-phase voltage of the mains according to the characteristic curve entered.

The measuring inputs of the TPEM MFR are evaluated for the mains voltage. The Q(U) characteristic curve can be parameterized via 8 sampling points for U and Q. Linear interpolation takes place between the entered sampling points.

A pair of values must be entered for every sampling point. Several sampling points can be parameterized with the same pair of values. The characteristic curve must be parameterized according to the specifications of the mains operator.

The characteristic curve is defined by parameters `20250109 1st sampling point for U` to `20250247 8th sampling point for U` and parameters `20250091 1st sampling point for Q` to `20250239 8th sampling point for Q`.

In each case, the parameter is only described for the first sampling point.

Additionally, the following parameter can be set.

- `20105334 Agreed reference voltage`
- `20105342 Agreed reference reactive power`
- `20250456 Delay time Q(U)`

20105334 Agreed reference voltage

Read permission: Level 0, Write permission: Level 230

Reference value for the voltage values of the sampling points.

Unit: V

20105342 Agreed reference reactive power

Read permission: Level 0, Write permission: Level 230

Reference value for the reactive power values of the sampling points.

Underexcited values to be entered with a negative sign.

Unit: kvar

20250109 1st sampling point for U

Read permission: Level 0, Write permission: Level 230

Voltage indication of the first sampling point of the Q(U) characteristic curve.

Unit: % U_{Ref}

20250091 1st sampling point for Q

Read permission: Level 0, Write permission: Level 230

Reactive power indication of the first grid point of the Q(U) characteristic curve.

Unit: % Q_{Ref}

20250456 Delay time Q(U)

Read permission: Level 0, Write permission: Level 230

This value slows down the change of the reactive power setpoint value resulting from the Q(U) characteristic curve.

Unit: s

10.16.2 Reactive power demand Q demand

With parameter `20910033 Reactive power demand source`, the source of the reactive power demand can be specified.

The following are available to choose from:

- Fixed value
- One analog input
- Fixed value via Modbus

The corresponding setting of the TPEM MFR and the generator controller define the range that can be implemented by the genset based on the reactive power capacity of the generator. When commissioning, it must be ensured that no values of the reactive power can be reached during operation which thermally overload the generator or breach the stability limit.

20910033 Reactive power demand source

Read permission: Level 0, Write permission: Level 230

Fixed value

Activates the following parameter:

- `20250016 Fixed reactive power (Q) value`

Analog

Activates the following parameters: ⇒ Inputs and outputs (Grid code mode: BDEW)

- `20250260 Input Qset min (at 4 mA)`
- `20250271 Input Qset max (at 20 mA)`
- `20250283 Input Qset low pass time`

Modbus

Fixed reactive power specified by Modbus from a higher-level control station.

20250016 Fixed reactive power (Q) value

Read permission: Level 0, Write permission: Level 230

Underexcited values to be entered with a negative sign.

If the mains operator or plant operator has no specifications, the setpoint value Q = 0 kvar is to be selected.

Unit: kvar

10.17 Reactive power (Grid code mode: AR-N 4110 and General Grid Code)

The provision of reactive power can occur for `Grid code mode: AR-N 4110` according to one of the following procedures:

- Reactive power demand with voltage limitation function Q(U)+Qref
- Characteristic curve of the reactive power dependent on the active power Q(P)
- Reactive power voltage characteristic curve Q(U) + UQ0

The provision of reactive power can occur for `Grid code mode: General Grid Code` according to one of the following procedures:

- Reactive power demand with voltage limitation function Q(U)+Qref
- Characteristic curve of the reactive power dependent on the active power Q(P)
- Reactive power voltage characteristic curve Q(U) + UQ0
- Reactive power demand (Q setpoint mode)

The local mains operator specifies in the technical connection requirements or in the mains operator check sheet which procedure has to be selected, which settings are to be made and whether telecontrol system should perform a switchover between the reactive power procedures.

Three digital inputs -127K1/DI2, DI3 and DI11 are provided on the TPEM IO Controller for the switchover and digital outputs -129K1/DO, DO2 and DO3 are provided for the feedback (see TPEM IO wiring diagram).

Allocation is defined according to the following table:

Demand / Charac-teristic curve	Mode	127K1/DI2, 129K1DO1	127K1/DI3, 129K1DO2	127K1/DI11, 129K1DO3
Q(U) + Qref	B	1	0	0
Q(P)	C	0	1	0
Q(U) + UQ0	D	1	1	0
Q setpoint mode	E	0	0	1

Moreover, the mains operator determines which method should be used with which desired value in case the telecontrol system should fail. In this regard, TPEM offers the Watchdog function with various setting options. Reactive power values are specified as a percentage of the rated active power; however, only the amount is relevant in this case.

10.17.1 `Q(U) + Qref`

The characteristic curve Q(U) with Qref, i.e. voltage limitation function is defined based on four sampling points (parameters `20250801 Sampling point Q demand(U): U1`, `20250817 Sampling point Q demand(U): Q(U1)` and the following).

A characteristic curve offset is possible by specifying a value for Qref via a fixed value or via an analog input.

The source of the offset is selected using parameter `20250922 Q demand Qref offset source`.

The fixed value is parameterized using parameter `20250911 Q demand Qref offset fixed value`.

The analog input is parameterized using parameters `20251202 Input Qset/ref min (at 4 mA)` and `20251192 Input Qset/ref max (at 20 mA)`.

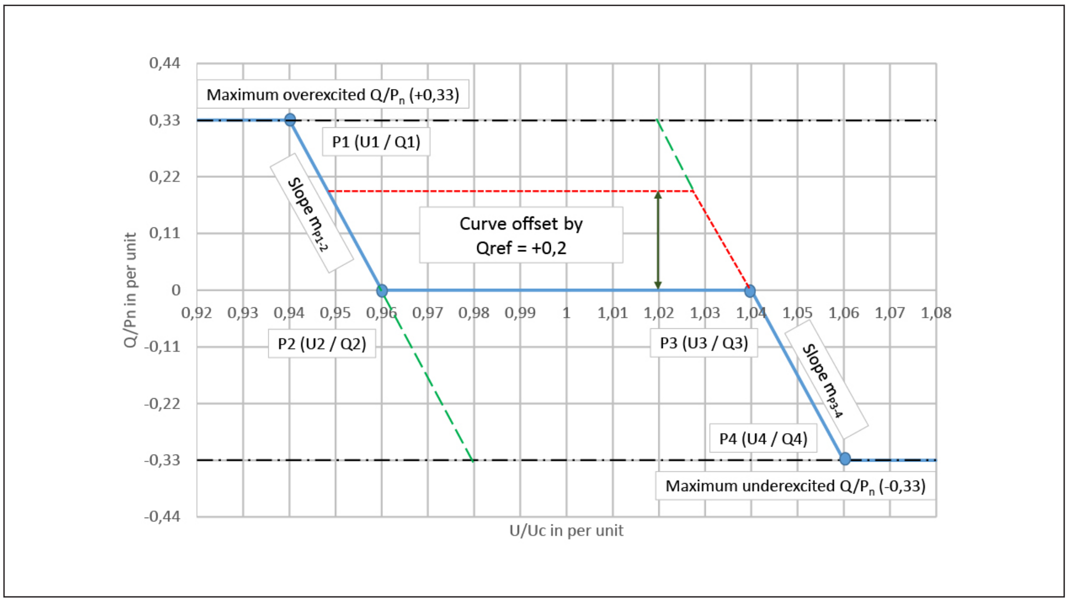
If the reactive power values of sampling points 2 and 3 are identical as in the figure below, an activation delay can be set (parameter `20251486 Q demand(U) delay`). If the voltage falls below U2 or exceeds U3, the modification of the reactive power desired value is delayed by the set period of time.

Several Watchdog parameters are available as a reaction to a fault in the telecontrol connection to the mains operator.

Another reactive power mode can be switched to using parameter `20251622 Watchdog reaction reactive power mode Q(U)+Qref`. Parameter `20251121 Watchdog substitute value mode Q(U)+Qref` can be parameterized either to retain the value or to a fixed value ⇒ parameter `20251159 Watchdog fixed substitute value Q(U)+Qref`.

The reactive power exhibits a PT1 behavior qualitatively at desired value increments. The time constant 3Tau, or the time until 95 % of the desired value is attained, is defined via parameter `20250906 Time constant 3Tau PT1 Q demand(U)`.

The following figure shows the Q demand with voltage limitation function for values P1(0.94/0.33), P2(0.96/0), P3(1.04/0) and P4(1.06/−0.33) (generator sign convention).



71421-003

`20910065 Reactive power characteristic curve Q(U) with Qref`

Read permission: Level 0

Activates / deactivates the sampling points Q demand(U): U1 to U4 and the sampling point Q demand(U): Q(U1) to Q(U4).

`20250801 Sampling point Q demand(U): U1`

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q demand:

Voltage value of the first sampling point for definition of the Q characteristic curve. The characteristic curve consists of 4 sampling points that must be parameterized accordingly.

Indicated as a percentage of the agreed supply voltage of the genset. See parameter `20250793 Agreed Uc`.

Unit: % U_c

`20250817 Sampling point Q demand(U): Q(U1)`

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q demand:

Reactive power value of the first sampling point for definition of the Q characteristic curve. Underexcited operation is identified by a negative sign before the reactive power. The characteristic curve consists of 4 sampling points that must be parameterized accordingly.

Input as a percentage of the rated active power.

Unit: % P_{Rated}

`20251486 Q demand(U) delay`

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q demand(U):

The activation delay can be set in the case that the reactive power values of sampling points 2 and 3 are identical. If the voltage falls out of the defined voltage band with a constant provision of reactive power, the modification of the reactive power setpoint value is only active after the set activation delay has elapsed.

Unit: s

`20251839 Q demand power threshold activation`

Read permission: Level 0, Write permission: Level 230

Limitation of the reactive power supply at low active power output. This parameter is used to set the active power threshold value above which reactive power is supplied in accordance with the characteristic curve of the Q demand.

Unit: % P_{Rated}

`20251847 Q demand power threshold deactivation`

Read permission: Level 0, Write permission: Level 230

Limitation of the reactive power supply at low active power output. This parameter is used to set the active power threshold value below which the reactive power desired value is set to zero.

Unit: % P_{Rated}

`20251606 Q demand power factor minimum`

Read permission: Level 0, Write permission: Level 230

This parameter limits the minimum power factor (PF) in Q(U)+Qref mode. The power factor is therefore always between the set value and 1.0.

Unit: 1

`20250906 Time constant 3Tau PT1 Q demand(U)`

Read permission: Level 0, Write permission: Level 230

Time until 95 % of the setpoint value (3Tau) of the reactive power, at control corresponding to the Q demand, is attained. The control behavior corresponds to that of a PT1 member.

Unit: s

`20250922 Q demand Qref offset source`

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q demand:

Selection of the source for Qref in normal operation.

Fixed value

Activates parameter:

- `20250911 Q demand Qref offset fixed value`

Analog

Activates the following parameters ⇒ Inputs and outputs (Grid code mode: AR-N 4110 and General Grid Code):

- `20251202 Input Qset/ref min (at 4 mA)`
- `20251192 Input Qset/ref max (at 20 mA)`

`20250911 Q demand Qref offset fixed value`

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q demand:

Setpoint value for the reactive power value Qref for the shift in the characteristic curve of the Q demand in normal operation.

Input as a percentage of the rated active power.

Unit: % P_{Rated}

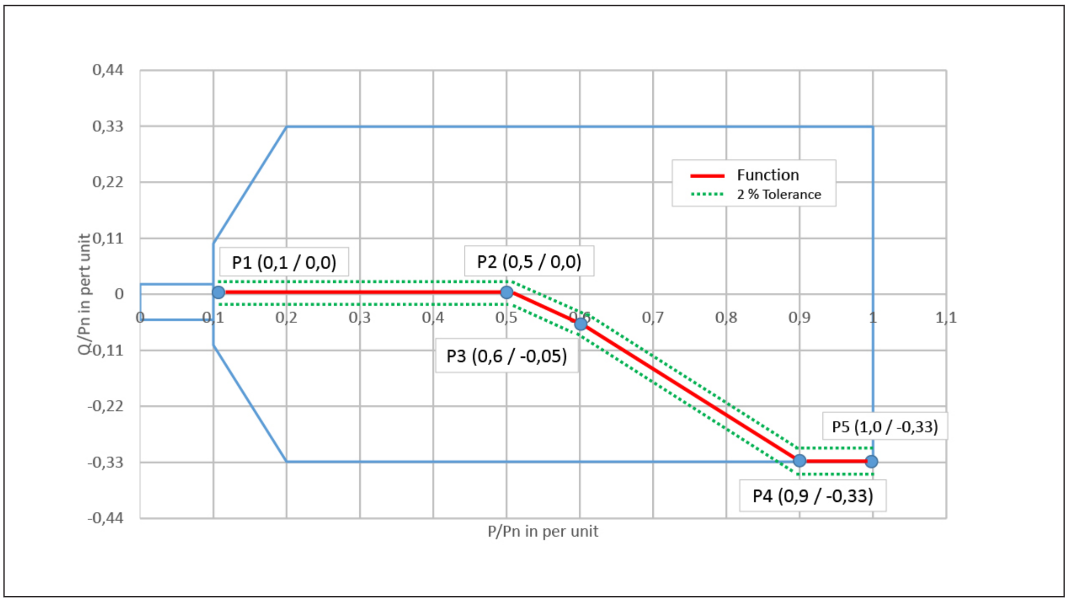
10.17.2 Q(P)

The Q(P) characteristic curve is defined based on ten sampling points. The ten value pairs from active and reactive power are set via parameters `20250599 Sampling point Q(P): P1`, `20250600 Sampling point Q(P): Q(P1)` and the following. If less than ten points are required to define the characteristic curve, all other sampling points are identical to the last required sampling point.

Watchdog parameter `20251633 Watchdog reaction reactive power mode Q(P)` is available as a reaction to a fault in the telecontrol connection to the mains operator. This can be used to change to another reactive power mode.

The reactive power exhibits a PT1 behavior qualitatively at setpoint increments. The time constant 3Tau, or the time until 95 % of the setpoint value is attained, is defined via parameter `20250585 Time constant 3Tau PT1 Q(P).`

The following figure shows the Q(P) characteristic curve. Sampling points P6 – P10 are assigned the values P = 1.0 and Q = −0.33 in this case, similar to P5 (generator sign convention).



71423-003

20910087 Reactive power characteristic curve Q(P)

Read permission: Level 0

Activates/deactivates the sampling point Q(P): P1 to P10 and the sampling point Q(P): Q(P1) to Q(P10).

20250599 Sampling point Q(P): P1

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q(P) characteristic curve:

Active power indication of the first sampling point of the Q(P) characteristic curve. The characteristic curve has 10 sampling points that must be parameterized accordingly.

Input as a percentage of the rated active power of the genset

Unit: % P_{Rated}

20250600 Sampling point Q(P): Q(P1)

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q(P) characteristic curve:

Reactive power indication of the first sampling point of the Q(P) characteristic curve. Underexcited operation is identified by a negative sign before the reactive power. The characteristic curve has 10 sampling points that must be parameterized accordingly.

Input as a percentage of the rated active power of the genset

Unit: % P_{Rated}

20250585 Time constant 3Tau PT1 Q(P)

Read permission: Level 0, Write permission: Level 230

Time until 95 % of the setpoint value (3Tau) of the reactive power, at control corresponding to the Q(P) characteristic curve, is attained. The control behavior corresponds to that of a PT1 member.

Unit: s

10.17.3 `Q(U) + UQ0`

The Q(U) characteristic with UQ0 can be set using the values Qmax (parameter `20250512 Q(U) Qmax`), Umax (parameter `20250573 Q(U) Umax`) and the UQ0 source (parameter `20250520 Q(U) UQ0 source`).

The offset of the UQ0 source curve is possible as a fixed value or an analog input.

The fixed value is parameterized using parameter `20250536 Q(U) UQ0 fixed value`. The offset along the voltage axis occurs via an analog input using parameter `20250548 Input Uset/ref min. (at 4 mA)` und `20250557 Input Uset/ref max (at 20 mA)`.

A dead band (parameter `20250561 Q(U) dead band`) can also be set.

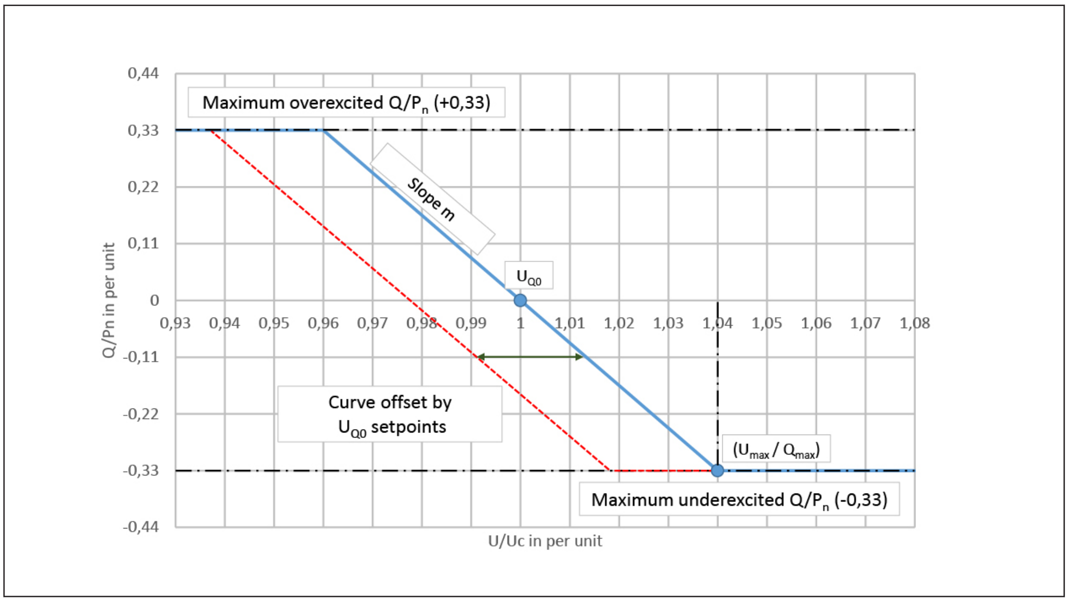
Several Watchdog parameters are available as a reaction to a fault in the telecontrol connection to the mains operator.

Another reactive power mode can be switched to using parameter `20251640 Watchdog reaction reactive power mode Q(U)+UQ0`.

Parameter `20251113 Watchdog substitute value mode Q(U)+UQ0` can be parameterized either to retain the value or to a fixed value ⇒ parameter `20251145 Watchdog fixed substitute value Q(U)+UQ0`.

The reactive power exhibits a PT1 behavior qualitatively at desired value increments. The time constant 3Tau, or the time until 95 % of the desired value is attained, is defined via parameter `20250504 Time constant 3Tau PT1 Q(U)`.

The following figure shows the Q(U) characteristic curve for the values UQ0 = 1; Umax = 1.04; Qmax = −0.33 (generator sign convention)



71424-003

`20910079 Reactive power characteristic curve Q(U) with UQ0`

Read permission: Level 0

Activates / deactivates the sampling points Q demand(U): U1 to U4 and the sampling point Q demand(U): Q(U1) to Q(U4).

20250573 Q(U) Umax

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q(U) characteristic curve:

Voltage value from which the maximum underexcited reactive power is provided by the genset.

Indicated as a percentage of the agreed supply voltage.

Unit: % U_c

20250512 Q(U) Qmax

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q(U) characteristic curve: Maximum reactive power that is provided by the genset. Underexcited operation is identified by a negative sign before the reactive power.

Input as a percentage of the rated active power of the genset

Unit: % P_{Rated}

20250561 Q(U) dead band

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q(U) characteristic curve:

No voltage-dependent change in the reactive power occurs within the set dead band limits around the characteristic curve.

Indicated as a percentage of the agreed supply voltage.

Unit: % U_c

20250504 Time constant 3Tau PT1 Q(U)

Read permission: Level 0, Write permission: Level 230

Time until 95 % of the setpoint value (3Tau) of the reactive power, at control corresponding to the Q(U) characteristic curve, is attained. The control behavior corresponds to that of a PT1 member.

Unit: s

20250520 Q(U) UQ0 source

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q(U) characteristic curve:

Selection of the source for the specified voltage UQ0 at which no reactive current exchange occurs (zero crossover) in normal operation: Fixed value or demand via analog input.

Fixed value

Activates parameter:

- 20250536 Q(U) UQ0 fixed value

Analog

Activates the following parameters ⇒ Inputs and outputs (Grid code mode: AR-N 4110 and General Grid Code):

- `20250548 Input Uset/ref min (at 4 mA)`
- `20250557 Input Uset/ref max (at 20 mA)`

`20250536 Q(U) UQ0 fixed value`

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q(U) characteristic curve:

Specified voltage U_{Q0} at which no reactive current exchange occurs (zero crossover).

Indicated as a percentage of the agreed supply voltage.

Unit: % U_c

10.17.4 `Q setpoint mode`

The reactive power is specified via parameter `20251429 Reactive power demand source` as a fixed value, via an analog input or via Modbus.

The fixed value is parameterized using parameter `20251432 Q demand fixed value`.

The analog input is parameterized using parameters `20251202 Input Qset/ref min (at 4 mA)` and `20251192 Input Qset/ref max (at 20 mA)`.

Several Watchdog parameters are available as a reaction to a fault in the telecontrol connection to the mains operator.

Another reactive power mode can be switched to using parameter `20251215 Watchdog reaction reactive power mode U desired value mode`.

Parameter `20251289 Watchdog substitute value mode U desired value mode` can be parameterized either to value retention or to a fixed value ⇒ `20251228 Watchdog fixed substitute value U setpoint mode`.

The reactive power exhibits a PT1 behavior qualitatively at desired value increments. The time constant 3Tau, or the time until 95 % of the desired value is attained, is defined using parameter `20251441 Time constant 3Tau Q demand`.

`20251429 Reactive power demand source`

Read permission: Level 0, Write permission: Level 230

Fixed value

Activates the following parameter:

- `20251432 Q demand fixed value`

Analog

Activates the following parameters ⇒ Inputs and outputs (Grid code mode: AR-N 4110 and General Grid Code):

- `20251202 Input Qset/ref min (at 4 mA)`
- `20251192 Input Qset/ref max (at 20 mA)`

Modbus

Fixed Q demand value specified by Modbus from a higher-level control station.

20251432 Q demand fixed value

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q setpoint mode:

Fixed setpoint value Qref for reactive power demand in normal operation. Underexcited operation is identified by a negative sign.

Unit: % P_{Rated}

20251441 Time constant 3Tau Q demand

Read permission: Level 0, Write permission: Level 230

Time until 95 % of the setpoint value (3Tau) of the reactive power, at control corresponding to the Q demand, is attained. The control behavior corresponds to that of a PT1 member.

Unit: s

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

10.18 Voltage desired value mode (Grid code mode: General Grid Code)

The provision of reactive power occurs according to the following procedure:

- Voltage desired value mode U

The local mains operator specifies in the technical connection requirements or in the mains operator check sheet which procedure has to be selected, which settings are to be made and whether telecontrol system should perform a switchover between the reactive power procedures.

Three digital inputs -127K1/DI2, DI3 and D11 are provided on the TPEM IO Controller for the switchover and digital outputs -129K1/DO, DO2 and DO3 are provided for the feedback (see TPEM IO wiring diagram).

Allocation is defined according to the following table:

Demand / Charac-teristic curve	Mode	127K1/DI2, 129K1DO1	127K1/DI3, 129K1DO2	127K1/DI11, 129K1DO3
U desired value mode	G	0	1	1

Moreover, the mains operator determines which method should be used with which desired value in case the telecontrol system should fail. In this regard, TPEM offers the Watchdog function with various setting options. Reactive power values are specified as a percentage of the rated active power; however, only the amount is relevant in this case.

U desired value mode

The reactive power is specified via parameter `20251290 Source U demand value` as a fixed value, via an analog input or via Modbus.

The fixed value is parameterized using parameter `20251231 U demand fixed value`. The analog input is parameterized via parameters `20250548 Input U set/ref min (at 4 mA)` and `20250557 Input U set/ref max (at 20 mA)`.

The P-I-D control can be set via the parameters `20251266 U demand control P proportional gain`, `20251253 U demand control I proportional gain` and `20251244 U demand control D proportional gain`.

Several Watchdog parameters are available as a reaction to a fault in the telecontrol connection to the mains operator.

Another reactive power mode can be switched to using parameter `20251215 Watchdog reaction reactive power mode U desired value mode`.

Parameter `20251289 Watchdog substitute value mode U desired value mode` can be parameterized either to retain the value or to a fixed value ⇒ Parameter `20251228 Watchdog fixed substitute value U desired value demand`.

The reactive power exhibits a PT1 behavior qualitatively at desired value increments. The time constant 3Tau, or the time until 95 % of the desired value is attained, is defined using parameter `20251277 Time constant 3Tau U demand`.

10.18.1 `20251266 U demand control P proportional gain`

Read permission: Level 0, Write permission: Level 230

Parameterization of the U setpoint mode: Active weighting of the P component. This is not effective with the parameter value "0" and fully effective with the parameter value "1".

10.18.2 `20251244 U demand control D proportional gain`

Read permission: Level 0, Write permission: Level 230

Parameterization of the U setpoint mode: Active weighting of the D component. This is not effective with the parameter value "0" and fully effective with the parameter value "1".

10.18.3 `20251253 U demand control I proportional gain`

Read permission: Level 0, Write permission: Level 230

Parameterization of the U setpoint mode: Active weighting of the I component. This is not effective with the parameter value "0" and fully effective with the parameter value "1".

10.18.4 `20251277 Time constant 3Tau U demand`

Read permission: Level 0, Write permission: Level 230

Time until 95 % of the setpoint value (3Tau) of the reactive power, at control corresponding to the U demand, is attained. The control behavior corresponds to that of a PT1 member.

Unit: s

10.18.5 `20251290 Source U demand value`

Read permission: Level 0, Write permission: Level 230

Fixed value

Activates the following parameter:

- `20251231 U demand fixed value`

Analog

Activates the following parameters ⇒ Inputs and outputs (Grid code mode: AR-N 4110 and General Grid Code):

- `20250548 Input Uset/ref min (at 4 mA)`
- `20250557 Input Uset/ref max (at 20 mA)`

Modbus

Fixed U setpoint mode specified by Modbus from a higher-level control station.

10.18.6 `20251231 U demand fixed value`

Read permission: Level 0, Write permission: Level 230

Parameterization of the U setpoint mode: Fixed setpoint value UQ0 for voltage demand in normal operation.

Unit: P_{Rated}

10.19 Watchdog reactive power (Grid code mode: AR-N 4110)

10.19.1 `20251062 Reactive power watchdog mode`

Read permission: Level 0, Write permission: Level 230

In the event of a failure of the telecontrol connection to the mains operator, TPEM can switch to reactive power watchdog mode and, depending on the reactive power mode previously active before this occurs (PF demand, Q(P), Q(U)+Qref, Q(U)+UQ0), select one of the four reactive power modes mentioned and use a fixed value or the last valid value as the desired value.

The functioning of the telecontrol connection can be shown to TPEM via the circuit of the digital input 127K1/DI4 on the TPEM IO: the supply voltage must either be constant (`Constantly on`) or the applied voltage must alternate between supply voltage and 0 V (`Pulse`). A rising flank must be present during the set downtime (parameter 20251176 `Watchdog DI coming downtime`). Alternatively, the reactive power watchdog mode can be completely deactivated (`Deactivated`).

The reactive power watchdog mode monitors analog inputs and digital inputs depending on the parameterization of the reactive power modes. For example, in the reactive power mode PF demand, the digital inputs 127K1 DI5 to DI9 are monitored for logic errors. If more than one of the five digital inputs are on high signal (digital active high) during selection or more than one of the five digital inputs are on low signal (digital active low) during switching, the reactive power watchdog mode finds the logic error and displays the text `PF DI demand incorrect`.

The reactive power watchdog mode monitors the following analog inputs and digital inputs depending on the parameterization of the reactive power modes:

Reactive power modes	Analog inputs	Digital inputs
PF demand	112K6 AI4	127K1 DI5 to DI9
Q(U)+UQ0	128K1 AI4	-
Q(U)+Qref	128K2 AI1	-

10.19.2 `20251176 Watchdog DI coming downtime`

Read permission: Level 0, Write permission: Level 230

Delay time after failure of the telecontrol connection up to the transition in the reactive power Watchdog mode.

Unit: s

10.19.3 `20251184 Watchdog DI going downtime`

Read permission: Level 0, Write permission: Level 230

Delay time after resumption of the telecontrol connection up to the transition in the reactive power is removed from the Watchdog mode.

Unit: s

10.19.4 `20251100 Watchdog reaction reactive power mode PF demand`

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Reaction to failure of the telecontrol system (Watchdog response) with active PF demand, selection of reactive power mode: Remain at PF demand or transition to one of the following modes ⇒ Q(P), Q(U)+Qref, Q(U)+UQ0.

10.19.5 `20251137 Watchdog substitute value mode PF demand`

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

If the PF demand was selected as the reaction to a failure of the telecontrol system (Watchdog response) (regardless of which reactive power mode was previously active), then either a fixed value or the last valid PF setpoint can be selected here as the PF setpoint.

Value retention

Last valid value received.

Fixed value

Activates parameter `20251168 Watchdog fixed substitute value PF demand`

10.19.6 `20251168 Watchdog fixed substitute value PF demand`

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Specification of a fixed setpoint for the offset factor PF, which is used during a failure of the telecontrol system (Watchdog response), provided that the parameter `20251137 Watchdog substitute value mode PF demand` is set to `Fixed value`. Underexcited operation is identified by a negative sign before the offset factor.

Unit: 1

10.19.7 `20251097 Watchdog reaction reactive power mode Q(U)+Qref`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(U)+Qref:

Reaction to failure of the telecontrol system (Watchdog response) with active reactive power mode Q(U)+Qref, selection of reactive power mode: Remain at reactive power mode Q(U)+Qref or transition to one of the following modes ⇒ PF demand, Q(P), Q(U)+UQ0.

10.19.8 `20251121 Watchdog substitute value mode Q(U)+Qref`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(U)+Qref:

If the reactive power mode Q(U)+Qref was selected as the reaction to a failure of the telecontrol system (Watchdog response) (regardless of which reactive power mode was previously active), then either a fixed value or the last valid Qref value can be selected here as the Qref value.

Value retention

Last valid value received.

Fixed value

Activates parameter `20251159 Watchdog fixed substitute value Q(U)+Qref`.

10.19.9 `20251159 Watchdog fixed substitute value Q(U)+Qref`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(U)+Qref:

Specification of a fixed value for Qref which is used during a failure of the telecontrol system (Watchdog response), provided the parameter `20251121 Watchdog substitute value mode Q(U)+Qref` is set to `Fixed value`. Underexcited operation is identified by a negative sign.

Input as a percentage of the rated active power.

Unit: % P_{Rated}

10.19.10 `20251070 Watchdog reaction reactive power mode Q(U)+UQ0`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(U)+UQ0:

Reaction to failure of the telecontrol system (Watchdog response) with active reactive power mode Q(U)+UQ0, selection of reactive power mode: Remain at reactive power mode Q(U)+UQ0 or transition to one of the following modes ⇒ PF demand, Q(P), Q(U) +Qref.

10.19.11 `20251113 Watchdog substitute value mode Q(U)+UQ0`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(U)+UQ0:

If the reactive power mode Q(U)+UQ0 was selected as the reaction to a failure of the telecontrol system (Watchdog response) (regardless of which reactive power mode was previously active), then either a fixed value or the last valid U_{Q0} value can be selected here as the U_{Q0} value.

Value retention

Last valid value received.

Fixed value

Activates parameter `20251145 Watchdog fixed substitute value Q(U)+UQ0`.

10.19.12 `20251145 Watchdog fixed substitute value Q(U)+UQ0`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(U)+UQ0:

Specification of a fixed value for UQ0 which is used during a failure of the telecontrol system (Watchdog response), provided the parameter `20251113 Watchdog substitute value mode Q(U)+UQ0` is set to `Fixed value`.

Unit: % U_c

10.19.13 `20251081 Watchdog reaction reactive power mode Q(P)`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(P):

Reaction to failure of the telecontrol system (Watchdog response) with active Q(P) characteristic curve, selection of reactive power mode: Remain at Q(P) characteristic curve or transition to one of the following modes ⇒ PF demand, Q(U)+Qref, Q(U)+UQ0.

10.20 Watchdog reactive power (Grid code mode: General Grid Code)

10.20.1 20251062 Reactive power watchdog mode

Read permission: Level 0, Write permission: Level 230

In the event of a failure of the telecontrol connection to the mains operator, TPEM can switch to reactive power watchdog mode and, depending on the reactive power mode previously active before this occurs (PF demand, Q(P), Q(U)+Qref, Q(U)+UQ0, Q setpoint mode, PF(P), U setpoint mode, PF(U)), select one of the four reactive power modes mentioned and use a fixed value or the last valid value as the setpoint.

The functioning of the telecontrol connection can be shown to TPEM via the circuit of the digital input 127K1/DI4 on the TPEM IO: the supply voltage must either be constant (`Constantly on`) or the applied voltage must alternate between supply voltage and 0 V (`Pulse`). A rising flank must be present during the set downtime (parameter 20251176 `Watchdog DI coming downtime`). Alternatively, the reactive power watchdog mode can be completely deactivated (`Deactivated`).

The reactive power watchdog mode monitors analog inputs and digital inputs depending on the parameterization of the reactive power modes. For example, in the reactive power mode PF demand, the digital inputs 127K1 DI5 to DI9 are monitored for logic errors. If more than one of the five digital inputs are on high signal (digital active high) during selection or more than one of the five digital inputs are on low signal (digital active low) during switching, the reactive power watchdog mode finds the logic error and displays the text `PF DI demand incorrect`.

The reactive power watchdog mode monitors the following analog inputs and digital inputs depending on the parameterization of the reactive power modes:

Reactive power modes	Analog inputs	Digital inputs
PF demand	112K6 AI4	127K1 DI5 to DI9
Q(U)+UQ0	128K1 AI4	-
Q(U)+Qref	128K2 AI1	-
Q setpoint	128K2 AI1	-
U setpoint	128K1 AI4	-

10.20.2 20251176 Watchdog DI coming downtime

Read permission: Level 0, Write permission: Level 230

Delay time after failure of the telecontrol connection up to the transition in the reactive power Watchdog mode.

Unit: s

10.20.3 20251184 Watchdog DI going downtime

Read permission: Level 0, Write permission: Level 230

Delay time after resumption of the telecontrol connection up to the transition in the reactive power is removed from the Watchdog mode.

Unit: s

10.20.4 20251611 Watchdog reaction reactive power mode PF demand

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Reaction to failure of the telecontrol system (Watchdog response) with active PF demand, selection of reactive power mode: Remain at PF demand or transition to one of the following modes ⇒ Q(P), Q(U)+Qref, Q(U)+UQ0, Q setpoint mode, PF(P), U setpoint mode, PF(U).

10.20.5 `20251137 Watchdog substitute value mode PF demand`

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

If the PF demand was selected as the reaction to a failure of the telecontrol system (Watchdog response) (regardless of which reactive power mode was previously active), then either a fixed value or the last valid PF setpoint can be selected here as the PF setpoint.

Value retention

Last valid value received.

Fixed value

Activates parameter `20251168 Watchdog fixed substitute value PF demand`

10.20.6 `20251168 Watchdog fixed substitute value PF demand`

Read permission: Level 0, Write permission: Level 230

Parameterization of the PF demand:

Specification of a fixed setpoint for the offset factor PF, which is used during a failure of the telecontrol system (Watchdog response), provided that the parameter `20251137 Watchdog substitute value mode PF demand` is set to `Fixed value`. Underexcited operation is identified by a negative sign before the offset factor.

Unit: 1

10.20.7 `20251304 Watchdog reaction reactive power mode PF(P)`

Read permission: Level 0, Write permission: Level 230

Parameterization of PF(P):

Reaction to failure of the telecontrol system (Watchdog response) with active PF(P), selection of reactive power mode: Remain at PF(P) or transition to one of the following modes ⇒ PF demand, Q(P), Q(U)+Qref, Q(U)+UQ0, Q setpoint mode, U setpoint mode, PF(U).

10.20.8 `20252480 Watchdog reaction reactive power mode PF(U)`

Read permission: Level 0, Write permission: Level 230

Parameterization of PF(U):

Reaction to failure of the telecontrol system (Watchdog response) with active PF(U), selection of reactive power mode: Remain at PF(U) or transition to one of the following modes ⇒ PF demand, Q(P), Q(U)+Qref, Q(U)+UQ0, Q setpoint mode, PF(P), U setpoint mode.

10.20.9 `20251455 Watchdog reaction reactive power mode Q setpoint mode`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q setpoint mode:

Reaction to failure of the telecontrol system (Watchdog response) with active Q setpoint mode, selection of reactive power mode: Remain at Q setpoint mode or transition to one of the following modes ⇒ PF demand, Q(P), Q(U)+Qref, Q(U)+UQ0, PF(P), U setpoint mode, PF(U).

10.20.10 `20251478 Watchdog substitute value mode Q setpoint mode`

Read permission: Level 0, Write permission: Level 230

Fixed value

Activates parameter `20251464 Watchdog fixed substitute value Q setpoint mode`.

Value retention

Last valid value received.

10.20.11 `20251464 Watchdog fixed substitute value Q setpoint mode`

Read permission: Level 0, Write permission: Level 230

Parameterization of the Q setpoint mode:

Fixed substitute value Qref for reactive power demand in the event of a fault (failure of telecontrol connection to the mains operator). In the event of a fault-induced switchover of the active reactive power mode to the Q setpoint mode, the switchover is always to the fixed substitute value at fault. Underexcited operation is identified by a negative sign.

Input as a percentage of the rated active power.

Unit: % P_{Rated}

10.20.12 `20251622 Watchdog reaction reactive power mode Q(U)+Qref`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(U)+Qref:

Reaction to failure of the telecontrol system (Watchdog response) with active Q(U)+Qref, selection of reactive power mode: Remain at Q(U)+Qref or transition to one of the following modes ⇒ PF demand, Q(P), Q(U)+UQ0, Q setpoint mode, PF(P), U setpoint mode, PF(U).

10.20.13 `20251121 Watchdog substitute value mode Q(U)+Qref`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(U)+Qref:

If the reactive power mode Q(U)+Qref was selected as the reaction to a failure of the telecontrol system (Watchdog response) (regardless of which reactive power mode was previously active), then either a fixed value or the last valid Qref value can be selected here as the Qref value.

Value retention

Last valid value received.

Fixed value

Activates parameter `20251159 Watchdog fixed substitute value Q(U)+Qref`.

10.20.14 `20251159 Watchdog fixed substitute value Q(U)+Qref`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(U)+Qref:

Specification of a fixed value for Qref which is used during a failure of the telecontrol system (Watchdog response), provided the parameter `20251121 Watchdog substitute value mode Q(U)+Qref` is set to `Fixed value`. Underexcited operation is identified by a negative sign.

Input as a percentage of the rated active power.

Unit: % P_{Rated}

10.20.15 `20251640 Watchdog reaction reactive power mode Q(U)+UQ0`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(U)+UQ0:

Reaction to failure of the telecontrol system (Watchdog response) with active Q(U)+UQ0, selection of reactive power mode: Remain at Q(U)+UQ0 or transition to one of the following modes ⇒ PF demand, Q(P), Q(U)+Qref, Q setpoint mode, PF(P), U setpoint mode, PF(U).

10.20.16 `20251113 Watchdog substitute value mode Q(U)+UQ0`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(U)+UQ0:

If the reactive power mode Q(U)+UQ0 was selected as the reaction to a failure of the telecontrol system (Watchdog response) (regardless of which reactive power mode was previously active), then either a fixed value or the last valid U_{Q0} value can be selected here as the U_{Q0} value.

Value retention

Last valid value received.

Fixed value

Activates parameter `20251145 Watchdog fixed substitute value Q(U)+UQ0`.

10.20.17 `20251145 Watchdog fixed substitute value Q(U)+UQ0`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(U)+UQ0:

Specification of a fixed value for UQ0 which is used during a failure of the telecontrol system (Watchdog response), provided the parameter `20251113 Watchdog substitute value mode Q(U)+UQ0` is set to `Fixed value`.

Unit: % U_c

10.20.18 `20251633 Watchdog reaction reactive power mode Q(P)`

Read permission: Level 0, Write permission: Level 230

Parameterization of Q(P):

Reaction to failure of the telecontrol system (Watchdog response) with active Q(P), selection of reactive power mode: Remain at Q(P) or transition to one of the following modes ⇒ PF demand, Q(U)+Qref, Q(U)+UQ0, Q setpoint mode, PF(P), U setpoint mode, PF(U).

10.20.19 `20251215 Watchdog reaction reactive power mode U setpoint mode`

Read permission: Level 0, Write permission: Level 230

Parameterization of the U setpoint mode:

Reaction to failure of the telecontrol system (Watchdog response) with active U setpoint mode, selection of reactive power mode: Remain at U setpoint mode or transition to one of the following modes ⇒ PF demand, Q(P), Q(U)+Qref, Q(U)+UQ0, Q setpoint mode, PF(P), PF(U).

10.20.20 `20251289 Watchdog substitute value mode U setpoint mode`

Read permission: Level 0, Write permission: Level 230

Parameterization of the U setpoint mode:

If the U setpoint mode was selected as the reaction to a failure of the telecontrol system (Watchdog response) (regardless of which reactive power mode was previously active), then either a fixed value or the last valid setpoint can be selected here as the setpoint demand.

Fixed value

Activates parameter `20251228 Watchdog fixed substitute value U setpoint mode`.

Value retention

Last valid value received.

10.20.21 `20251228 Watchdog fixed substitute value U setpoint mode`

Read permission: Level 0, Write permission: Level 230

Parameterization of the U setpoint mode:

Specification of a fixed substitute value for the U setpoint which is used during a failure of the telecontrol system (Watchdog response), provided the parameter `20251289 Watchdog substitute value mode U setpoint mode` is set to `Fixed value`.

Unit: % Uc

11 Lube oil

Table of contents

11.1 General

11.1.1 20130189 Lube oil sump automatic refill

Read permission: Level 0, Write permission: Level 50

The parameter is only visible if the following parameters are activated:

- 21130158 L327 Oil reservoir sensor

Activates the oil reservoir pump monitoring. The input 110K4: DI8 of the TPEM IO must be assigned a high signal. If the signal drops to low, the warning `Oil reservoir pump failed` is issued.

Activates the following parameters:

- 20130233 Oil sump oil level start value refill
- 20130240 Oil sump oil level stop value refill
- 20130222 Oil sump wait time for rise in oil level
- 20130211 Oil sump wait time after refill failure
- 20190021 Oil reservoir pump dry running protection
- 20190037 Oil reservoir pump dry running protection deactivation
- 20130190 Oil reservoir pump maximum runtime
- 20130206 Oil reservoir pump pause time

11.1.2 20130279 Lube oil sump automatic refill

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the following parameters are deactivated:

- 21130158 L327 Oil reservoir sensor

Activates the following parameters:

- 20130233 Oil sump oil level start value refill
- 20130240 Oil sump oil level stop value refill
- 20130222 Oil sump wait time for rise in oil level
- 20130211 Oil sump wait time after refill failure

11.1.3 20130233 Oil sump oil level start value refill

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if one of the following parameters is activated:

- 20130189 Lube oil sump automatic refill
- 20130279 Lube oil sump automatic refill

Defines the fill level in the lube oil sump (L234) at which automatic refill is activated.

Unit: 1 %

11.1.4 20130240 Oil sump oil level stop value refill

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if one of the following parameters is activated:

- 20130189 Lube oil sump automatic refill
- 20130279 Lube oil sump automatic refill

Defines the fill level in the lube oil sump (L234) at which automatic refill is deactivated.

Unit: 1 %

11.1.5 20130222 Oil sump wait time for rise in oil level

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if one of the following parameters is activated:

- 20130189 Lube oil sump automatic refill
- 20130279 Lube oil sump automatic refill

After the start of the automatic refill, an increase in the fill level in the lube oil sump is expected. If the oil level does not increase in due time, it is assumed that either the oil reservoir pump (CG132B) / fresh oil pump (CG170B) is defective, the filling is blocked or there is a leak. The oil reservoir pump / fresh oil pump is switched off and a warning appears.

The parameter defines the wait time within which the fill level in the lube oil sump must rise.

Unit: 1 second

11.1.6 20130211 Oil sump wait time after refill failure

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if one of the following parameters is activated:

- 20130189 Lube oil sump automatic refill
- 20130279 Lube oil sump automatic refill

After the start of the automatic refill, an increase in the fill level in the lube oil sump is expected. If the oil level does not increase in due time, it is assumed that either the oil reservoir pump (CG132B) / fresh oil pump (CG170B) is defective, the filling is blocked or there is a leak. The oil reservoir pump / fresh oil pump is switched off and a warning appears.

The parameter defines the waiting time before a potential restart of the oil reservoir pump / fresh oil pump.

Unit: 1 second

11.1.7 20190021 Oil reservoir pump dry running protection

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the following parameters are activated:

- 20130189 Lube oil sump automatic refill

Defines the fill level in the oil reservoir (L327) at which dry running protection is activated. The oil reservoir pump can no longer be switched on.

Unit: 1 %

11.1.8 **20190037 Oil reservoir pump dry running protection deactivation**

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the following parameters are activated:

- `20130189 Lube oil sump automatic refill`

Defines the fill level in the oil reservoir (L327) at which dry running protection is deactivated. The oil reservoir pump can be switched back on.

Unit: 1 %

11.1.9 **20130190 Oil reservoir pump maximum runtime**

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the following parameters are activated:

- `20130189 Lube oil sump automatic refill`

Defines the maximum runtime of the oil reservoir pump for the scheduled refilling of the lube oil sump while the genset is running. Between two runtimes, a pause time is set with parameter `20130206 Oil reservoir pump pause time`.

The runtime set here is not active at the lube oil change.

Unit: 1 second

11.1.10 **20130206 Oil reservoir pump pause time**

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the following parameters are activated:

- `20130189 Lube oil sump automatic refill`

Defines the pause time between two runtimes of the oil reservoir pump (see parameter `20130190 Oil reservoir pump maximum runtime`).

The pause time set here is not active at the lube oil change.

Unit: 1 second

11.1.11 **20105776 Oil reservoir automatic refill**

Read permission: Level 0, Write permission: Level 50

The parameter is only visible if the following parameters are activated:

- `21130158 L327 Oil reservoir sensor`

Activates the following parameters:

- `20190000 Oil reservoir oil level start value refill`
- `20190013 Oil reservoir oil level stop value refill`

11.1.12 **20190000 Oil reservoir oil level start value refill**

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the following parameters are activated:

- `20105776 Oil reservoir automatic refill`

Defines the fill level in the oil reservoir (L327) at which automatic refill is activated.

Unit: 1 %

11.1.13 20190013 Oil reservoir oil level stop value refill

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the following parameters are activated:

- 20105776 Oil reservoir automatic refill

Defines the fill level in the oil reservoir (L327) at which automatic refill is deactivated.

Unit: 1 %

11.1.14 20190045 Lube oil change prelubrication time

Read permission: Level 0

Specifies the runtime of the prelubrication pump after a lube oil change.

Unit: s

11.1.15 20130594 Alternative oil level limits for oil change

Read permission: Level 0, Write permission: Level 50

Activates the parameter for the automatic refill during the lube oil change.

Activates oil reservoir pump monitoring for CG132B. The input 110K4: DI8 of the TPEM IO must be assigned a high signal. If the signal drops to low, the warning `Oil reservoir pump failed` is issued.

Activates the following parameters for CG132B:

- 20130571 Oil sump oil level start value refill (oil change)
- 20190021 Oil reservoir pump dry running protection
- 20190037 Oil reservoir pump dry running protection deactivation

If the parameter `21130158 L327 oil reservoir sensor` is activated, the following additional parameter is activated for CG132B:

- 20190068 Oil reservoir oil level start value refill (oil change)
- 20190084 Oil reservoir oil level stop value refill (oil change)

Activates the following parameters for CG170B:

- 20130571 Oil sump oil level start value refill (oil change)

11.1.16 20130571 Oil sump oil level start value refill (oil change)

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the following parameters are activated:

- 20130594 Alternative oil level limits for oil change

Defines the fill level in the lube oil reservoir (L234) for the lube oil change at which automatic refill is activated. When the oil level reaches 75 %, automatic refill is deactivated.

Unit: 1 %

11.1.17 20190068 Oil reservoir oil level start value refill (oil change)

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the following parameters are activated:

- 21130158 L327 Oil reservoir sensor
- 20130594 Alternative oil level limits for oil change

Defines the fill level in the oil reservoir (L327) for the lube oil change at which automatic refill is activated.

Unit: 1 %

11.1.18 20190084 Oil reservoir oil level stop value refill (oil change)

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the following parameters are activated:

- 21130158 L327 Oil reservoir sensor
- 20130594 Alternative oil level limits for oil change

Defines the fill level in the oil reservoir (L327) for the lube oil change at which automatic refill is deactivated.

Unit: 1 %

11.1.19 20130547 Waste oil tank monitoring

Read permission: Level 0, Write permission: Level 200

Activates the monitoring of the fill level in the waste oil tank. Sensor L835 must be connected to terminal 110K5: DI3 of the TPEM IO. The input must be assigned a high signal. If the signal drops to low, the warning `L835 waste oil tank overfilled` is issued.

Activates the following parameters:

- 20130552 Waste oil tank leakage monitoring

11.1.20 20130552 Waste oil tank leakage monitoring

Read permission: Level 0, Write permission: Level 200

The parameter is only visible if the following parameters are activated:

- 20130547 Waste oil tank monitoring

Activates the monitoring of waste oil tank leakage.

Sensor L617 must be connected to terminal 110K5: DI4 of the TPEM IO. The input must be assigned a low signal. When the signal increases to High, warning `L617 Waste oil tank leakage` is issued.

12 MFR generator

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12.1 Overcurrent

The current monitoring is dependent on the setting of the parameter 22018500 Current measurement.

The maximum phase current is monitored in three stages.

12.1.1 Overcurrent limit 1

22022008 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The overcurrent is monitored according to the following parameters: Limit and delay. Monitoring is performed in three stages. All three limits can be configured independently of each other.

Prerequisite: Limit 1 < Limit 2 < Limit 3

The limits relate to the rated current in the system ⇒ parameter 22017546 Rated current.

22022043 Limit

Read permission: Level 0, Write permission: Level 230

The limit to be monitored is set here.

If the limit is reached or exceeded, an alarm sounds. The triggering of the alarm can be delayed using a delay time.

Hysteresis: 1 %, reset delay: 1 s

Unit: %

22022056 Delay

Read permission: Level 0, Write permission: Level 230

If the actual value exceeds the limit for longer than the set delay time, an alarm sounds.

If the actual value falls below the limit (minus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

12.1.2 Overcurrent limit 2

22022062 Monitoring

Read permission: Level 0, Write permission: Level 230

⇒ Parameter 22022008 Monitoring

22022100 Limit

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22022043 Limit`

`22022113 Delay`

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22022056 Delay`

12.1.3 Overcurrent limit 3

`22022121 Monitoring`

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22022008 Monitoring`

`22022168 Limit`

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22022043 Limit`

12.2 Frequency

Overfrequency errors and underfrequency errors are each monitored in two stages.

12.2.1 Overfrequency limit 1

22019004 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The overfrequency is monitored according to the following parameters: Limit and delay. Monitoring is performed in two stages. Both limits can be configured independently of each other.

Prerequisite: Limit 1 < Limit 2

The limits relate to the system rated frequency ⇒ parameter `22017509 System rated frequency`.

22019048 Limit

Read permission: Level 0, Write permission: Level 230

The limit to be monitored is set here.

If the limit is reached or exceeded, an alarm sounds. The triggering of the alarm can be delayed using a delay time.

Hysteresis: 0.05 Hz, reset delay: 80 ms

Unit: %

22019057 Delay

Read permission: Level 0, Write permission: Level 230

If the actual value exceeds the limit for longer than the set delay time, an alarm sounds.

If the actual value falls below the limit (minus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

12.2.2 Overfrequency limit 2

22019061 Monitoring

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22019004 Monitoring`

22019103 Limit

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22019048 Limit`

`22019116 Delay`

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22019057 Delay`

12.2.3 Underfrequency limit 1

`22019501 Monitoring`

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The underfrequency is monitored according to the following parameters: Limit and delay. Monitoring is performed in two stages. Both limits can be configured independently of each other.

Prerequisite: Limit 1 > Limit 2

The limits relate to the system rated frequency ⇒ parameter `22017509 System rated frequency`.

`22019549 Limit`

Read permission: Level 0, Write permission: Level 230

The limit to be monitored is set here.

If the limit value is reached or undershot, an alarm sounds. The triggering of the alarm can be delayed using a delay time.

Hysteresis: 0.05 Hz, reset delay: 80 ms

Unit: %

`22019558 Delay`

Read permission: Level 0, Write permission: Level 230

If the actual value falls short of the limit longer than the set delay time, an alarm sounds.

If the actual value exceeds the limit (plus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

12.2.4 Underfrequency limit 2

`22019563 Monitoring`

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22019501 Monitoring`

`22019605 Limit`

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22019549 Limit`

`22019618 Delay`

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22019558 Delay`

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

12.3 Operating range

The parameters for the operating voltage and the frequency are used to check whether these values are within their limits when a black start or generator synchronization is to be performed. Busbar 1 must be within these limits in order to synchronize the generator to the busbar.

The operating limits must be configured within the monitoring limits.

12.3.1 Operating range

22058008 Upper voltage limit

Read permission: Level 0, Write permission: Level 230

Generator, maximum operating voltage limit

Maximum permissible positive deviation of the generator voltage from the generator rated voltage ⇒ parameter `22017663 Rated voltage`.

Hysteresis: 1 %

Unit: %

22058019 Lower voltage limit

Read permission: Level 0, Write permission: Level 230

Generator, minimum operating voltage limit

Maximum permissible negative deviation of the generator voltage from the generator rated voltage ⇒ parameter `22017663 Rated voltage`.

Hysteresis: 1 %

Unit: %

22058024 Upper frequency limit

Read permission: Level 0, Write permission: Level 230

Generator, maximum operating frequency limit

Maximum permissible positive deviation of the generator frequency from the system rated frequency ⇒ parameter `22017509 System rated frequency`.

Hysteresis: 0.05 %

Unit: %

22058035 Lower frequency limit

Read permission: Level 0, Write permission: Level 230

Generator, minimum operating frequency limit

Maximum permissible negative deviation of the generator frequency from the system rated frequency ⇒ parameter `22017509 System rated frequency`.

Hysteresis: 0.05 %

Unit: %

12.4 Other monitoring

12.4.1 Busbar

22051188 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The busbar monitoring compares the actual voltage and the actual frequency of the busbar with the configured parameters of the generator operating range.

- ⇒ Parameter `22058008 Upper voltage limit`
- ⇒ Parameter `22058019 Lower voltage limit`
- ⇒ Parameter `22058024 Upper frequency limit`
- ⇒ Parameter `22058035 Lower frequency limit`

If the measured busbar voltage or busbar frequency deviates from the operating range beyond the parameterized delay time, a message appears.

12.4.2 Phase rotation

22039506 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The phase rotation is monitored according to the following parameters ⇒ parameter `22039540 Generator phase rotation direction`.

22039540 Generator phase rotation direction

Read permission: Level 0, Write permission: Level 230

Clockwise rotating field

The measured three-phase generator voltage has a clockwise rotating field, i.e. the voltage rotates in the direction L1-L2-L3 (standard setting) in a three-phase system.

Counterclockwise rotating field

The measured three-phase generator voltage has an counterclockwise rotating field, i.e. the voltage rotates in the direction L1-L3-L2 in a three-phase system.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

12.5 Power factor

The operation of the generator in the overexcited range is hereafter designated as `inductive`. Numerical values are given a positive sign.

The operation of the generator in the underexcited range is hereafter designated as `capacitive`. Numerical values are given a negative sign.

12.5.1 Generator lagging limit 1

22023254 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The excessively inductive generator power factor (PF) is monitored according to the following parameters: Limit and delay. Monitoring is performed in two stages. Both limits can be configured independently of each other.

12.5.2 Generator lagging limit 2

22023316 Monitoring

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22023254 Monitoring`

12.5.3 Generator leading limit 1

22023759 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

An excessively capacitive power factor (PF) is monitored according to the following parameters. Monitoring is performed in two stages. Both values can be configured independently of each other.

12.5.4 Generator leading limit 2

22023810 Monitoring

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22023759 Monitoring`

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

12.6 Pole slip

Monitoring function that disconnects the genset from the mains and shuts down the engine when generator stability is lost.

12.6.1 22024160 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

Activates pole slip monitoring with the following parameters:

- 22024171 Min. power
- 22024194 Number of pole slip events
- 22024208 Pole slip reset time

12.6.2 22024171 Min. power

Read permission: Level 0, Write permission: Level 230

When this miminum active power is reached in mains parallel mode, pole slip monitoring is released.

Input as a percentage of the generator rated power.

Unit: %

12.6.3 22024194 Number of pole slip events

Read permission: Level 200, Write permission: Level 230

Maximum number of pole slips allowed to avoid triggering an alarm.

12.6.4 22024208 Pole slip reset time

Read permission: Level 0, Write permission: Level 230

If the pole slip counter is not incremented within the parameterized time when pole slip monitoring is released, then the pole slip counter is reset.

Unit: s

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

12.7 Power load share

12.7.1 Active power load share deviation

22051004 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The load share is monitored according to the parameters limit and delay.

The limit relates to the absolute difference between the generator rated power and the percentage average power of the other generators ⇒ parameter `22017523 Rated active power`. When the power decrease is activated, the generator rated power is affected by the power decrease factor.

22051048 Delay

Read permission: Level 0, Write permission: Level 230

If the actual value exceeds the limit for longer than the set delay time, a message is issued.

If the actual value falls below the limit (minus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

12.7.2 Reactive power load share deviation

22048427 Limit

Read permission: Level 0, Write permission: Level 230

Display of the limit being monitored.

If the limit is reached or exceeded for at least the duration of the delay time, a message is issued.

Unit: %

22051061 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

Monitoring of the reactive power load share to several generators is performed.

For this to happen, the activated parameter must be `22056318 Reactive power load share`.

⇒ Section 13.2 `Load share`

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

22051103 Delay

Read permission: Level 0, Write permission: Level 230

If the actual value exceeds the limit for longer than the set delay time, a message is issued.

If the actual value falls below the limit (minus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

12.8 Overload

The power produced by the generator is calculated from the voltage values and current values, which are measured depending on the settings of the parameters 22018513 Voltage measurement and 22018500 Current measurement. The control monitors whether the system is in island mode or mains parallel mode.

If the control determines that the system is in island mode, the monitoring of the overload in mains parallel mode is deactivated using the following parameters:

IPM overload limit 1 and 2

- 22023505 Monitoring
- 22023560 Monitoring

If the control determines that the system is in mains parallel mode, the monitoring of the overload in island mode is deactivated by the following parameters:

MPM overload limit 1 and 2

- 22023009 Monitoring
- 22023067 Monitoring

If the measured generator active power in island mode is above the set limit, an alarm is triggered.

12.8.1 IPM overload limit 1

22023009 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The overload in island mode is monitored according to the following parameters: Limit and delay. Monitoring is performed in two stages. Both limits can be configured independently of each other.

Prerequisite: Limit 1 < Limit 2

The limits relate to the parameter 22017523 Rated active power.

22023046 Limit

Read permission: Level 0, Write permission: Level 230

The limit to be monitored is set here.

If the limit is reached or exceeded, an alarm sounds. The triggering of the alarm can be delayed using a delay time.

Hysteresis: 1 %, reset delay: 80 ms

Unit: %

22023051 Delay

Read permission: Level 0, Write permission: Level 230

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

If the actual value exceeds the limit for longer than the set delay time, an alarm sounds.

If the actual value falls below the limit (minus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

12.8.2 IPM overload limit 2

22023067 Monitoring

Read permission: Level 0, Write permission: Level 230

⇒ Parameter 22023009 Monitoring

22023102 Limit

Read permission: Level 0, Write permission: Level 230

⇒ Parameter 22023046 Limit

22023115 Delay

Read permission: Level 0, Write permission: Level 230

⇒ Parameter 22023051 Delay

12.8.3 MPM overload limit 1

12.8.4 MPM overload limit 2

22023560 Monitoring

Read permission: Level 0, Write permission: Level 230

⇒ Parameter 22023505 Monitoring

22023604 Limit

Read permission: Level 0, Write permission: Level 230

⇒ Parameter 22023547 Limit

12.9 Reduced power

The power produced by the generator is calculated from the voltage values and current values, which are measured depending on the settings of the parameters `22018513 Voltage measurement` and `22018500 Current measurement`.

The generator power limits can be configured according to the set limit for reduced power and/or reverse power. The following examples explain how to configure a reduced power limit or reverse power limit.

If the single-phase or three-phase measured active power is below the set limit for the reduced power or below the setpoint value for the reverse power, a message appears.

The values for the reverse power monitoring and/or reduced power monitoring can be configured as follows:

Example 1

Level 1 limit = positive and level 2 limit = positive

whereby level 1 limit > level 2 limit > 0 %

Both limits are configured for reduced power monitoring.

Rated power is 1000 kW, level 1 limit = 5 % > level 2 limit = 3 %

Triggered when the active power falls below 50 kW (level 1 limit) or 30 kW (level 2 limit).

Example 2

Level 1 limit = negative and level 2 limit = negative

whereby level 2 limit < level 1 limit < 0 %

Both limits are configured for reverse power monitoring

Rated power is 1000 kW, level 1 limit = -3 % > level 2 limit = -5 %

Triggered when the active power falls below -30 kW (level 1 limit) or -50 kW (level 2 limit).

Example 3

Level 1 limit = positive and level 2 limit = negative

whereby level 1 limit > 0 % > level 2 limit

Level 1 is configured for the reduced power monitoring and level 2 is configured for the reverse power monitoring

Rated power is 1000 kW, level 1 limit = 3 % > level 2 limit = -5 %

Triggered when the active power falls below 30 kW (level 1 limit) or -50 kW (level 2 limit).

12.9.1 Reverse power/reduced power limit 1

22022503 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The reduced power and/or reverse power is monitored according to the following parameters: Limit and delay. Both limits can be configured independently of each other.

The limits relate to the parameter `22017523 Rated active power`.

22022542 Limit

Read permission: Level 200, Write permission: Level 230

The limit to be monitored is set here.

If the limit value is reached or undershot, an alarm sounds. The triggering of the alarm can be delayed using a delay time.

Hysteresis: 1 %, reset delay: 80 ms

Unit: %

22022550 Delay

Read permission: Level 0, Write permission: Level 230

If the actual value reaches or falls below the limit for longer than the set delay time, an alarm sounds.

If the actual value exceeds the limit (plus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

12.9.2 Reverse power/reduced power limit 2

22022569 Monitoring

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22022503 Monitoring`

22022606 Limit

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22022542 Limit`

22022611 Delay

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22022550 Delay`

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

12.10 Unbalanced load

The unbalanced load monitoring depends on the setting of parameter 22018513 Voltage measurement and parameter 22018500 Current measurement. The unbalanced load monitoring monitors the individual phase currents of the generator. The percentage response value indicates the permissible deviation of a phase from the arithmetic mean value of all three phases.

This monitor is only active if parameter 22018513 Voltage measurement is configured to 3Ph 4W or 3Ph 3W and parameter 22018500 Current measurement is configured to L1 L2 L3.

12.10.1 Unbalanced load limit 1

22024001 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The unbalanced load is monitored according to the following parameters: Limit and delay. Monitoring is performed in two stages. Both limits can be configured independently of each other.

Condition: Limit 1 < Limit 2

The limits relate to the parameter 22017546 Rated current.

22024049 Limit

Read permission: Level 0, Write permission: Level 230

The limit to be monitored is set here.

If the limit is reached or exceeded, an alarm sounds. The triggering of the alarm can be delayed using a delay time.

Hysteresis: 0.5 %, reset delay: 80 ms

Unit: %

22024058 Delay

Read permission: Level 0, Write permission: Level 230

If the actual value exceeds the limit for longer than the set delay time, an alarm sounds.

If the actual value falls below the limit (minus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

12.10.2 Unbalanced load limit 2

22024063 Monitoring

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22024001 Monitoring`

`22024105 Limit`

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22024049 Limit`

`22024118 Delay`

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22024058 Delay`

12.11 Voltage

The voltage monitoring is dependent on the setting of the parameter `22018513 Voltage measurement`.

Overvoltage errors and undervoltage errors are each monitored in two stages.

The voltage asymmetry is monitored in one stage.

12.11.1 Measurement

22017706 Voltage monitoring

Read permission: Level 0, Write permission: Level 230

This parameter determines the working method of the monitoring functions.

The control can monitor either phase-neutral voltages (star) or phase-phase voltages (delta).

If the control is used in an isolated or compensated mains network, the voltage protection monitoring should be set to `Phase - N`. Monitoring the chained star voltage is particularly necessary in order to prevent a ground fault in the isolated or compensated mains from triggering the voltage protection.

Phase - Phase

The phase-phase voltage is monitored. All following parameters relating to voltage monitoring of the generator are based on this value (U_{L-L}).

Phase - N

The phase-neutral voltage is measured. All following parameters relating to voltage monitoring of the generator are based on this value (U_{L-N}).

12.11.2 Overvoltage limit 1

22020000 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The overvoltage is monitored according to the following parameters: Limit and delay. Monitoring is performed in two stages. Both limits can be configured independently of each other.

Prerequisite: Limit 1 < Limit 2

The limits relate to the rated voltage in the system ⇒ parameter `22017663 Rated voltage`.

22020045 Limit

Read permission: Level 0, Write permission: Level 230

The limit to be monitored is set here.

If the limit is reached or exceeded, a message is issued. Triggering the message can be delayed using a delay time.

Hysteresis: 0.7 %, reset delay: 80 ms

Unit: %

22020059 Delay

Read permission: Level 0, Write permission: Level 230

If the actual value exceeds the limit for longer than the set delay time, a message is issued.

If the actual value falls below the limit (minus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

12.11.3 Overvoltage limit 2

22020068 Monitoring

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22020000 Monitoring`

22020101 Limit

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22020045 Limit`

22020117 Delay

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22020059 Delay`

12.11.4 Undervoltage limit 1

22020502 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The undervoltage is monitored according to the following parameters: Limit and delay. Monitoring is performed in two stages. Both limits can be configured independently of each other.

Prerequisite: Limit 1 > Limit 2

The limits relate to the rated voltage in the system ⇒ parameter `22017663 Rated voltage`.

22020544 Limit

Read permission: Level 0, Write permission: Level 230

The limit to be monitored is set here.

If the limit is reached or undershot, a message is issued. Triggering the message can be delayed using a delay time.

Hysteresis: 0.7 %, reset delay: 80 ms

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

Unit: %

22020553 Delay

Read permission: Level 0, Write permission: Level 230

If the actual value falls short of the limit for longer than the set delay time, a message is issued.

If the actual value exceeds the limit (plus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

12.11.5 Undervoltage limit 2

12.12 Reactive Power

12.12.1 Reactive power underexcited

22042007 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The generator reactive power in the underexcited range is monitored according to the following parameters: Limit and delay.

22042055 Limit

Read permission: Level 0, Write permission: Level 230

Display of the reactive power limit value being monitored.

Input as a percentage of the value of parameter `22017580 Rated reactive power`. Underexcited operation is identified by a negative sign.

If the limit value is reached or undershot, an alarm sounds. The triggering of the alarm can be delayed using a delay time.

Unit: %

22042078 Delay

Read permission: Level 200, Write permission: Level 230

If the actual value falls short of the limit value longer than the set delay time, an alarm sounds.

If the actual value exceeds the limit before the delay time has passed, then the control resets the delay time.

Unit: s

12.12.2 Reactive power overexcited

22042170 Monitoring

Read permission: Level 0, Write permission: Level 230

Deactivated

No monitoring is performed.

Activated

The generator reactive power in the overexcited range is monitored according to the following parameters: Limit and delay.

22042227 Limit

Read permission: Level 0, Write permission: Level 230

Display of the reactive power limit value being monitored.

Input as a percentage of the value of parameter `22017580 Rated reactive power`.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

If the limit is reached or exceeded, an alarm sounds. The triggering of the alarm can be delayed using a delay time.

Unit: %

`22042242 Delay`

Read permission: Level 0, Write permission: Level 230

If the actual value exceeds the limit value longer than the set delay time, an alarm sounds.

If the actual value drops below the limit value before the delay time has passed, then the control resets the delay time.

Unit: s

13 MFR mains

Table of contents

13.1 QU

13.1.1 22032922 Monitoring

Read permission: Level 0, Write permission: Level 230

ON

QU monitoring is performed.

OFF

No monitoring is performed.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

13.2 Frequency

Overfrequency errors and underfrequency errors are each monitored in two stages.

13.2.1 Overfrequency limit 1

22028506 Monitoring

Read permission: Level 0, Write permission: Level 230

ON

The overfrequency is monitored according to the following parameters: Limit and delay. Monitoring is performed in two stages. Both limits can be configured independently of each other.

Prerequisite: Limit 1 < Limit 2

The limits relate to the system rated frequency ⇒ parameter `22017509 System rated frequency`.

OFF

No monitoring is performed.

22028540 Limit

Read permission: Level 0, Write permission: Level 230

The limit to be monitored is set here.

If the limit is reached or exceeded, an alarm sounds. The triggering of the alarm can be delayed using a delay time.

Reset delay: 80 ms

Unit: %

22028554 Delay

Read permission: Level 0, Write permission: Level 230

If the actual value exceeds the limit for longer than the set delay time, an alarm sounds.

If the actual value falls below the limit (minus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

13.2.2 Overfrequency limit 2

22028565 Monitoring

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22028506 Monitoring`

22028603 Limit

Read permission: Level 0, Write permission: Level 230

⇒ Parameter 22028540 Limit

22028616 Delay

Read permission: Level 0, Write permission: Level 230

⇒ Parameter 22028554 Delay

13.2.3 Underfrequency limit 1

22029006 Monitoring

Read permission: Level 0, Write permission: Level 230

ON

The underfrequency is monitored according to the following parameters: Limit and delay. Monitoring is performed in two stages. Both limits can be configured independently of each other.

Prerequisite: Limit 1 > Limit 2

The limits relate to the system rated frequency ⇒ parameter 22017509 System rated frequency.

OFF

No monitoring is performed.

22029040 Limit

Read permission: Level 0, Write permission: Level 230

The limit to be monitored is set here.

If the limit value is reached or undershot, an alarm sounds. The triggering of the alarm can be delayed using a delay time.

Reset delay: 80 ms

Unit: %

22029054 Delay

Read permission: Level 0, Write permission: Level 230

If the actual value falls short of the limit longer than the set delay time, an alarm sounds.

If the actual value exceeds the limit (plus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

13.2.4 Underfrequency limit 2

22029065 Monitoring

Read permission: Level 0, Write permission: Level 230

⇒ Parameter 22029006 Monitoring

22029104 Limit

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22029040 Limit`

`22029112 Delay`

Read permission: Level 0, Write permission: Level 230

⇒ Parameter `22029054 Delay`

13.3 General monitoring

13.3.1 General settings

22028018 Settling time

Read permission: Level 0, Write permission: Level 230

After mains decoupling and voltage return, the mains voltage must remain within the valid operating range without interruption for at least this indicated time before the TPEM MFR permits a back synchronization.

For applications according to VDE-AR-N 4110, the settings for parameter `20105768 Monitoring time before mains recoupling` must be observed irrespective of this, according to which TPEM CC only demands synchronization at TPEM MFR.

Unit: s

22029641 Hysteresis voltage monitor

Read permission: Level 0, Write permission: Level 230

This setting can be used to specify what interval the excitation threshold and fallback threshold for the mains voltage monitors of the TPEM MFR are to exhibit. Unless explicitly desired by the responsible mains operator, the setting should be left at its default value 1.5 %.

Unit: %

22029655 Hysteresis frequency monitor

Read permission: Level 0, Write permission: Level 230

This setting can be used to specify the interval which the excitation threshold and fallback threshold for the mains frequency monitors of the TPEM MFR are to exhibit. Unless explicitly desired by the responsible mains operator, the setting should be left at its default value 0.1 %.

Unit: %

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

13.4 Mains decoupling

13.4.1 Connection condition AR-4105

22032979 Monitoring

Read permission: Level 0, Write permission: Level 230

OFF

The diagnostic function is deactivated, no associated monitoring is performed.

ON

If the diagnostic function is activated, the associated messages can be received via CAN 1, CAN 3 or Ethernet.

The following messages may appear:

- Participant 4105
- Parameter adjustment 4105
- Measuring difference 4105

13.4.2 Frequency change and phase shift

22030584 Frequency change

Read permission: Level 0, Write permission: Level 230

OFF

No monitoring is performed.

Phase shift

The phase shift is monitored.

df/dt

df/dt is monitored

Phase shift df/dt

The phase shift monitoring and the df/dt monitoring are performed. Triggering occurs when the phase shift or df/dt is triggered.

13.4.3 Activation decoupling

22031106 Mains decoupling

Read permission: Level 0, Write permission: Level 230

OFF

The mains decoupling monitoring is deactivated.

GCB

The GCB is opened when an assigned monitor is triggered. If the genset is in mains parallel mode and the MCB opens, the GCB is closed again.

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

GCB -> MCB

The GCB is opened when an assigned monitor is triggered. If the feedback "GCB open" is not given within the time configured in parameter `22031133 Feedback delay`, the MCB is also opened.

MCB

The MCB is opened when a monitor is triggered.

MCB -> GCB

The MCB is opened when a monitor is triggered. If the feedback "MCB open" is not given within the time configured in parameter `22031133 Feedback delay`, the GCB is also opened.

`22049895 Mains decoupling time-dependent voltage monitoring`

Read permission: Level 0, Write permission: Level 230

Deactivated

Time-dependent voltage monitoring does not trigger mains decoupling.

Activated

Time-dependent voltage monitoring triggers mains decoupling.

`22088447 Mains decoupling by undervoltage 1`

Read permission: Level 0, Write permission: Level 230

Deactivated

The monitor does not trigger mains decoupling.

Activated

The monitor triggers mains decoupling.

`22088452 Mains decoupling by overvoltage 1`

Read permission: Level 0, Write permission: Level 230

Deactivated

The monitor does not trigger mains decoupling.

Activated

The monitor triggers mains decoupling.

`22088471 Mains decoupling by underfrequency 1`

Read permission: Level 0, Write permission: Level 230

Deactivated

The monitor does not trigger mains decoupling.

Activated

The monitor triggers mains decoupling.

`22088483 Mains decoupling by overfrequency 1`

Read permission: Level 0, Write permission: Level 230

Deactivated

The monitor does not trigger mains decoupling.

Activated

The monitor triggers mains decoupling.

13.5 Mains time-dependent voltage monitor 1

This monitor supports dynamic stabilization of the mains. For this reason, an FRT (Fault Ride Through) curve can be defined.

This monitoring function allows the genset to be decoupled from the mains when FRT capability is exceeded.

The voltage is monitored depending on parameter `22018537 Voltage measurement`.

In addition, it can be used for either undervoltage monitoring or overvoltage monitoring. Undercut or exceedance is selected with parameter `22049537 Monitoring at`.

If the measured voltage of at least one phase (depending on setting of parameter `22049521 AND type`) falls below or exceeds the configured initialization threshold, then the sequence of time-dependent voltage monitoring is started.

⇒ parameter `22049703 Initial threshold`

If the measured voltage falls below or exceeds this characteristic curve, then the monitor is triggered. If configured, the mains decoupling function is included. If the measured voltage falls below or exceeds the configured fallback threshold for at least the duration of the configured fallback time, then the sequence of time-dependent voltage monitoring is reset.

⇒ parameter `22049788 Fallback threshold`

⇒ parameter `22049689 Fallback time`

Rules for the configuration

The times should always be in ascending order. The fallback threshold should always be configured higher or lower than the initial threshold.

⇒ parameter `22049703 Initial threshold`

The monitoring of undervoltage above the undervoltage characteristic curve or overvoltage above the overvoltage characteristic curve is always active when parameter `22049500 Monitoring` is activated. Mains decoupling is only carried out if the generator is operated parallel to the mains. Monitoring acts according to the configured parameter `22049521 AND type`. If the `AND type` is configured to `ON`, then all 3 phases are taken into account. Monitoring is triggered only when all phases are below or above the configurable characteristic curve. If the `AND type` is configured to `OFF`, then all the individual phases are taken into account. Monitoring is also triggered when only one phase is below or above the configurable characteristic curve.

Monitoring begins when the initial limit value is exceeded. The triggering time is defined by the voltage deviation and its corresponding position in the characteristic curve. Monitoring is deactivated if the voltage value or values exceed(s) the fallback threshold.

FRT monitoring type

The parameter `22017711 Voltage monitoring` defines whether the Ph-Ph or Ph-N measurement is used.

13.5.1 Time-dependent voltage 1

22049500 Monitoring

Read permission: Level 0, Write permission: Level 230

ON

Time-dependent voltage monitoring is performed according to the following parameters.

OFF

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

No monitoring is performed.

Unit: none

22049537 Monitoring at

Read permission: Level 0, Write permission: Level 230

Determines whether the system is to perform overvoltage monitoring or undervoltage monitoring.

Undercut

If the measured voltage falls below the characteristic curve, then undervoltage monitoring is carried out.

Exceedance

If the measured voltage exceeds the characteristic curve, then overvoltage monitoring is carried out.

22049615 Point of time 1

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049628 Point of time 2

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049631 Point of time 3

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049644 Point of time 4

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049653 Point of time 5

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049666 Point of time 6

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049677 Point of time 7

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049689 Fallback time

Read permission: Level 0, Write permission: Level 230

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

Fallback time of the time-dependent voltage monitoring 1.

If the measured voltage falls below or exceeds the configured fallback threshold for at least the duration of the time configured here, the monitoring sequence is reset ⇒ parameter `22049788 Fallback threshold`.

Unit: s

22049703 Initial threshold

Read permission: Level 0, Write permission: Level 230

Initial limit value of time-dependent voltage monitoring.

If the measured voltage falls below or exceeds this response value, then the monitoring sequence starts and the voltage response value changes in a timely manner according to the configured response characteristic points.

If the measured voltage falls below or exceeds this characteristic curve, the monitoring function is triggered and the configured relay is supplied with current.

Unit: %

22049716 Point 1 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22049727 Point 2 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22049734 Point 3 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22049742 Point 4 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22049750 Point 5 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22049769 Point 6 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22049775 Point 7 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22049788 Fallback threshold

Read permission: Level 0, Write permission: Level 230

Fallback voltage of the time-dependent voltage monitoring.

If the measured voltage falls below or exceeds the voltage configured here for at least for the duration of the configured fallback time, then the monitoring sequence is reset ⇒ parameter `22049689 Fallback time`.

Unit: %

13.6 Mains time-dependent voltage monitor 2

Time-dependent voltage monitoring 2 is additional, independent FRT monitoring that acts similarly to time-dependent voltage monitoring.

This monitoring function allows the genset to be decoupled from the mains when FRT capability is exceeded.

13.6.1 Time-dependent voltage 2

22049545 Monitoring

Read permission: Level 0, Write permission: Level 230

ON

Time-dependent voltage monitoring 2 is performed according to the following parameters.

OFF

No monitoring is performed.

22049576 Monitoring at

Read permission: Level 0, Write permission: Level 230

Determines whether the system is to perform overvoltage monitoring or undervoltage monitoring.

Undercut

If the measured voltage falls below the characteristic curve, then undervoltage monitoring is carried out.

Exceedance

If the measured voltage exceeds the characteristic curve, then overvoltage monitoring is carried out.

22049814 Point of time 1

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049823 Point of time 2

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049838 Point of time 3

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049846 Point of time 4

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049851 Point of time 5

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049867 Point of time 6

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049872 Point of time 7

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

22049880 Fallback time

Read permission: Level 0, Write permission: Level 230

Fallback time of the time-dependent voltage monitoring 2.

If the measured voltage falls below or exceeds the configured fallback threshold for at least the duration of the time configured here, the monitoring sequence is reset ⇒ parameter `22049986 Fallback threshold`.

Unit: s

22049907 Initial threshold

Read permission: Level 0, Write permission: Level 230

Initial limit value of time-dependent voltage monitoring 2.

If the measured voltage falls below or exceeds this response value, then the monitoring sequence starts and the voltage response value changes in a timely manner according to the configured response characteristic points.

If the measured voltage 2 falls below or exceeds this characteristic curve, then the monitoring function is triggered and the configured relay is supplied with current.

Unit: %

22049910 Point 1 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22049929 Point 2 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22049932 Point 3 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22049941 Point 4 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

`22049955 Point 5 voltage`

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

`22049964 Point 6 voltage`

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

`22049978 Point 7 voltage`

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

`22049986 Fallback threshold`

Read permission: Level 0, Write permission: Level 230

Fallback voltage of time-dependent voltage monitoring 2.

If the measured voltage falls below or exceeds the voltage configured here for at least for the duration of the configured fallback time, then the monitoring sequence is reset ⇒ parameter `22049880 Fallback time`.

Unit: %

13.7 Mains time-dependent voltage monitor 3

Time-dependent voltage monitoring 3 is additional, independent FRT monitoring that acts similarly to time-dependent voltage monitoring.

This monitoring function allows the genset to be decoupled from the mains when FRT capability is exceeded.

13.7.1 Time-dependent voltage 3

22091306 Monitoring

Read permission: Level 0, Write permission: Level 230

ON

Time-dependent voltage monitoring 3 is performed according to the following parameters.

OFF

No monitoring is performed.

22049791 Characteristics

Read permission: Level 0, Write permission: Level 230

Time-dependent mains voltage monitoring works with different characteristics.

1-phase

The lowest/highest phase is used to trigger the alarm.

When parameter `22017711 Voltage monitoring` is configured to "All", then the alarm is triggered when at least one phase-to-phase voltage or at least one phase-to-neutral voltage is out of range, and is reset when all phase-to-phase and phase-to-neutral voltages are in range.

2-phase

The two lowest/highest phases are used to trigger the alarm.

When parameter `22017711 Voltage monitoring` is configured to "All", then the alarm is triggered when at least two phase-to-phase voltages or at least two phase-to-neutral voltages are out of range, and is reset when at least two phase-to-phase voltages and at least two phase-to-neutral voltages are in range.

3-phase

All three phases are used to trigger the alarm.

When parameter `22017711 Voltage monitoring` is configured to "All", then the alarm is triggered when all phase-to-phase voltages or all phase-to-neutral voltages are out of range, and is reset when at least one phase-to-phase voltage and at least one phase-to-neutral voltage is in range.

22091333 Monitoring at

Read permission: Level 0, Write permission: Level 230

Determines whether the system is to perform overvoltage monitoring or undervoltage monitoring.

Undercut

If the measured voltage falls below the characteristic curve, then undervoltage monitoring is carried out.

Exceedance

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

If the measured voltage exceeds the characteristic curve, then overvoltage monitoring is carried out.

22091485 Init threshold

Read permission: Level 0, Write permission: Level 230

Initial limit value of time-dependent voltage monitoring 3.

If the measured voltage falls below or exceeds this response value, then the monitoring sequence starts and the voltage response value changes in a timely manner according to the configured response characteristic points.

If the measured voltage 3 falls below or exceeds this characteristic curve, then the monitoring function is triggered and the configured relay is supplied with current.

Unit: %

22091568 Fallback threshold

Read permission: Level 0, Write permission: Level 230

Fallback voltage of time-dependent voltage monitoring 2.

If the measured voltage falls below or exceeds the voltage configured here for at least for the duration of the configured fallback time, then the monitoring sequence is reset ⇒ parameter `22091473 Fallback time`.

Unit: %

22091473 Fallback time

Read permission: Level 0, Write permission: Level 230

Fallback time of the time-dependent voltage monitoring 3.

If the measured voltage falls below or exceeds the configured fallback threshold for at least the duration of the time configured here, the monitoring sequence is reset ⇒ parameter `22091568 Fallback threshold`.

Unit: s

22091499 Point 1 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22091500 Point 2 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22091513 Point 3 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

22091521 Point 4 voltage

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

`22091537 Point 5 voltage`

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

`22091545 Point 6 voltage`

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

`22091559 Point 7 voltage`

Read permission: Level 0, Write permission: Level 230

Voltage for the voltage point of time-dependent voltage monitoring.

`22091404 Point of time 1`

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

`22091412 Point of time 2`

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

`22091420 Point of time 3`

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

`22091436 Point of time 4`

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

`22091448 Point of time 5`

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

`22091457 Point of time 6`

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

`22091461 Point of time 7`

Read permission: Level 0, Write permission: Level 230

Time value for the point of time of time-dependent voltage monitoring.

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13.8 Voltage

13.8.1 Overvoltage limit 1

22029508 Monitoring

Read permission: Level 0, Write permission: Level 230

ON

The overvoltage is monitored according to the following parameters: Limit and delay. Monitoring is performed in two stages. Both limits can be configured independently of each other.

Prerequisite: Limit 1 < Limit 2

The limits relate to the mains rated voltage ⇒ parameter `22017682 Rated voltage`.

OFF

No monitoring is performed.

22029543 Limit

Read permission: Level 0, Write permission: Level 230

The limit to be monitored is set here.

If the limit is reached or exceeded, an alarm sounds. The triggering of the alarm can be delayed using a delay time.

Reset delay: 80 ms

Unit: %

22029556 Delay

Read permission: Level 0, Write permission: Level 230

If the actual value exceeds the limit for longer than the set delay time, an alarm sounds.

If the actual value falls below the limit (minus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

13.8.2 Overvoltage limit 2

22029562 Monitoring

⇒ Parameter `22029508 Monitoring`

13.8.3 Undervoltage limit 1

22030001 Monitoring

Read permission: Level 0, Write permission: Level 230

ON

The undervoltage is monitored according to the following parameters: Limit and delay. Monitoring is performed in two stages. Both limits can be configured independently of each other.

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Prerequisite: Limit 1 > Limit 2

The limits relate to the mains rated voltage ⇒ parameter `22017682 Rated voltage`.

OFF

No monitoring is performed.

`22030049 Limit`

Read permission: Level 0, Write permission: Level 230

The limit to be monitored is set here.

If the limit value is reached or undershot, an alarm sounds. The triggering of the alarm can be delayed using a delay time.

Reset delay: 80 ms

Unit: %

`22030058 Delay`

Read permission: Level 0, Write permission: Level 230

If the actual value falls short of the limit longer than the set delay time, an alarm sounds.

If the actual value exceeds the limit (plus the hysteresis) before the delay time has passed, the control resets the delay time.

Unit: s

13.8.4 Undervoltage limit 2

`22030063 Monitoring`

⇒ parameter `22030001 Monitoring`

`22030105 Limit`

⇒ Parameter `22030049 Limit`

`22030118 Delay`

⇒ Parameter `22030058 Delay`

13.9 Voltage increase

The voltage is monitored depending on parameter 22088066 Monitoring. This function enables the monitoring of the voltage quality over a long period. A 10-minute moving average value is calculated for this purpose. The function is only active if the mains voltage and mains frequency are within the operating range.

13.9.1 Voltage increase

22088066 Monitoring

Read permission: Level 0, Write permission: Level 230

Activated

The voltage increase is monitored according to the following parameters.

Deactivated

No monitoring is performed.

13.10 Operating range

A synchronization with the mains is only begun by the TPEM MFR if the mains voltage and mains frequency are within the entered operating range. A distinction is made here between a normal connection and a connection after mains decoupling and voltage return.

If the mains operating range in the TPEM MFR is violated, the warning "Generator/mains operating range failed" is issued. An automatic disconnection from the mains does not occur. The operating limits are normally within the excitation thresholds of the relevant mains monitors so that the operating range does not yet have the status of valid upon protection triggering

For applications according to VDE-AR-N 4110 and General Grid Code, the settings for the following parameters must be observed irrespective of this, according to which TPEM CC only demands the synchronization by TPEM MFR:

⇒Grid code⇒General

- 20105807 Lower mains voltage limit mains connection
- 20105792 Upper mains voltage limit mains connection
- 20105829 Lower mains frequency limit mains connection
- 20105810 Upper mains frequency limit mains connection

⇒Grid code⇒Behavior after mains decoupling

- 20105841 Lower mains voltage limit mains decoupling
- 20105832 Upper mains voltage limit mains decoupling
- 20105864 Lower mains frequency limit mains decoupling
- 20105855 Upper mains frequency limit mains decoupling

Example

- Mains rated voltage: 400 V
- Upper voltage limit: 110 % of the mains rated voltage = 440 V
- Hysteresis for the upper voltage: 5 % of the mains rated voltage = 20 V

The mains voltage leaves the operating range when it exceeds 440 V and comes back within the operating range when it falls below 420 V.

Example

- System rated frequency: 50 Hz
- Lower frequency limit: 90 % of the system rated frequency = 45 Hz
- Hysteresis for the lower frequency limit: 5 % of the system rated frequency = 2.5 Hz

The frequency leaves the operating range when it falls below 45 Hz and comes back within the operating range when it exceeds 47.5 Hz.

13.10.1 22058100 Upper voltage limit

Read permission: Level 0, Write permission: Level 230

Maximum permissible positive deviation of the mains voltage from the mains rated voltage ⇒ parameter 22017682 Rated voltage.

Unit: %

13.10.2 22058113 Lower voltage limit

Read permission: Level 0, Write permission: Level 230

Maximum permissible negative deviation of the mains voltage from the mains rated voltage ⇒ parameter 22017682 Rated voltage.

Unit: %

13.10.3 22058121 Upper frequency limit

Read permission: Level 0, Write permission: Level 230

Maximum permissible positive deviation of the mains frequency from the system rated frequency ⇒ parameter 22017509 System rated frequency.

Unit: %

13.10.4 22058137 Lower frequency limit

Read permission: Level 0, Write permission: Level 230

Maximum permissible negative deviation of the mains frequency from the system rated frequency ⇒ parameter 22017509 System rated frequency.

Unit: %

13.10.5 22058145 Hysteresis upper voltage deviation

Read permission: Level 0, Write permission: Level 230

If the mains voltage has exceeded the upper voltage deviation: To return to the operating range, the mains voltage must fall below the response value (minus the hysteresis).

i.e. Mains voltage < 22058100 Upper voltage limit minus 22058145 Hysteresis upper voltage deviation.

Unit: %

13.10.6 22058159 Hysteresis lower voltage deviation

Read permission: Level 0, Write permission: Level 230

If the mains voltage has fallen below the lower voltage deviation: to return to the operating range, the mains voltage must exceed the response value (plus the hysteresis).

i.e. Mains voltage > 22058113 Lower voltage limit plus 22058159 Hysteresis lower voltage deviation.

Unit: %

13.10.7 22058168 Hysteresis upper frequency deviation

Read permission: Level 0, Write permission: Level 230

If the mains frequency has exceeded the upper frequency deviation: To return to the operating range, the mains frequency must fall below the response value (minus the hysteresis).

i.e. Mains frequency < 22058121 Upper frequency limit minus 22058168 Hysteresis upper frequency deviation.

Unit: %

13.10.8 22058176 Hysteresis lower frequency deviation

Read permission: Level 0, Write permission: Level 230

If the mains frequency has fallen below the lower frequency deviation: To return to the operating range, the mains frequency must exceed the response value (plus the hysteresis).

i.e. Mains frequency > 22058137 Lower frequency limit plus 22058176 Hysteresis lower frequency deviation.

Unit: %

13.10.9 Mains connection after mains decoupling

22058184 Upper voltage deviation

Read permission: Level 0, Write permission: Level 230

Maximum permissible positive deviation of the mains voltage from the mains rated voltage after mains decoupling ⇒ parameter 22017682 Rated voltage.

Unit: %

22058192 Lower voltage deviation

Read permission: Level 0, Write permission: Level 230

Maximum permissible negative deviation of the mains voltage from the mains rated voltage after mains decoupling ⇒ parameter 22017682 Rated voltage.

Unit: %

22058215 Upper frequency deviation

Read permission: Level 0, Write permission: Level 230

Maximum permissible positive deviation of the mains frequency from the system rated frequency after mains decoupling ⇒ parameter 22017509 System rated frequency.

Unit: %

22058228 Lower frequency deviation

Read permission: Level 0, Write permission: Level 230

Maximum permissible negative deviation of the mains frequency from the system rated frequency after mains decoupling ⇒ parameter 22017509 System rated frequency.

Unit: %

14 MFR measurements

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14.1 General measurement settings

14.1.1 Measurement

22017509 System rated frequency

Read permission: Level 0, Write permission: Level 230

The system rated frequency is used as a reference value for all frequency-related functions that use a percentage value.

These are frequency monitoring and switch activation conditions.

Unit: Hz

14.2 General mains monitoring

14.2.1 Measuring general settings

22017711 Voltage monitoring

Read permission: Level 0, Write permission: Level 230

The control can monitor either phase-neutral voltages (star, Phase - N) or phase-phase voltages (delta, Phase - Phase). Monitoring the chained star voltage is particularly necessary in order to prevent a ground fault in the isolated or compensated mains from triggering the voltage protection.

This parameter determines the working method of the monitoring functions.

Phase - Phase

The phase-phase voltage is monitored and all following parameters relating to Mains voltage monitoring are based on this value (UL-L).

Phase - N

The phase-neutral voltage is monitored and all following parameters relating to Mains voltage monitoring are based on this value (UL-N).

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14.3 Generator

14.3.1 Rated values

22017546 Rated current

Read permission: Level 0, Write permission: Level 230

Indicates the rated current of the generator. The rated current is used as a reference value for functions related to it.

The rated current must be calculated and may not be read from the generator or genset rating plate.

Rated current = Generator rated active power : (1.73 x PF_R x Genset rated voltage)

Generator rated reactive power = parameter `22017523 Rated active power`

Genset rated voltage = parameter `22017663 Rated voltage`

The rated power factor PF_R is indicated on the generator rating plate (~ 0.8)

Unit: A

22017580 Rated reactive power

Read permission: Level 0, Write permission: Level 230

Indicates the rated reactive power of the generator. The rated reactive power is used as a reference value for functions related to it.

Unit: kvar

22017663 Rated voltage

Read permission: Level 0, Write permission: Level 230

Genset rated voltage as per the genset rating plate or the genset data sheet.

The rated voltage is a reference value for all generator voltage-related functions that use a percentage value.

Examples are:

- Generator voltage monitoring
- Switch activation conditions

Unit: V

14.3.2 Measurement

22017523 Rated active power

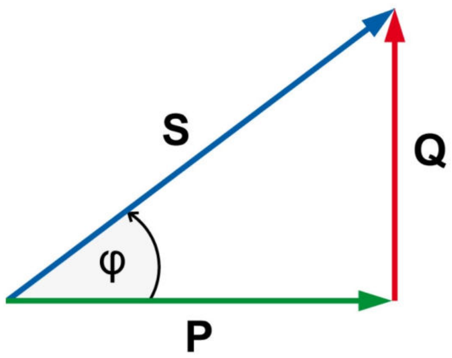
Read permission: Level 0, Write permission: Level 230

Rated active power of the generator in accordance with the order-specific documents.

The rated active power of the generator is a reference value for functions related to it.

Unit: kW

14.4 Mains



PF Power factor
P Active power [kW]
S Apparent power [kVA]
Q Reactive power [kvar]

$PF = P/S = \cos \Phi$
$Q = \sqrt{}(S2-P2)$
$S = \sqrt{}(P2+Q2)$
$P = S * PF$

The power triangle diagram shows the dependencies between active power, apparent power, reactive power and the power factor.

14.4.1 Rated values

22017682 Rated voltage

Read permission: Level 0, Write permission: Level 230

This rated voltage is the voltage measured at the primary winding of the potential transformer.

The rated voltage is a reference value for all mains voltage-related functions that use a percentage value.

Examples are:

- Mains voltage monitoring
- Switch activation conditions

Unit: V

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15 MFR system management

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15.1 General

15.1.1 20025217 Energy counter setting

Read permission: Level 0, Write permission: Level 230

The amount of energy generated by the genset is displayed in Data ⇒ Operating data ⇒ Operating values.

If needed, the energy counter can either be reset to the default value "0 MWh" or to any desired value between the preset minimum and maximum. For example, if the TPEM MFR is replaced, the energy count starts back at "0". If this is not desired, the amount of energy read before removing the TPEM MFR can be set, from which point the new count starts.

Unit: MWh

16 Initial setup

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16.1 General

16.1.1 `20105303 Black start possible`

Read permission: Level 0, Write permission: Level 200

The order-specific documents contain the information as to whether the genset is capable of black-starting.

Activated

Genset is capable of black-starting. Activates parameter `20105981 Black start alarm suppression also at standstill`.

Deactivated

Genset is not capable of black-starting.

16.1.2 `20105981 Black start alarm suppression also at standstill`

Read permission: Level 0, Write permission: Level 200

The run-on time of the pumps starts when the genset stops. If the pumps do not have a separate power supply, alarms stop pumps that are not running from starting the genset during the run-on time.

Activated

The alarms are suppressed and the genset can be black-started during the run-on time. The genset can therefore be restarted immediately after a mains failure.

Deactivated

The alarms are not suppressed. The genset can be restarted only after the run-on time and the alarm acknowledgement.

16.1.3 `20130014 CH4 compensation`

Read permission: Level 0, Write permission: Level 100

Activates the measurement, monitoring and calibration of the CH4 value. Required for plants with variable CH4 content of the fuel gas, e.g. landfill gas plants.

Activates the following parameters in section `Gas train (GTR)`:

- `20390009 CH4 value min (at 4 mA)`
- `20390014 CH4 value max (at 20 mA)`

16.1.4 `20130095 Temperature monitoring generator bearing`

Read permission: Level 0, Write permission: Level 200

Activates the temperature monitoring of the generator bearing A (T459) and generator bearing B (T460)

If one of the bearing temperatures exceeds the predefined limit, this generates a corresponding message. ⇒ Parameter `20750148 Temperature monitoring generator bearing max`.

16.1.5 `20130102 Temperature monitoring generator air`

Read permission: Level 0, Write permission: Level 200

Activates the Temperature monitoring generator air. ⇒ Parameter 20750157 Temperature monitoring generator air max.

Monitors the generator air inlet temperature (T487) and the generator air outlet temperature (T488).

If one of the two temperatures exceeds the defined limit, this generates a corresponding message.

16.1.6 20130115 Oil level monitoring generator bearing

Read permission: Level 0, Write permission: Level 200

Activates the monitoring of oil levels of the generator bearing A (L622) and generator bearing B (L624).

If one of the oil levels falls below the defined limit, this generates a corresponding message. The limit is not parameterizable.

16.1.7 20130131 T287 monitoring downstream of CAT

Read permission: Level 0, Write permission: Level 200

Activates the display and the continuous monitoring of the exhaust temperature downstream of the catalytic converter with the parameters:

- 20750112 T286/T287 max exhaust gas at 40 % power
- 20750120 T286/T287 max exhaust gas at 100 % power

16.1.8 20410002 Intake air preheating (IAP)

Read permission: Level 0, Write permission: Level 200

Activates or deactivates the intake air preheating with the following parameters ⇒ Section Cabin ventilation (CV) ⇒ Intake air preheating:

- 20410015 T203 set intake air
- 20410028 T203 set intake air gas type B
- 20410031 T203 set intake air dead band deactivation
- 20410044 IAP control minimum signal length
- 20410089 IAP control delay time activation
- 20410090 IAP control delay time deactivation
- 20410053 IAP control P proportional gain
- 20410066 IAP control D proportional gain

16.1.9 20130144 T286 monitoring downstream of engine

Read permission: Level 0, Write permission: Level 200

Activates the display and the continuous monitoring of the exhaust temperature downstream of the engine with the parameters:

- 20750112 T286/T287 max exhaust gas at 40 % power
- 20750120 T286/T287 max exhaust gas at 100 % power

16.1.10 20130474 DCR type

Read permission: Level 0, Write permission: Level 200

Deactivated

Deactivates the dual core radiator.

The following parameters are activated and must be configured accordingly:

- `20130417 MCC RDTR type`
- `20130425 DCC RDTR type`
- `20130449 T384 sensor upstream of DCC`
- `60008496 DCC configuration`
- `20130505 HC`

Frequency control

In the case of recoolers in frequency control, all ventilators are activated together with the cooling circuit pumps. When the cooling demand increases or decreases, the ventilator speeds are increased or decreased via a frequency converter.

The following parameters of the `MCC` and `DCC/DCR` are used to enter the desired value:

- `20750006 T405 set MCC RDTR outlet at 40 % power`
- `20750011 T405 set MCC RDTR outlet at 100 % power`
- `20750173 T405 set MCC RDTR outlet at 40 % power gas type B`
- `20750161 T405 set MCC RDTR outlet at 100 % power gas type B`
- `20750022 T419 set DCC RDTR outlet at 40 % power`
- `20750033 T419 set DCC RDTR outlet at 100 % power`

The following parameters of the `DCC/DCR` are used for control:

- `20470042 DCC RDTR/DCR control P proportional gain`
- `20470075 DCC RDTR/DCR control I proportional gain`
- `20470050 DCC RDTR/DCR control D proportional gain`
- `20470088 DCC RDTR/DCR control low pass time`

Stage switching

In the case of recoolers with stage switching, the cooling capacity is controlled by switching on or off cooling units (e.g. ventilators) in cooling steps. To do so, several cooling units can be combined to form a cooler group which are addressed by TPEM via a common digital output. When the cooling demand increases or decreases, the changeover between the cooling stages takes place by activating or deactivating another cooler group so that one cooler group is active in cooling stage 1, two cooler groups are active in cooling stage 2, and so on. The following applies to ventilator cooler stages: All ventilators are operated at an identical, constant speed.

The control of the recooler in the mixture cooling circuit is active together with the control of the mixture cooling circuit.

The following parameters of the `MCC` and `DCC` are used to enter the desired value:

- `20750006 T405 set MCC RDTR outlet at 40 % power`
- `20750011 T405 set MCC RDTR outlet at 100 % power`
- `20750173 T405 set MCC RDTR outlet at 40 % power gas type B`
- `20750161 T405 set MCC RDTR outlet at 100 % power gas type B`

- 20750022 T419 set DCC RDTR outlet at 40 % power
- 20750033 T419 set DCC RDTR outlet at 100 % power

The following parameters of the DCC are used for control:

- 20470091 DCC RDTR/DCR max stage number
- 20470109 DCC RDTR/DCR downtime
- 20470114 DCC RDTR/DCR temperature difference
- 20470123 DCC RDTR/DCR reaction time

External control

It is left to the customer to handle heat dissipation and closed-loop control to the colder coolant infeed required by TPEM according to the specification.

16.1.11 20130417 MCC RDTR type

Read permission: Level 0, Write permission: Level 200

This parameter is only available on the TPEM TP if parameter 20130474 DCR type is deactivated.

Deactivated

The cooling circuit is deactivated.

Frequency control

The recooler is actuated with analog speed setting.

In the case of recoolers in frequency control, all ventilators are activated with the mixture cooling circuit pump. When the cooling demand increases or decreases, the ventilator speeds are increased or decreased via a frequency converter.

The following parameters of the MCC are used to enter the desired value:

- 20750006 T405 set MCC RDTR outlet at 40 % power
- 20750011 T405 set MCC RDTR outlet at 100 % power
- 20750173 T405 set MCC RDTR outlet at 40 % power gas type B
- 20750161 T405 set MCC RDTR outlet at 100 % power gas type B

The following parameters of the MCC are used for control:

- 20490049 MCC RDTR control P proportional gain
- 20490074 MCC RDTR control I proportional gain
- 20490058 MCC RDTR control D proportional gain
- 20490082 MCC RDTR control low pass time

Stage switching

The recooler is actuated with discrete cooling stages.

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In the case of recoolers with stage switching, the cooling capacity is controlled by switching on or off cooling units (e.g. ventilators) in cooling steps. To do so, several cooling units can be combined to form a cooler group which are addressed by TPEM via a common digital output. When the cooling demand increases or decreases, the changeover between the cooling stages takes place by activating or deactivating another cooler group so that one cooler group is active in cooling stage 1, two cooler groups are active in cooling stage 2, and so on. The following applies to ventilator cooler stages: All ventilators are operated at an identical, constant speed.

Cooling stage 1 is activated with the mixture cooling circuit pump.

The following parameters of the MCC are used to enter the desired value:

- `20750006 T405 set MCC RDTR outlet at 40 % power`
- `20750011 T405 set MCC RDTR outlet at 100 % power`
- `20750173 T405 set MCC RDTR outlet at 40 % power gas type B`
- `20750161 T405 set MCC RDTR outlet at 100 % power gas type B`

The following parameters of the MCC are used for control:

- `20490096 MCC RDTR max stage number`
- `20490105 MCC RDTR downtime`
- `20490118 MCC RDTR temperature difference`
- `20490126 MCC RDTR reaction time`

External control

It is left to the customer to handle heat dissipation and closed-loop control to the colder coolant infeed required by TPEM according to the specification.

16.1.12 `20130425 DCC RDTR type`

Read permission: Level 0, Write permission: Level 200

This parameter is only available on the TPEM TP if parameter `20130474 DCR type` is deactivated.

Deactivated

Deactivates stage switching and frequency control.

Deactivates the following parameters:

- `20130449 T384 sensor upstream of DCC`
- `60008496 DCC configuration`

Frequency control

In the case of recoolers in frequency control, all ventilators are activated with the mixture cooling circuit pump. When the cooling demand increases or decreases, the ventilator speeds are increased or decreased via a frequency converter.

The following parameters of the DCC are used to enter the desired value:

- `20750022 T419 set DCC RDTR outlet at 40 % power`
- `20750033 T419 set DCC RDTR outlet at 100 % power`

The following parameters of the DCC are used for control:

- `20470042 DCC RDTR/DCR control P proportional gain`
- `20470075 DCC RDTR/DCR control I proportional gain`
- `20470050 DCC RDTR/DCR control D proportional gain`
- `20470088 DCC RDTR/DCR control low pass time`

Stage switching

In the case of recoolers with stage switching, several ventilators are grouped together into one cooler group. The ventilators are operated at a constant speed. When the cooling demand increases or decreases, the individual cooler groups are switched on or off in stages one after the other. Cooling stage 1 is activated with the mixture cooling circuit pump.

The following parameters of the DCC are used to enter the desired value:

- `20750022 T419 set DCC RDTR outlet at 40 % power`
- `20750033 T419 set DCC RDTR outlet at 100 % power`

The following parameters of the DCC are used for control:

- `20470091 DCC RDTR/DCR max stage number`
- `20470109 DCC RDTR/DCR downtime`
- `20470114 DCC RDTR/DCR temperature difference`
- `20470123 DCC RDTR/DCR reaction time`

External control

It is left to the customer to handle heat dissipation and closed-loop control to the colder coolant infeed required by TPEM according to the specification.

16.1.13 `20130449 T384 sensor upstream of DCC`

Read permission: Level 0, Write permission: Level 200

This parameter is only available on the TPEM TP if parameter `20130425 DCC RDTR type` is deactivated.

Activates or deactivates the optional temperature sensor upstream of the dump cooling circuit.

16.1.14 `60008496 DCC configuration`

Read permission: Level 0, Write permission: Level 200

This parameter is only available on the TPEM TP if parameter `20130425 DCC RDTR type` is deactivated.

The following dump cooling circuit variants are possible:

DCC directly in HC

Dump cooling circuit directly in heating circuit.

DCC in HC with PHE

Dump cooling circuit with plate heat exchanger in heating circuit

DCC directly in ECC

Dump cooling circuit directly in engine cooling circuit

200-017-EN : 51000042 : BA : VAR, COV, IMP, B, BA, BS, DEM, EIN, IBN, IST, WP, SK, MH, SB, STB, TA, TL

DCC in ECC with PHE

Dump cooling circuit with plate heat exchanger in engine cooling circuit

No DCC

No dump cooling circuit present.

16.1.15 `20130287 Cabin ventilation (with/without circulating air)`

Read permission: Level 0, Write permission: Level 200

CV without circulating air

Activates the cabin ventilation without circulating air

⇒ Parameter in chapter `Cabin ventilation (CV)`

CV with circulating air

Activates the cabin ventilation with circulating air

⇒ Parameter in chapter `Cabin ventilation (CV)`

CV deactivated

No cabin ventilation variant is active.

16.1.16 `20130505 HC`

Read permission: Level 0, Write permission: Level 200

This parameter is only available on the TPEM TP if parameter `20130474 DCR type` is deactivated.

Activates or deactivates the heating circuit control with the following parameters:

- `20130128 T288 monitoring downstream of EHE`
- `20130254 T385 monitoring upstream of EHE`
- `60008997 Return temperature increase`
- `20130526 Variant EHE`
- `20450004 EHE bypass`
- `20750065 T207 set ECC engine inlet at 40 % power`
- `20750079 T207 set ECC engine inlet at 100 % power`
- `20430125 T207 set CPH`
- `20430101 ECC control P proportional gain`
- `20430117 ECC control D proportional gain`
- `20430196 ECC control low pass time`
- `20430174 ECC control dead band`
- `20430092 HC supply flow control T291 set`
- `20430076 HC supply flow control P proportional gain`
- `20430084 HC supply flow control I proportional gain`
- `20430207 HC supply flow control low pass time`
- `20430130 ECC pump switch-off delay`

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16.1.17 20130128 T288 monitoring downstream of EHE

Read permission: Level 0, Write permission: Level 200

Activates the display and the continuous monitoring of the exhaust temperature downstream of the exhaust heat exchanger with the parameters:

- 20750087 T288 max EHE outlet at 40 % power
- 20750098 T288 max EHE outlet at 100 % power

16.1.18 20130254 T385 monitoring upstream of EHE

Read permission: Level 0, Write permission: Level 200

Activated

Measurement and monitoring of the temperature in the heating circuit upstream of the exhaust heat exchanger.

16.1.19 60008997 Return temperature increase

Read permission: Level 0, Write permission: Level 200

Can only be activated when the parameters 20130505 HC and 20130518 ECC control are activated.

The coolant temperature at the engine inlet (T207) can be specified via the parameterizable characteristic curve with the parameters 20750065 and 20750079. The return temperature can be increased in two ways:

- In an engine cooling circuit with heat recovery by actuating a 3-way valve in the heating circuit
- In an engine cooling circuit without heat recovery by actuating a 3-way valve directly in the engine cooling circuit

Activated

Warm heating circuit fluid is admixed into the return of the heating circuit via the 3-way valve. This means that less heat is lost from the engine cooling circuit in the cooling water heat exchanger. This increases the coolant temperature at the engine inlet to the required temperature.

⇒ TPEM operating manual⇒Structure and function⇒Engine cooling circuit (ECC)⇒Flow diagram: engine cooling circuit with heat recovery

Deactivated

Part of the uncooled engine coolant is admixed into the return of the engine cooling circuit via the 3-way valve. This increases the coolant temperature at the engine inlet to the required temperature.

⇒TPEM operating manual⇒Structure and function⇒Engine cooling circuit (ECC) ⇒Flow diagram: engine cooling circuit with heat recovery and 3-way valve

16.1.20 20130526 Variant EHE

Read permission: Level 0, Write permission: Level 200

An exhaust heat exchanger can be installed in the heating circuit or engine cooling circuit depending on the plant.

No EHE

No exhaust heat exchanger available in the plant.

EHE in HC

Exhaust heat exchanger in the heating circuit.

EHE in ECC

Exhaust heat exchanger in the engine cooling circuit

16.1.21 `20450004 EHE bypass`

Read permission: Level 0, Write permission: Level 200

Activates/deactivates the following parameters:

⇒ Chapter 9 `Exhaust gas` ⇒ Section `EHE`

- `20450048 EHE bypass T diff to T291 set`
- `20450061 EHE bypass control low pass time`
- `20450020 EHE bypass control P proportional gain`
- `20450012 EHE bypass control D proportional gain`
- `20450036 EHE bypass control dead band`

16.1.22 `20130518 ECC control`

Read permission: Level 0, Write permission: Level 200

Activates or deactivates the engine cooling circuit control with the following parameters:

- `20750065 T207 set ECC engine inlet at 40 % power`
- `20750079 T207 set ECC engine inlet at 100 % power`
- `20130009 Coolant preheating (CPH)`
- `20430101 ECC control P proportional gain`
- `20430117 ECC control D proportional gain`
- `20430196 ECC control low pass time`
- `20430174 ECC control dead band`
- `20430130 ECC pump switch-off delay`

16.1.23 `20130009 Coolant preheating (CPH)`

Read permission: Level 0, Write permission: Level 200

This parameter is only available on the TPEM TP if parameter `20130518 ECC control` is deactivated.

Activates or deactivates the coolant preheating via the heating element and circulation pump.

Activates the parameter `20430125 T207 set CPH`. ⇒ Chapter 7 `Heating circuit (HC), cooling circuits (ECC, DCC, MCC)` ⇒ Section `Heating circuit and engine cooling circuit (HC, ECC)`

16.1.24 `20133842 Coolant preheating (CPH) flex module`

Read permission: Level 0, Write permission: Level 200

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Deactivated

The external coolant preheating is deactivated.

Demand only

The output is always active when the genset is at a standstill and the engine cooling circuit pump is switched off.

Temperature control

Activates a temperature controller for external coolant preheating. The desired value demand is carried out via parameter 20430264 T207 set CPH flex module ⇒ Chapter 7 `Heating circuit (HC), cooling circuits (ECC, DCC, MCC)` ⇒ `Heating circuit and engine cooling circuit (HC, ECC)`

17 Appendix

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17.1 List of abbreviations

Abbreviation	Explanation
DES	Demand for external starting preparations
JC	Job card
AKC	Anti-knock control
DMT	Dependent maximum current time protection
ANSI	American National Standards Institute
ETC	Exhaust turbocharger
AVR	Alternator Voltage Regulator (generator controller)
IAP	Intake air preheating
EHE	Exhaust heat exchanger
BDEW	Bundesverband der Energie- und Wasserwirtschaft (German Association of Energy and Water Industries)
oh	Operating hours
CHPS	Combined heat and power station
BY	Exhaust bypass
CH4	CH_4 compensation
PF	Power factor
TV	Throttle valve
M levels	Maintenance levels
f	Frequency
FRT	Fault Ride Through
FC	Frequency converter
FUS	Frequency converter cabinet
GGB	Generator group breaker
MC	Mixture cooler
MCC	Mixture cooling circuit
MCC RDTR	Mixture cooling circuit recooler
GLF	Generator power field switch cabinet
GAM	Gas-air mixer
GCB	Generator circuit breaker
GTR	Gas train
AD test	Auxiliary drive test
h	Hour
HAS	Auxiliary drive switch cabinet

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Abbreviation	Explanation
HP	High pressure
HC	Heating circuit
HC EHE ECC	Heating circuit with exhaust heat exchanger in engine cool-ing circuit
HT	High temperature
HVRT	High Voltage Ride Through
ILF	Integral local frequency control
IO	Input/Output
CAT	Catalytic converter
CPH	Coolant preheating
CL	Competence level
CHE	Coolant heat exchanger
LFSM	Limited frequency sensitive mode
CB (load step)	Circuit breaker
LVRT	Bridging of undervoltage (Low Voltage Ride Through)
MTDVM	Mains time-dependent voltage monitor
min	Minute
Max. / max.	Maximum
Min. / min.	Minimum
at least	at least
ECC	Engine cooling circuit
Grid code	Grid code requirements
DCC	Dump cooling circuit
DCC RDTR	Dump cooling circuit recooler
MCB	Mains circuit breaker
LT	Low temperature
P	Pressure
P diff	Differential pressure
PMV	Parameterizable measured value
PMC	Parameterizable controllers
PHE	Plate heat exchanger
TDC	Top dead center
PTFE	Polytetrafluorethylene
PHE	Plate heat exchanger
RAM	Remote Asset Monitoring

Abbreviation	Explanation
P&I diagram	Piping and instrumentation diagram
CV	Cabin ventilation
RP	Power decrease (Reduced power)
S	Speed
s	Second
busB	Busbar
SSOV	Safety shut-off valve
SC	Shutdown controlled
Act	Actuator
QCV	Quick closing valve
LHE	Lube oil heat exchanger
T	Temperature
TPEM	Total Plant and Energy Management
TPEM CB	TPEM Connection Box
TPEM CC	Switch cabinet TPEM Control Cabinet
TPEM CU	TPEM Control Unit
TPEM GC IO	TPEM Grid Code IO Controller
TPEM IO	TPEM IO Controller
TPEM MFR	TPEM Multi Function Relay
TPEM PLE	TPEM Product Link Elite
TPEM RC	TPEM Remote Client
TPEM RC DT	TPEM Remote Client Desktop
TPEM RC TP	TPEM Remote Client Touch Panel
TPEM RPG	TPEM Remote Plant Gateway
TPEM RVS	TPEM Rendezvous Server
TPEM SaC	TPEM Safety Chain
TPEM TP	TPEM Touch Panel
TPEM TSG	TPEM Troubleshooting Guide
TR	Technical Bulletin
UPF	Underpressure filter
BDC	Bottom dead center
PLP	Prelubrication pump
WG	Wastegate
WO	without auxiliary drives

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Abbreviation	Explanation
IG	Ignition general
SP	Spark plug
DCR	Dual-core radiator

17.2 Changes with TPEM release 1.9

- Chapter 4 Engine
  - 4.3 GLM start position: revised parameter 21130013 GAM automatic start position, added parameter 21260042 GAM automatic start position ramp 1 and parameter 21260050 GAM automatic start position ramp 2.
  - 4.5 T combustion chamber control: revised parameter 20260431 T combustion chamber Set 2 control type.
  - 4.7 Power control: Revised parameter 21100023 Set power maximum value, parameter 21100038 Set power maximum value gas type B, added parameter 21100046 Set power maximum value in admix operation / full-mix operation (X-axis), added parameter 21100067 Set power maximum value in admix operation / full-mix operation (Y-axis).
- Chapter 10 Grid code
  - 10.9 Mains-dependent power change (Grid code mode: General Grid Code): revised parameter 20252173 ILF reset timeout, revised parameter 20251894 LFSM-O limit value mode.

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