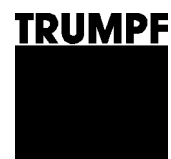


Supplement to operator's manual

TruConvert system control

Grid codes



**Supplement to opera-
tor's manual**

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Edition **2020-08-13**

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1. Introduction

Grid codes define rules that generation systems must obey in order to gain access to the mains grid. In particular, these rules regulate behavior in the event of mains fluctuations.

The mains operator determines the behavior of systems in the event of undervoltage, overvoltage and frequency deviation, and also defines the connect and disconnect conditions.

Note

All entries made via the web-based user interface must be subsequently confirmed: Press key ↵.

1.1 Making necessary presettings

Before the grid codes are configured, the following presettings must be made.

Condition

- Initial commissioning was performed, see operating instructions, chapter "Operation", "Initial commissioning".

NOTICE

Do not change grid codes without authorization!

- The configuration of the grid codes is to be agreed upon, implemented and documented together with the mains operator prior to connection.
- During operation, the conditions (grid codes, TAB) on which the decisions regarding the connection of the generating system and/or of the accumulator were based may **only** be changed with the consent of the mains operator.
- The settings for the grid codes are password protected.

Selecting AC mains

Note

All entries made via the web-based user interface must be subsequently confirmed: Press key ↵.

1. Switch AC-DC module to idle operation:
 - Select *>Operation >Device control AC-DC mode*.
 - For "Activate power stage" enter 0.

The following is displayed in the status bar: "Divice status: Idle". The device is idling.

2. To ensure that the settings apply to all AC-DC modules:
 - For "Slave module selection" enter "0".

3. Change to the *>AC-DC module settings* submenu.
4. In the "AC settings" area under "Grid type selection": Select the AC grid available for the operating environment.

Selecting grid code

5. Change to the *>System configuration* submenu.
6. In the "Grid code configuration" area, click on the "Edit grid codes" button.

The button briefly turns green.

7. Reload the browser window: press the <F5> key.

Or: Click on "Reload" in the browser window.

A new browser window appears: "Grid code password and save settings".

8. In the "Grid code password and save settings" area under "Password", enter the password.

Request the password from TRUMPF service.

9. In the "Grid code password and save settings" area under "Active grid code", select a grid code.

The selected grid code must correspond to the previously selected AC grid.

The *>GRID CODE* menu item is displayed in the main menu.

10. To configure the grid codes:

- In the main menu, click on *>GRID CODE*.
- Select the desired grid code in the selection list.

11. Set the parameters for the selected grid code.

Adopting grid code settings in system

Note

After entering the password, there is a time window of 10 min in which the parameters can be set and permanently stored.

If the parameters are not stored until after the window has elapsed, they are only applied for the current operation. After a 24 V reset, restart of the CPU or a software update, the settings are lost.

12. To save the changes:

In the "Grid code password and save settings" area, click on "Save grid code settings".

13. To exit the window with the grid code settings:

- In the "Grid code configuration" area, click on the "Exit grid codes" button.

- Reload the browser window: press the <F5> key.

Or: Click on "Reload" in the browser window.

Showing selected grid code

14. Select *>Operation >System configuration*.

The selected grid code is displayed in the *>Grid code configuration* area by *>Active grid code*.

Displaying status of power limiting

During operation, the "Power limiting status" indicates whether the power is currently limited and what the reason for limiting is.

Status	Meaning
"inactive"	No power limiting.
"DC link limiting controller"	DC link limiting controller is active.
"Grid code"	Grid code functions are active.
"Overload limiting"	Overload limiting is active.
"Temperature derating"	Temperature limits power output.

Status of power limiting

Tab. 1

15. Select *>Operation >Device control AC-DC mode*.

16. Read off the current status in the *>Device control AC-DC* area under "Power limiting status".

Tip

To query the current status of the configuration, the *>GRID CODE* menu item and the corresponding selection list of the grid codes can also be opened without entering the password.

2. Hierarchy of the grid code functions

If several grid code functions are active at the same time, the function with the highest hierarchy level takes control. Functions of the same hierarchy level have the same ability to intervene.

Hierarchy	Abbreviation of the function	Name of the function	SA
0	Anti-islanding	Anti-islanding protection	8
1	FRT voltage	Low and high voltage ride through	9
1	FRT frequency	Low and high frequency ride through	10
2	P(U)	Volt-Watt	15
3	P(f)	Frequency-Watt	14
4	Q(U)	Volt/Var mode	13
5	SPF cos(Phi)	Specified power factor	12
5	Ramp rate	Normal ramp rate and soft-start ramp rate	11

Hierarchy of the grid code functions

Tab. 2

3. Low and high voltage ride through (SA9)

3.1 Switching on "FRT voltage mode"

The "FRT voltage mode" function controls the behavior of the AC-DC module in the event of undervoltage and overvoltage on the mains grid. The AC-DC module remains connected to the mains for a preset period of time and then disconnects from the mains. The alarm message is displayed: "Grid code ride through time exceeded".

Activate "FRT voltage mode"

1. To activate the function:
 - In the main menu, click on *>GRID CODE*.
 - Select the grid code in the selection list: "UL1741SA FRTs"
2. In the "Fault ride through mode" area under "Activate FRT voltage mode", select: "FRT voltage mode"

The function is active.

Enter parameters for "FRT voltage mode"

In order to support the mains grid, 6 operating ranges are defined:

- Undervoltage: 3 ranges
- Nominal voltage ("Near Nominal"): 1 range
- Overvoltage: 2 ranges

If the mains voltage is in the nominal voltage range, the AC-DC module behaves normally.

If the mains voltage is in one of the undervoltage or overvoltage ranges, some entries made by the user will be ignored because the mains-supporting measures have priority.

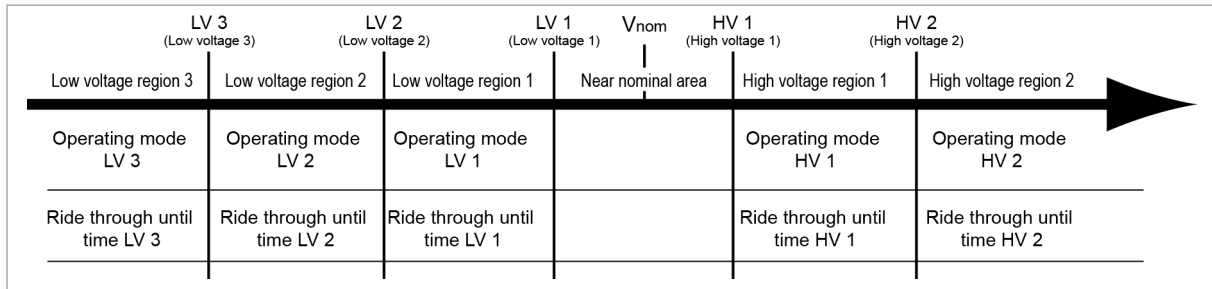
A time period can be defined for each undervoltage and overvoltage range.

For each range, it is additionally possible to specify which mode the AC-DC module is to remain in while connected to the mains:

- "Mandatory operation"
The AC-DC module attempts to maintain the output apparent power.
- "Momentary cessation"
The AC-DC module reduces the output apparent power to 0.

In both modes, the AC-DC module attempts to maintain the power factor and phase position (inductive/capacitive). If one of the modes is active, these values cannot be changed.

All 3 phases are considered separately.



Possible voltage ranges and the corresponding parameters

Fig. 1

Parameter	Unit	Step size	Default	Minimum	Maximum
Low voltage 3	V	0.01	138.5	120	276
Low voltage 2	V	0.01	193.9	190	276
Low voltage 1	V	0.01	243.76	240	276
High voltage 1	V	0.01	304.7	279	306
High voltage 2	V	0.01	332.4	279	335
Operating mode LV 3*	–	1	0	0	1
Operating mode LV 2*	–	1	1	0	1
Operating mode LV 1*	–	1	1	0	1
Operating mode HV 1*	–	1	0	0	0
Operating mode HV 2*	–	1	0	0	0
Ride through until time LV 3	s	0.1	1	0	1
Ride through until time LV 2	s	0.1	10	0	10
Ride through until time LV 1	s	0.1	20	0	20
Ride through until time HV 1	s	0.1	12	0	12
Ride through until time HV 2	s	0.1	0	0	0

*) 0 = Momentary cessation; 1 = Mandatory operation

Parameters for "FRT voltage mode"

Tab. 3

Requirement:

- The output voltage is $\geq 15\% U_{nom}$.
 - With an output voltage below $15\% U_{nom}$, the AC-DC module disconnects from the mains.
3. Select **>GRID CODE >UL1741SA FRTs** .
 4. Enter the desired values in the "Fault ride through voltage settings" area.

4. Low and high frequency ride through (SA10)

4.1 Switching on "FRT frequency mode"

The "FRT voltage mode" function controls the behavior of the AC-DC module in the event of frequency fluctuations on the mains grid. Dynamic frequency fluctuations should be balanced out as much as possible without necessitating separation of the AC-DC module from the mains.

The AC-DC module remains connected to the mains for a pre-set period of time and then disconnects from the mains, if necessary. The alarm message is displayed: "Grid code ride through time exceeded".

Activate "FRT frequency mode"

1. To activate the function:
 - In the main menu, click on *>GRID CODE*.
 - Select the grid code in the selection list: "UL1741SA FRTs"
2. In the "Fault ride through mode" area under "Activate FRT frequency mode", select: "FRT frequency mode"

The function is active.

Enter parameters for "FRT frequency mode"

In order to support the mains frequency, 5 operating ranges are defined:

- Underfrequency: 2 ranges
- Nominal frequency ("Near Nominal"): 1 range
- Overfrequency: 2 ranges

If the mains frequency is in the nominal frequency range ("Near Nominal"), the AC-DC module behaves normally. The power specifications are not limited by the "FRT frequency mode" function.

The "FRT frequency mode" function is active both in charging and discharging mode.

If the mains frequency is in one of the underfrequency or overfrequency ranges, some entries made by the user will be ignored because the mains-supporting measures have priority.

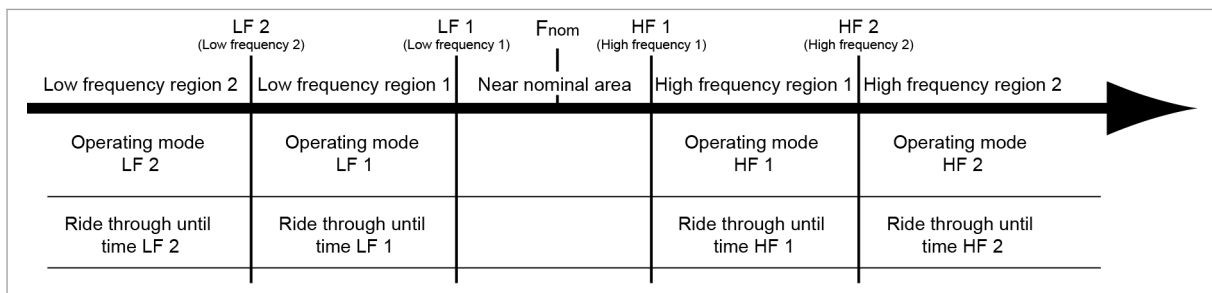
A time period can be defined for each underfrequency and overfrequency range.

For each range, it is additionally possible to specify which mode the AC-DC module is to remain in while connected to the mains:

- "Mandatory operation"
The AC-DC module attempts to maintain the output apparent power.
- "Momentary cessation"
The AC-DC module reduces the output apparent power to 0.

In both modes, the AC-DC module attempts to maintain the power factor and phase position (inductive/capacitive). If one of the modes is active, these values cannot be changed.

All 3 phases are considered separately.



Possible frequency ranges and the corresponding parameters

Fig. 2

Parameter	Unit	Step size	Default	Minimum	Maximum
Low frequency 2	Hz	0.01	57	53	59.9
Low frequency 1	Hz	0.01	58.5	57	59.9
High frequency 1	Hz	0.01	60.5	60.1	62
High frequency 2	Hz	0.01	62	60.1	64
Operating mode LF 2*	–	1	0	0	0
Operating mode LF 1*	–	1	1	0	1
Operating mode HF 1*	–	1	1	0	1
Operating mode HF 2*	–	1	0	0	0
Ride through until time LF 2	s	0.1	0	0	0
Ride through until time LF 1	s	0.1	297	0	600
Ride through until time HF 1	s	0.1	297	0	600
Ride through until time HF 2	s	0.1	0	0	0

*) 0 = Momentary cessation; 1 = Mandatory operation

Parameters for "FRT frequency mode"

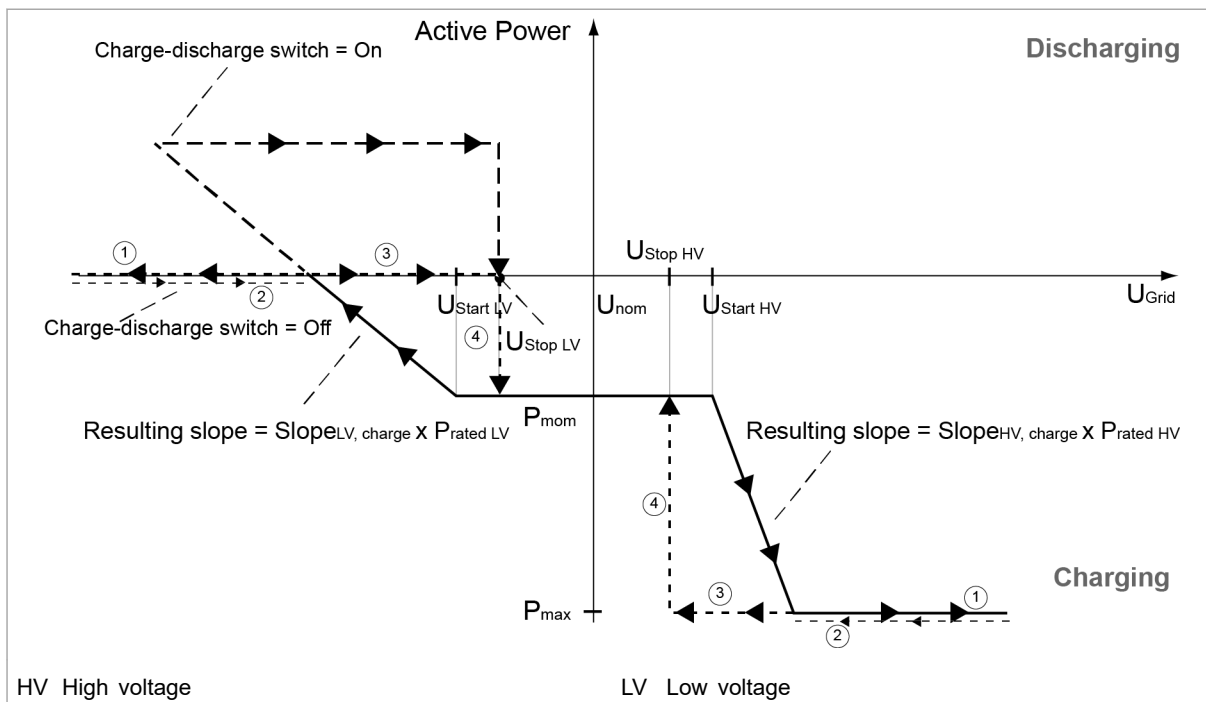
Tab. 4

3. Select `>GRID CODE >UL1741SA FRTs` .
4. Enter the desired values in the "Fault ride through voltage settings" area.

5. Volt-Watt mode (SA15)

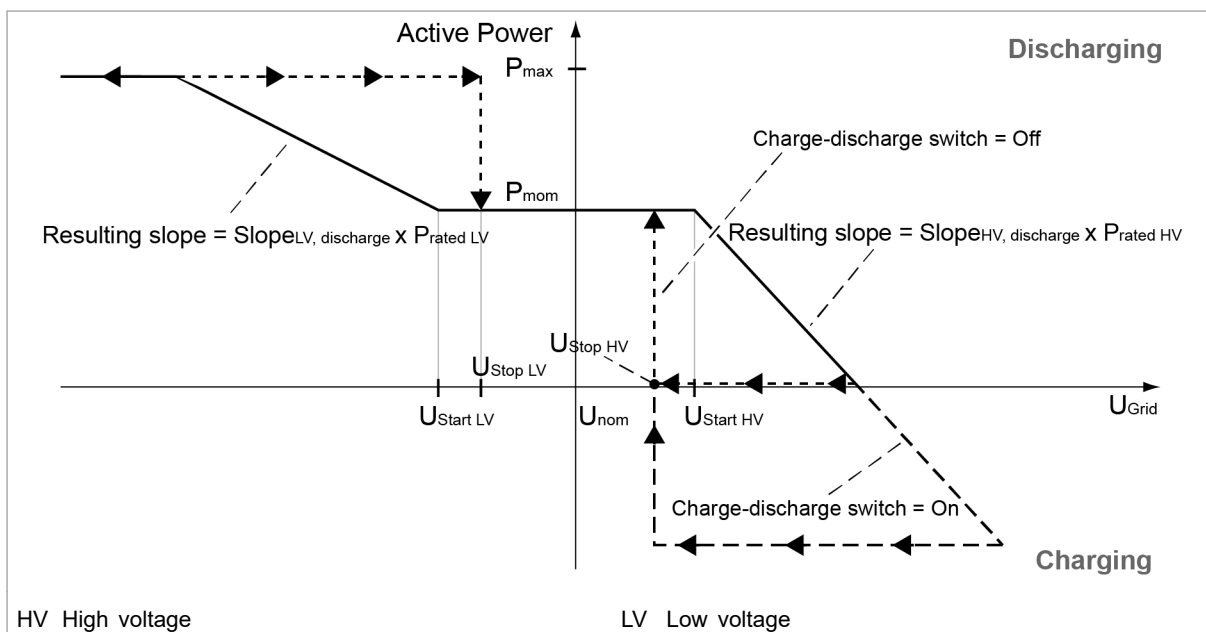
Effective power as a function of voltage

The Volt-Watt mode (SA15) function is also called "P(U) mode". This function allows an effective power to be fed into or drawn from mains based on the arithmetic mean value of conductors L1, L2, L3. The provided effective power follows a defined curve here.



Charge: Curve function P(U)

Fig. 3



Discharge: Curve function P(U)

Fig. 4

- Function active** The function is active as soon as one of these conditions is satisfied:
- $U_{Grid} > U_{start_HV}$
 - $U_{Grid} < U_{start_LV}$

Function inactive The function is deactivated as soon as the voltage is again within the permitted voltage range and other conditions are satisfied.

The following conditions must be met in order for function P(U) to become inactive:

- $U_{stop_LV} \leq U_{Grid} \leq U_{stop_HV}$
- "Return time" for "Return to NN" has elapsed.
- After "Return time" has elapsed:
 - Effective power is again achieved before function P(U) is activated.
 - Or:
 - "Max time" for "Return to NN" has elapsed.

Note

This function does not switch off the AC-DC module.

It is the settings in function "Fault Ride Through" or the factory settings in the device that lead to shutdown.

5.1 Switching on "P(U) mode"

- Activate "P(U) mode"**
1. To activate the function:
 - In the main menu, click on *>GRID CODE*.
 - Select the grid code in the selection list: "UL1741SA Grid Codes"
 2. In the "Grid code mode" area under "Activate P(U) mode", select: "P(U)"

The function is active.

- Enter parameters for "P(U) mode"**
3. Select *>GRID CODE >UL1741SA Grid Codes*.
 4. Enter the desired values in the "P(U) mode settings" area.

Parameter	Unit	Step size	Default	Minimum	Maximum
High voltage: Voltage start	V	0.1	280	280	305
Low voltage: Voltage start	V	0.1	275	250	275
High voltage: Slope charge	% P_{rated}/V	0.1	10	0	100
High voltage: Slope discharge	% P_{rated}/V	0.1	10	10	100
Low voltage: Slope charge	% P_{rated}/V	0.1	10	0	100

Parameter	Unit	Step size	Default	Minimum	Maximum
Low voltage: Slope discharge	% P _{rated} /V	0.1	10	10	100
High voltage: Rated Power	–	–	1: Nominal power	0: Momentary power	1: Nominal power
Low voltage: Rated Power	–	–	1: Nominal power	0: Momentary power	1: Nominal power
High voltage: Voltage stop	V	0.1	280	278	305
Low voltage: Voltage stop	V	0.1	275	250	277
Charge-discharge switch	–	–	0: OFF	0: OFF	1: ON
"Return to NN": "Slope"	% W/V	0.01	1	1	10
"Return to NN": "Max time"	s	0.1	600	0	3600
"Return to NN": "Return to NN"	s	0.1	1	0	100

Adjustable parameters for function P(U) (SA15)

Tab. 5

Parameter	Description
Voltage start	<p>There are 2 parameters here. One for overvoltage and one for undervoltage.</p> <p>The starting voltage is the voltage at which function P(U) is activated.</p> <p>If $U_{Grid} > U_{start_HV}$ or $U_{Grid} < U_{start_LV}$, P(U) is active and the function takes control.</p>
Slopes and Rated power	<p>As soon as function P(U) is activated, curve P(U) is traversed.</p> <p>At this point in time, there is a critical grid condition and apparent power S, cosPhi and the phase can no longer be changed.</p> <p>There are a total of 4 adjustable slopes s:</p> <ul style="list-style-type: none"> ▪ Discharging and overvoltage ▪ Discharging and undervoltage ▪ Charging and overvoltage ▪ Charging and undervoltage <p>The respective slope s is multiplied by the setting for "Rated power" to obtain the resulting slope.</p> <p>Choices for "Rated power" are:</p> <ul style="list-style-type: none"> ▪ "Nominal power" (25 kW) ▪ "Momentary power": Apparent power is again achieved before function P(U) is activated. <p>Examples</p> <p>If $s = 10\% \text{ W/V}$ and "Rated power" = "Nominal power" (25 kW) => Resulting slope = $10\% \times 25 \text{ kW/V} = 2.5 \text{ kW/V}$.</p> <p>If $s = 20\% \text{ W/V}$ and "Rated power" = "Momentary power" and the power at the start of function P_Mom = 15 kW => Resulting slope = $20\% \times 15 \text{ kW/V} = 3 \text{ kW/V}$.</p> <p>Note</p> <p>Function P(U) is not strictly a "traversing of the curve". In the event of overvoltage: as soon as the voltage increases, function P(U) is a traversal of the curve. If the voltage drops again, the current effective power value during voltage feedback is held constant at "Near nominal". The reduction of the effective power does not occur until in "Return to NN" mode.</p>
Charge-discharge switch	<p>Automatic switching between charging and discharging while curve P(U) is being traversed can be permitted or prohibited.</p> <p>Set switch "Charge-discharge switch" to "On" to permit automatic switching.</p>

Parameter	Description
Voltage stop	There are 2 parameters here. One for overvoltage and one for undervoltage. As soon as $U_{stop_LV} < U_{Grid} < U_{stop_HV}$, function P(U) changes to Return to NN mode.
Return to NN mode	As soon as the mains voltage is again between U_{stop_HV} and U_{stop_LV} , "Return to NN mode" starts. The effective power is first held constant for a defined time ("Return time"). After "Return time" has elapsed, the effective power is again achieved before function P(U) is activated."Return to NN: Slope" Function P(U) is ended as soon as the effective power is again achieved before function P(U) is activated or the set "Max time" has elapsed.
Functionality	To obtain the predefined effective power P, the reactive power Q is kept constant as long as possible and the apparent power S adapted. If this is no longer possible, cosPhi is rotated in direction 1.

Description of the parameters

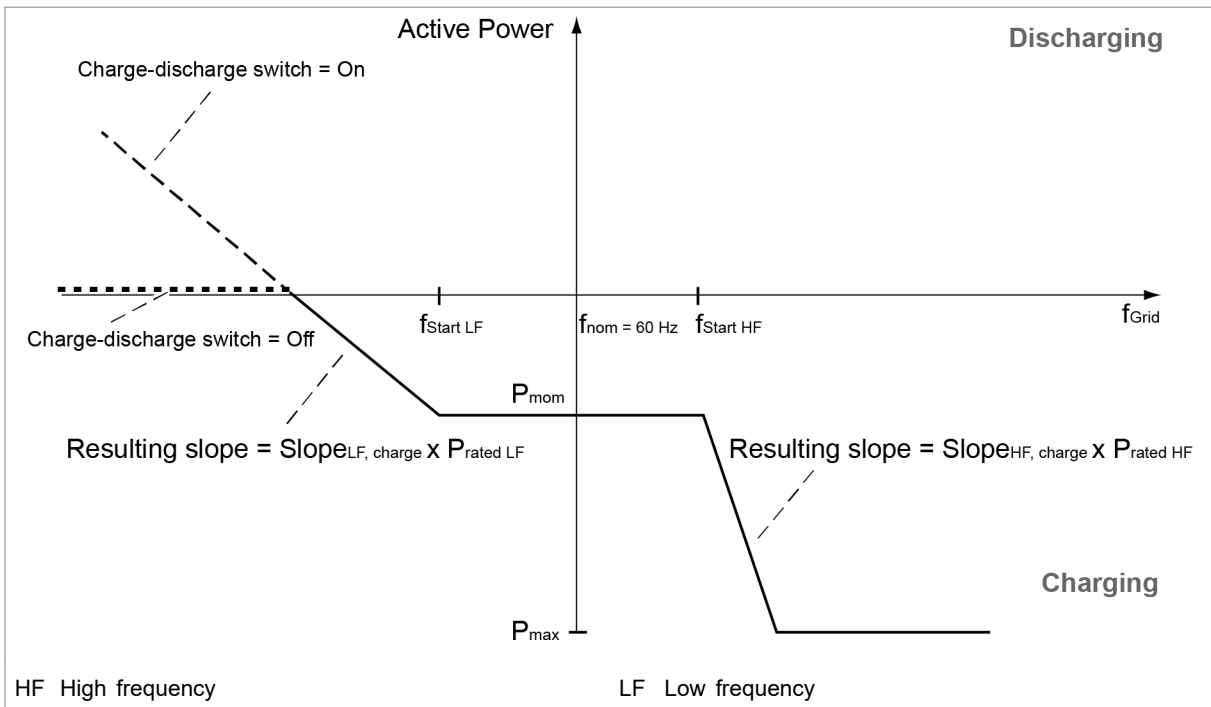
Tab. 6

6. Frequency-Watt mode (SA14)

Effective power as a function of mains frequency

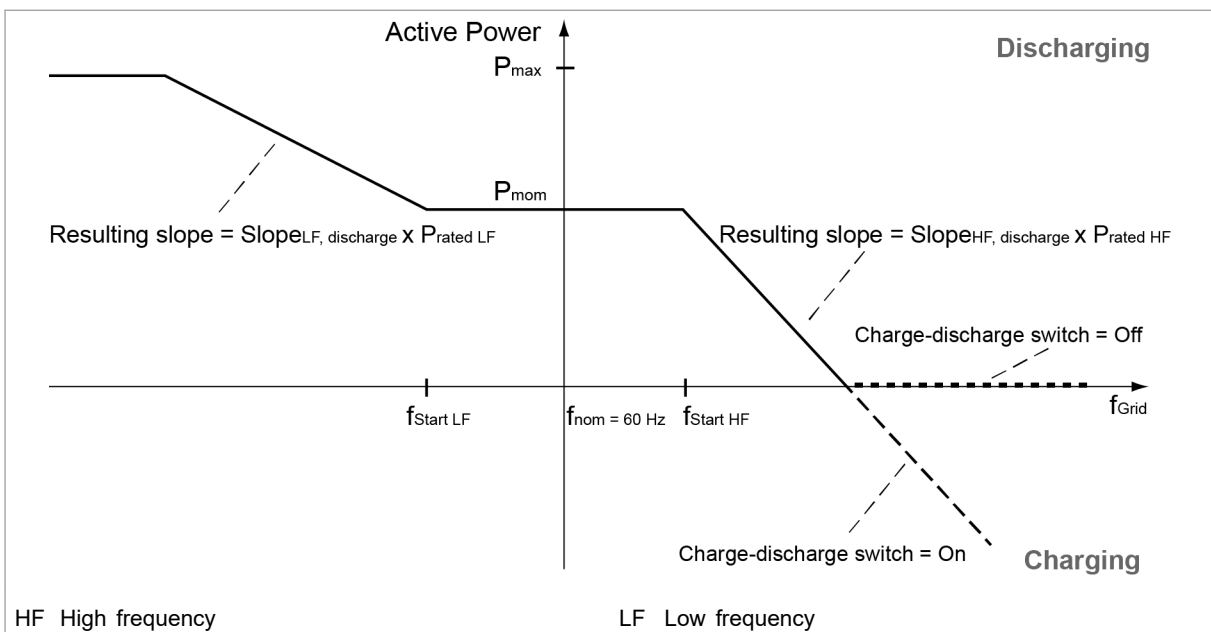
The Frequency-Watt mode (SA14) function is also called "P(f) mode".

This function allows a mains frequency that is dependent on effective power to be fed into or drawn from mains. The provided effective power follows a defined curve here.



Charge: Curve function P(f)

Fig. 5



Discharge: Curve function P(f)

Fig. 6

Function active The function is active as soon as one of these conditions is satisfied:

- $f_{\text{Grid}} \geq f_{\text{start_HF}}$
- $f_{\text{Grid}} \leq f_{\text{start_LF}}$

Function inactive The function is again deactivated as soon as the frequency is again within the permitted frequency range. There is a difference here if alarm mode is also active or inactive.

- Without alarm mode: $f_{\text{start_LF}} < f_{\text{Grid}} < f_{\text{start_HF}}$
- With alarm mode, the following conditions must be met:
 - $f_{\text{start_LF}} < f_{\text{Grid}} < f_{\text{start_HF}}$
 - Time span (duration) for alarm mode has elapsed.

Note

This function does not switch off the AC-DC module.

It is the settings in function "Fault Ride Through" or the factory settings in the device that lead to shutdown.

6.1 Switching on "P(f) mode"

- Activate "P(f) mode"**
1. To activate the function:
 - In the main menu, click on *>GRID CODE*.
 - Select the grid code in the selection list: "UL1741SA Grid Codes"
 2. In the "Grid code mode" area under "Activate P(f) mode", select: "P(f)"
- The function is active.

- Enter parameters for "P(f) mode"**
3. Select *>GRID CODE >UL1741SA Grid Codes*.
 4. Enter the desired values in the "P(f) mode settings" area.

Parameter	Unit	Step size	Default	Minimum	Maximum
High frequency: Frequency start	Hz	0.001	60.2	60.01	64.00
Low frequency: Frequency start	Hz	0.001	59.8	56.00	59.99
High frequency: Slope charge	% P _{rated} /Hz	0.1	10	0	100
High frequency: Slope discharge	% P _{rated} /Hz	0.1	50	25	100
Low frequency: Slope charge	% P _{rated} /Hz	0.1	10	0	100
Low frequency: Slope discharge	% P _{rated} /Hz	0.1	50	25	100
High frequency: Rated Power	–	–	1: Nominal power	0: Momentary power	1: Nominal power
Low frequency: Rated Power	–	–	1: Nominal power	0: Momentary power	1: Nominal power
Charge-discharge switch	–	–	0: Off	0: Off	1: On
Alarm mode	–	–	0: Off	0: Off	1: On
Alarm mode: Slope	% W/Hz	0.01	1	1	10
Alarm mode: Duration	s	0.1	60	0	3600

Adjustable parameters for function P(f) (SA14)

Tab. 7

Parameter	Description
Frequency start	<p>There are 2 parameters here. One for overfrequency and one for underfrequency.</p> <p>The starting frequency is the frequency above which function P(f) is activated.</p> <p>If $f_{Grid} \geq f_{start_HF}$ or $f_{Grid} \leq f_{start_LF}$, P(f) is active and the function takes control.</p>
Slopes and Rated power	<p>As soon as function P(f) is activated, curve P(f) is traversed.</p> <p>At this point in time, there is a critical grid condition and apparent power S, cosPhi and the phase can no longer be changed.</p> <p>There are a total of 4 adjustable slopes:</p> <ul style="list-style-type: none"> ▪ Discharging and overfrequency ▪ Discharging and underfrequency ▪ Charging and overfrequency ▪ Charging and underfrequency <p>The respective slope s is multiplied by the setting for "Rated power" to obtain the resulting slope.</p> <p>Choices for "Rated power" are:</p> <ul style="list-style-type: none"> ▪ "Nominal power" (25 kW) ▪ "Momentary power": Apparent power is again achieved before function P(U) is activated. <p>Examples</p> <p>If s = 10% W/Hz and "Rated power" = "Nominal power" (25 kW) => Resulting slope = 10% x 25 kW/Hz = 2.5 kW/Hz.</p> <p>If s = 20% W/Hz and "Rated power" = "Momentary power" and the power at the start of function P_Mom = 15 kW => Resulting slope = 20% x 15 kW/Hz = 3 kW/Hz.</p>
Charge-discharge switch	<p>Automatic switching between charging and discharging while curve P(f) is being traversed can be permitted or prohibited.</p> <p>Set switch "Charge-discharge switch" to "On" to permit automatic switching.</p>

Parameter	Description
Alarm mode	<p>If alarm mode is deactivated, function P(f) is deactivated as soon as $f_{start_LF} < f_{Grid} < f_{start_HF}$.</p> <p>If alarm mode is activated, then set value changes are permitted only to a limited extent for a certain length of time ("Alarm mode": "Duration"). The S set value changes with a slope of $s = Slope \times S_{max}$.</p>
Functionality	<p>To obtain the predefined effective power P, the reactive power Q is kept constant as long as possible and the apparent power S adapted. If this is no longer possible, cosPhi is rotated in direction 1.</p>

Description of the parameters

Tab. 8

7. Volt/Var mode (SA13)

7.1 Switching on "Volt/Var mode"

This function enables reactive power to be drawn from the mains or fed into the mains.

The function is active as soon as the mains voltage is outside a specified value range. This value range and other threshold values must be set in accordance with the specifications of the mains operator.

If the function is active, the user cannot change the output apparent power, power factor or phase position (inductive/capacitive).

Activate "Volt/Var mode"

1. To activate the function:
 - In the main menu, click on *>GRID CODE*.
 - Select the grid code in the selection list: "UL1741SA Grid Codes"
2. In the "Grid code mode" area under "Activate Q-mode", select: "Q(U)"

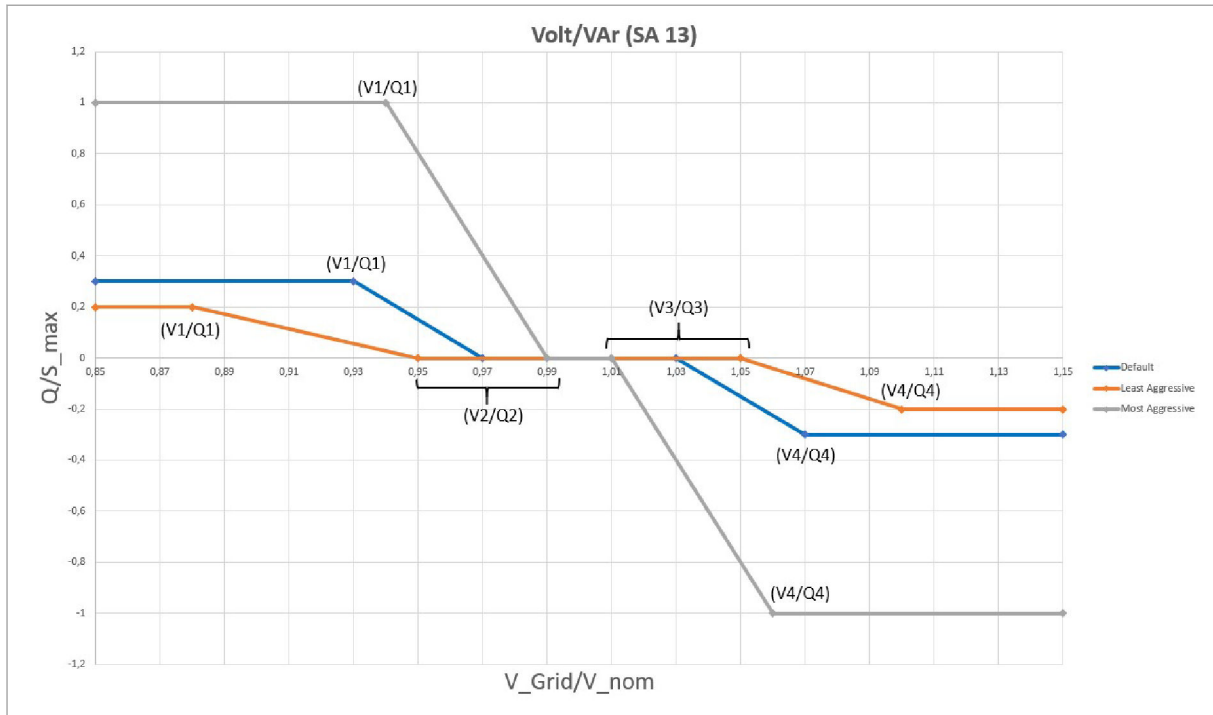
The function is active.

Enter parameters for Q(U)

3. Select *>GRID CODE >UL1741SA Grid Codes*.

There are 4 value pairs which define the characteristic curve: Point1(V1;Q1 = "Max rated Q"), Point2(V2;Q2 = 0 kVAr), Point3(V3;Q3 = 0 kVAr), Point4(V4;Q4 = "Max rated Q"). That

means there are 5 values that must be defined: V1 to V4 and the maximum reactive power "Max rated Q".



Current/reactive power characteristic curve for ranges in which reactive power compensation occurs.

Fig. 7

4. In the "Q-mode settings" area, enter the desired values in "Q(U): ...".

Parameter	Default	Min	Max	Step size
Voltage 1	93%	88% (± 244 V)	94% (± 260 V)	0.1
Voltage 2	97%	95 % (± 260 V)	99% (± 274 V)	0.1
Voltage 3	103%	101% (± 280 V)	105% (± 291 V)	0.1
Voltage 4	107%	106% (± 291 V)	110% (± 305 V)	0.1
Max rated Q	30% kVAr	20% kVAr (± 5 kVAr)	100% kVAr (± 25 kVAr)	0.1

Value ranges for V1 to V4 and "Max rated Q"

Tab. 9

Between voltage threshold values V2 and V1 or V3 and V4, delivery of the reactive power value to the mains is linear to the changing mains voltage.

The slope between these voltage threshold values depends on previously defined values V1 to V4 and "Max rated Q".

8. Specified power factor (SA12)

8.1 Adjust Specified power factor

The "Specified power factor" function is used to preset a constant power factor $\cos(\Phi)$ for discharging mode.

Despite the defined power factor $\cos(\Phi)$ in discharging mode, switching between charging and discharging is possible during operation.

Operating state	Meaning for $\cos(\Phi)$	Adjusting
Discharging	The specified power factor $\cos(\Phi)$ is used.	(see "Entering $\cos(\Phi)$ value", pg. 20)
Charging	All values for power factor $\cos(\Phi)$ are still possible.	>Operation >Device control AC-DC module in the "Device control AC-DC" area, enter the value in "Power factor (CosPhi)". Note the selected reference arrow system and set the sign accordingly.
Discharging → Charging (switching)	It is possible to switch between the fixed $\cos(\Phi)$ value in discharging mode to any $\cos(\Phi)$ value with the opposite sign in charging mode.	>Operation >Device control AC-DC module in the "Device control AC-DC" area, enter the value in "Power factor (CosPhi)". Note the selected reference arrow system and set the sign accordingly.
Charging → Discharging (switching)	It is possible to switch between a $\cos(\Phi)$ value in charging mode to the fixed $\cos(\Phi)$ value with the opposite sign in discharging mode.	>Operation >Device control AC-DC module in the "Device control AC-DC" area, enter the opposite sign in "Power factor (CosPhi)" (value irrelevant). It switches to discharging mode with fixed $\cos(\Phi)$ value.

Changing operating states and operating states

Tab. 10

Activate "Specified power factor"

- To activate the function:
 - In the main menu, click on >GRID CODE.
 - Select the grid code in the selection list: "UL1741SA Grid Codes"
- In the "Grid code mode" area under "Activate Q-mode", select: "SPF $\cos(\Phi)$ "
The function is active.

Entering $\cos(\Phi)$ value

- Select >GRID CODE >UL1741SA Grid Codes.
- In the "Q-mode settings" area, enter the desired value under "SPF: $\cos(\Phi)$ value".

As soon as power output has been enabled at the AC-DC module ("Activate power stage" = 1), the entered power factor is adopted and can no longer be changed for the discharge operation during operation.

9. Normal ramp rate and soft-start ramp rate (SA11)

9.1 Adjust Normal ramp rate and soft-start ramp rate

Activate Rampe rate mode

In discharging mode, this function can be used to move the apparent output power linearly from a set value to a new set value. The slope of the linear set value change is specified with the change speed [kVA/s].

Requirement:

- Discharging mode: $\cos\phi \geq 0$.

1. To activate the function:
 - In the main menu, click on *>GRID CODE*.
 - Select the grid code in the selection list: "UL1741SA Grid Codes"
2. In the "Grid code mode" area under "Activate ramp rate mode", select: "Ramp rate"

The function is active.

Enter parameters for Rampe rate mode

3. Select *>GRID CODE >UL1741SA Grid Codes*.
4. In the "Ramp rate mode settings" area, enter the desired value under "Ramp rate: slope".
 - Minimum slope: 0.1 kVA/s
 - Maximum slope: 833 kVA/s

The "Ramp rate" is active for all set value changes in discharging mode and is the same for power increase and power decrease.

10. Anti-islanding protection (SA8)

10.1 Adjust Anti-islanding protection

If inadvertent isolated operation is detected, the AC-DC module is switched off within 2 s.

This function is always switched on if "Mains-connected system" is selected. The function is active in the background no matter whether other functions (SA 9 – SA15) are activated.

1. Select *>Operation >AC-DC module settings*.
2. Under "Grid voltage", enter the mains voltage and mains frequency as well as the operating mode:
 - 400 V / 50 Hz, 480 V / 60 Hz, ...
 - Mains-connected or isolated operation

11. Switch-on/switch-off conditions

11.1 Setting switch-on/switch-off conditions

The mains voltage and mains frequency must move within a defined range for a certain period of time; only then can the AC-DC module be connected. An appropriate alarm message is displayed ("Grid does not match grid code requirements.").

Activate "Switch on criteria"

1. To activate the function:
 - In the main menu, click on *>GRID CODE*.
 - Select the grid code in the selection list: "UL1741SA FRTs"
2. In the "Grid code mode" area under "Activate switch on criteria", select: "Active"

The function is active.

Enter parameters for "Switch on criteria"

3. Select *>GRID CODE >UL1741SA Grid Codes*.
4. Enter the desired values in the "Switch on/off settings" area.
 - Under "Voltage min [V]" and "Voltage max [V]": Enter the minimum and maximum value for the mains voltage.
 - Under "Frequency min [Hz]" and "Frequency max [Hz]": Enter the minimum and maximum value for the mains frequency.
 - Under "Time [s]": Enter the time period.

Parameter	Unit	Step size	Default value	Area
Voltage, min.	V	0.01	263.15	250– 276
Voltage, max.	V	0.01	290.85	278– 300
Frequency, min.	Hz	0.01	59.3	58 – 59,9
Frequency, max.	Hz	0.01	60.5	60,1 – 61
Time	s	0.1	10	0 – 300

Possible parameter values for "Switch on criteria"

Tab. 11

