Fronius
SHIFTING THE LIMITS

Service Menüs SnapINverter

Service menus SnapINverter

DE Serviceanleitung

Netzgekoppelter Wechselrichter

EN Service manual

Grid-connected inverter

42,0410,2015 005-19082015

Contents

General

General

The "Service menus" are setup menus for installers and service engineers. The "Service menus" are located at a separate menu level that can only be opened by entering an access code.
The access code is provided by Fronius.

The following "Service menus" are described in these instructions:
- Service Basic menu
- Service Error Counter menu
- Service Pro menu

Safety

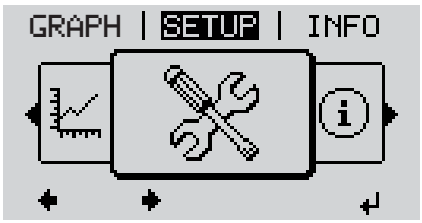
CAUTION! Incorrect settings can cause malfunctions and failures on the inverter. Settings may only be made by trained and qualified personnel. Incorrect or omitted settings will result in non-conformance with the standard.

IMPORTANT! If a status code is shown on the inverter display during the startup phase, the "Service menus" can be opened by pressing the "Menu" button five times and then entering the relevant access code.

Refer to the safety rules in the inverter operating instructions.

Opening a Service menu

Opening a Service menu



1 Press the 'Menu' key

The menu level appears.

2 Press the unassigned 'Menu / Esc' key
5 times

"Access Code" is displayed in the "CODE" menu; the first digit starts flashing.

3 Enter the access code for the Service menu required: Use the 'Up' and 'Down' keys to select a value for the first digit of the code.

4 Press the 'Enter' key

The second digit starts flashing.

5 Repeat steps 3 and 4 for the second, third, fourth and fifth digit of the access code until ...

the selected code starts flashing.

6 Press the 'Enter' key

12345 ... Example code

The first parameter of the required Service menu is displayed

Setting entries on the Setup menu, general

1 Enter the SETUP menu item

2 Use the 'Up' or 'Down' keys to select the desired menu item

3 Press 'Enter'

The first digit of a value to be set flashes:

4 Use the 'Up' or 'Down' keys to select a value for the first digit

5 Press 'Enter'

The second digit of the value flashes.

6 Repeat steps 4 and 5 until ...

the whole value to be set flashes.

7 Press 'Enter'

8 Repeat steps 4 - 6 as required for units or other values that are to be set until the appropriate unit or the value flashes.

9 Press the 'Enter' key to save and apply the changes.

To discard the changes, press the 'Esc' key.

The currently selected menu item is displayed.

The available settings are displayed:

4 Use the 'Up' or 'Down' keys to select the desired setting

5 Press the 'Enter' key to save and apply the setting.

To discard the setting, press the 'Esc' key.

The currently selected menu item is displayed.

Service Basic menu

Access code for the Service Basic menu

2 2 7 4 2

Overview of menu items in the Service Basic menu

x Press 'Enter'

1) The function is activated

2) The value is applied

3) The function is deactivated

4) Apply the function settings as described in the inverter operating instructions

5) Max. and min. voltage values and max. power of feeding in are reset to zero in the TOTAL display mode

a Fronius Galvo
b Fronius Symo S
c Fronius Symo M -8k2
d Fronius Symo M -20
e Fronius Symo Hybrid
f Fronius Primo -8k2
g Fronius Primo US -15
h Fronius Eco
i Fronius Symo US -12
j Fronius Symo US -24
k Fronius Symo US (Eco)
l Fronius Primo US -8k2

▲▼	↵	▲▼	↵	▲▼	
MPP Tracker 1	x	DC operating mode	x	MPP AUTO	1)
			x	FIX	1)
			x	MPP USER	1)
		Dyn. Peak Manager [b,c,d,e,f,g,h,i,j,k,l]	x	ON x OFF x	1) 3)
		Fixed voltage	x	80 - 800 V [f,g,l] 120 - 440 V [a] 150 - 800 V [b,c,d,e,i,j] 315 - 550 V [k] 580 - 850 V [h]	2) 2) 2) 2) 2)
		MPPT1 initial voltage	x	80 - 800 V [f,g,l] 120 - 440 V [a] 150 - 800 V [b,c,d,e,i,j] 315 - 550 V [k] 580 - 850 V [h]	2) 2) 2) 2) 2)
MPP Tracker 2 [c,d,f,g,i,j,l]	x	MPP Tracker 2	x	ON x OFF x	1) 3)
		DC operating mode	x	MPP AUTO	1)
			x	FIX	1)
			x	MPP USER	1)

▲▼	↵	▲▼	↵	▲▼	
		Dyn. Peak Manager	x	ON x OFF x	1) 3)
		Fixed voltage	x	80 - 800 V [f,g,l] 150 - 800 V [c,d,i,j,]	2) 2)
		MPPT2 initial voltage	x	80 - 800 V [f,g,l] 150 - 800 V [c,d,i,j,]	2) 2)
USB logbook	x	ON	x		1)
		OFF	x		3)
		Auto	x		3)
Input signal	x	Mode of operation	x	Ext Sig. x S0-Meter x OFF x	 1) 1) 3)
		Triggering method (indicated by selection of "Ext Sig.")	x	Ext. Stop x Warning x	 1) 1)
		Connection type (indicated by selection of "Ext Sig.")	x	N/C x N/O x	 1) 1)
SMS / relay	x	Event delay	x	900 - 86400 s	2)
		Event counter	x	10 - 255	2)
Grounding setting [a]	x	Grounding mode	x	OFF x Positive x Negative x	 3) 1) 1)
		Earth current watchdog	x	OFF x Warning x Error x Warn Err x	 3) 1) 1) 1)
		Switch off delay	x	0 - 9999 hrs	2)
Insulation mode	x	Insulation warning	x	ON x OFF x	 1) 3)

▲▼	↵	▲▼	↵	▲▼	
		Threshold warning	x	0.6 - 10 MOhm [a]	2)
				1.1 - 10 MOhm [b,c,e,h,k]	2)
				1.025 - 10 MOhm [d,i,j]	2)
				1.5 - 10 MOhm [f,g,l]	2)
		Insulation fault [a]	x	ON	
				x	1)
				OFF	
				x	3)
		Threshold error [a]	x	0 kOhm - 10000 kOhm	2)
Temperature warning	x	ON	x		1)
		OFF	x		3)
TOTAL reset	x	CONFIRM	x		5)

The display of menu items depends on the respective country setup.

MPP Tracker 1 Setting the operating mode on the MPP Tracker 1

Selection options	DC operating mode / Dyn. Peak Manager / Fixed voltage / MPPT1 initial voltage

DC operating mode

Unit	-
Selection options	MPP AUTO / FIX / MPP USER
MPP AUTO	normal operating status; the inverter automatically searches for the ideal operating point
FIX	for entering a fixed DC voltage at which the inverter will operate
MPP USER	for entering a MPP voltage above which the inverter will search for its ideal operating point

Dyn. Peak Manager
for activating or deactivating the dynamic peak managers

Selection options	ON / OFF

Fixed voltage
for entering the fixed voltage

Unit	V
Setting range	80 - 800 120 - 440 150 - 800 315 - 550 580 - 850

MPPT1 initial voltage
for entering the MPPT1 initial voltage

Unit	V
Setting range	80 - 800 120 - 440 150 - 800 315 - 550 580 - 850

MPP Tracker 2 Setting the operating mode on the MPP Tracker 2

Selection options	MPP Tracker 2 / DC operating mode / Dyn. Peak Manager / Fixed voltage / MPPT2 initial voltage

MPP Tracker 2
for activating/deactivating 2nd MPP tracker

Setting range	OFF / ON

DC operating mode

Unit	-
Selection options	MPP AUTO / FIX / MPP USER
MPP AUTO	normal operating status; the inverter automatically searches for the ideal operating point
FIX	for entering a fixed DC voltage at which the inverter will operate
MPP USER	for entering a MPP voltage above which the inverter will search for its ideal operating point

Dyn. Peak Manager
for activating or deactivating the dynamic peak managers

Selection options	ON / OFF

Fixed voltage
for entering the fixed voltage

Unit	V
Setting range	80 - 800 150 - 800

MPPT2 initial voltage
for entering the MPPT2 initial voltage

Unit	V
Setting range	80 - 800 150 - 800

USB logbook Activation or deactivation of the function that saves all error messages on the USB stick

Selection options	ON/OFF/Auto

The "Auto" setting is reserved for future USB modifications and currently has a similar function to the "OFF" setting.

Input signal Activation and setting of the input signal

Selection options	Mode of operation / Trigger response / Connection type (Trigger response and connection type are only visible by selection of „Ext Sig.“)

Mode of operation

Ext Sig.	Status signal input
S0-Meter	Output of information from the performance counter in the in-home grid
OFF	Mode of operation deactivated

Trigger response

Ext. Stop	If there is a signal fault, an external stop appears on the display (interruption of feed-in).
Warning	If there is a signal fault, a warning appears on the display at regular intervals (no interruption of feed-in).

Connection type

N/C	Normal closed
N/O	Normal open

SMS / relay

Selection options	Event delay / event counter

Event delay
for entering the time delay after which an SMS is sent or the relay is to switch

Unit	s
Setting range	900 - 86400

Event counter
for entering the number of errors after which an SMS is sent or the relay is to switch

Unit	-
Setting range	10 - 255

Grounding setting

Activation and setting of the solar module ground

Selection options	Grounding mode / Earth current watchdog(1) / Switch off delay(2)

(1) only displayed if "Positive" or "Negative" is selected under Grounding mode
(2) only displayed if "Warn Err" is activated

Grounding mode
for selecting the solar module ground

Selection options	Off / Positive / Negative

Earth current watchdog
for activating and deactivating the grounding monitoring

Selection options	Off / Warning / Error / Warn Err
Off	Earth current watchdog deactivated
Warning	If there is a grounding fault, a warning that there is no longer a grounding connection appears on the display at regular intervals (no interruption of feed-in).
Error	The inverter produces an error message if there is a grounding fault with immediate shutdown of the inverter.
Warn Err	If there is a grounding fault, a warning that there is no longer a grounding connection first appears on the display at regular intervals (no interruption of feed-in). The inverter will then be switched off after a specified interval (switch off delay).

Switch off delay
for setting the delay time (in h) until the inverter will switch off following a grounding fault (unless the fault is rectified in the meantime).

Unit h

Setting range 0 - 9999

IMPORTANT! If the solar module manufacturer has specified that grounding of the solar modules is required, the relevant solar module ground setting must be applied to the inverter. Instructions from the solar module manufacturer on polarity and the required solar module grounding method, as well as national regulations, must be observed.
The solar module can be grounded to the negative pole in the inverter itself. In this case use of a ground fuse (1 A) is mandatory.

IMPORTANT! The fuse in the inverter is not used for grounding the solar modules to the positive pole; this has to take place outside the inverter.

Insulation mode Activation and setting of the insulation monitoring

Selection options Insulation warning / Threshold warning / Insulation fault / Threshold error

Insulation warning
for activating and deactivating the insulation monitoring, with display of a warning without interruption of feed-in if there is an insulation fault

Selection options ON / OFF

Threshold warning
for setting an insulation threshold at which the inverter produces a warning (without interruption of feed-in)

Setting range 0.6 - 10
1.1 - 10
1.025 - 10
1.5 - 10

Unit MOhm

Insulation fault
for activating and deactivating the insulation monitoring, with error message and immediate shutdown of the inverter if there is an insulation fault

Selection options ON / OFF

Threshold error
for setting an insulation threshold at which the inverter produces an error message and interrupts grid power feed operation

Setting range 0 - 10000

Unit kOhm

Temperature warning	for activating / deactivating the overtemperature warning for each event; the overtemperature warning is sent and displayed on the monitor. Selection options ON / OFF
TOTAL reset	In the LOG menu item, resets the max. and min. voltage values and the max. power of feeding in to zero. Once values have been reset, this action cannot be undone. To reset the values to zero, press the "Enter" key. "CONFIRM" is displayed. Press "Enter" again. The values are reset and the menu is displayed.

Service Error Counter menu

Access code for the Service Error Counter menu

3 7 7 6 7

Overview of menu items in the Service Error Counter menu

You can select the menu items in the Service Error Counter menu using the "up" and "down" arrow keys.

To open a menu item, press "Enter".
To exit a menu item, press "Esc".

State Counter 0-999 displays all status codes in numerical order
State Ranking TODAY displays all the day's status codes according to their frequency
State Ranking L.DAY displays all the last day's status codes according to their frequency
State Ranking ALL displays all status codes according to their frequency
Counter Reset Press "Enter" to reset the State Counter. This will irretrievably delete all logged values.

Service Pro menu

General remarks

Preconfigured network parameters depend on the country setup. The parameters have been selected to ensure that the inverter is compliant with currently applicable standards. In special cases, a qualified electrician or Fronius Service Partner (FSP) can adapt preconfigured country-specific limit values to local grid conditions in the Service Pro menu.
The modified limit values are permanently saved by the inverter.

NOTE! Modifying the monitoring parameters will immediately result in non-conformance of the inverter with the standards and, for this reason, may only be carried out after consulting the responsible grid operator.

To reinstate the original settings on the inverter, select the country setup again (Country Setup Menu), as described in the leaflet.

Access code for the Service Pro menu

The access code for the Service Pro menu is only provided to Fronius upon written request. The relevant request form can be obtained from the national Technical Support team.

Overview of menu items in the Service Pro menu

The display of menu items depends on the respective country setup.

x	Press 'Enter'
n	Value, dependent on local grid and also partly on country setup
1)	The function is activated
2)	The value is applied
3)	The function is deactivated
6)	A characteristic is entered with 4 X points and 4 Y points

a	Fronius Galvo	g	Fronius Primo US -15
b	Fronius Symo S	h	Fronius Eco
c	Fronius Symo M -8k2	i	Fronius Symo US -12
d	Fronius Symo M -20	j	Fronius Symo US -24
e	Fronius Symo Hybrid	k	Fronius Symo US (Eco)
f	Fronius Primo -8k2	l	Fronius Primo US -8k2

▲▼	↵	▲▼	↵ ▲▼	
U Inner Limit Max	x	n [V]	x	2)
U IL Max TripTime	x	n [cyl]	x	2)
U Inner Limit Min	x	n [V]	x	2)
U IL Min TripTime	x	n [cyl]	x	2)
U Outer Limit Max	x	n [V]	x	2)
U OL Max TripTime	x	n [cyl]	x	2)
U Outer Limit Min	x	n [V]	x	2)
U OL Min TripTime	x	n [cyl]	x	2)
U reconnect max	x	n [V]	x	2)
U reconnect min	x	n [V]	x	2)
U Longtime Limit	x	n [V]	x	2)
Freq. Inner Limit Max	x	n [Hz]	x	2)

▲▼	↵	▲▼	↵	▲▼	
Freq IL Max TripTime	x	n [cyl]	x		2)
Freq. Inner Limit Min	x	n [Hz]	x		2)
Freq IL Min TripTime	x	n [cyl]	x		2)
Alt Freq Mode	x	ON	x		1)
		OFF	x		3)
Alt Freq IL Max	x	n [Hz]	x		2)
Alt Freq IL Max TT	x	n [cyl]	x		2)
Alt Freq IL Min	x	n [Hz]	x		2)
Alt Freq IL Min TT	x	n [cyl]	x		2)
Freq Outer Limit Max	x	n [Hz]	x		2)
Freq OL Max TripTime	x	n [cyl]	x		2)
Freq Outer Limit Min	x	n [Hz]	x		2)
Freq OL Min TripTime	x	n [cyl]	x		2)
NL-MONitor [a,i,j,k,l]	x	NL-MONitor On/Off	x	ON	
				x	1)
				OFF	
				x	3)
				Stinger[i,j,k]	
				x	1)
		NL Uouter Limit Min	x		2)
		NL U OL Min TripTime	x		2)
		NL Uinner Limit Min	x		2)
		NL U IL Min TripTime	x		2)
		NL Uinner Limit Max	x		2)
		NL U IL Max TripTime	x		2)
		NL Uouter Limit Max	x		2)
		NL U OL Max TripTime	x		2)
Freq Reconnect min	x	n [Hz]	x		2)
Freq Reconnect max	x	n [Hz]	x		2)
Trip Time Delay	x	n [cyl]	x		2)
Reactive Power Mode	x	React. P. Mode	x	Cos φ / P	
				x	1)
				Q / U	
				x	1)
				Q / P	
				x	1)
				OFF	
				x	3)
				C. Cos φ	
				x	1)
				C. Qrel	
				x	1)
				C. Qabs	
				x	1)
		Const. Cos φ	x		2)
		Const. Cos φ TimeC.	x		2)
		Const. Q Rel	x		2)
		Const. Q Rel TimeC.	x		2)
		Const. Q Abs	x		2)

↑↓	↵	↑↓	↵	↑↓	
		Const. Q Abs TimeC.	x		2)
		Ch Cos φ (P) 0-0	x		6)
		Ch Cos φ (P) 0-1	x		6)
		Ch Cos φ (P) 1-0	x		6)
		Ch Cos φ (P) 1-1	x		6)
		Ch Cos φ (P) 2-0	x		6)
		Ch Cos φ (P) 2-1	x		6)
		Ch Cos φ (P) 3-0	x		6)
		Ch Cos φ (P) 3-1	x		6)
		Ch Cos φ (P) TimeC.	x		2)
		Ch Cos φ (P) U-LockIn	x		2)
		Ch Cos φ (P) U-Lock-Out	x		2)
		Ch Cos φ (P) P-Lock-Out	x		2)
		Ch Q (U) 0-0	x		6)
		Ch Q (U) 0-1	x		6)
		Ch Q (U) 1-0	x		6)
		Ch Q (U) 1-1	x		6)
		Ch Q (U) 2-0	x		6)
		Ch Q (U) 2-1	x		6)
		Ch Q (U) 3-0	x		6)
		Ch Q (U) 3-1	x		6)
		Ch Q (U) Init Delay	x		2)
		Ch Q (U) Offset Factor	x		2)
		Ch Q (U) TimeC.	x		2)
		Ch Q (U) P-LockIn	x		2)
		Ch Q (U) P-LockOut	x		2)
		Ch Q (U) Cos φ Min.	x		2)
		Ch Q (P) 0-0	x		6)
		Ch Q (P) 0-1	x		6)
		Ch Q (P) 1-0	x		6)
		Ch Q (P) 1-1	x		6)
		Ch Q (P) 2-0	x		6)
		Ch Q (P) 2-1	x		6)
		Ch Q (P) 3-0	x		6)
		Ch Q (P) 3-1	x		6)
		Ch Q (P) TimeC.	x		2)
		Ch Q (P) U-LockIn	x		2)
		Ch Q (P) U-LockOut	x		2)
		Ch Q (P) P-LockOut	x		2)

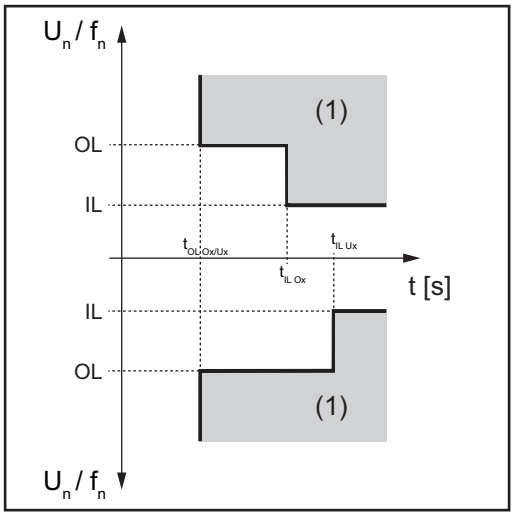
▲▼	↵	▲▼	↵	▲▼	
Freq dep. Power Red	x	GFDPR ON/OFF	x	Off x On DisHyst x On x	3) 1) 1)
		Enable Limit	x	50 - 52 Hz	2)
		Initial Delay	x		2)
		Derating Gradient	x	0.01 - 100 %/Hz	2)
		Change Time Constant	x		2)
		Frequency Test Time	x	0 - 600 s	2)
		Disable Limit Min.	x	50 - 52 Hz	2)
		Disable Limit Max.	x	50 - 52 Hz	2)
		Alt. Ret. Grad Thr.	x	0.01 - 100%	2)
		Return Gradient 1	x	0.01 - 100%/s	2)
		Alt. Return Grad. 1	x	0.01 - 100%/s	2)
		Use Return Grad. 2	x	OFF x ON x	3) 1)
		Return Gradient 2	x	0.01 - 100%/s	2)
Volt. dep. Power Red	x	GVDPR On/Off	x	Off x On x	3) 1)
		Enable Limit	x	208 - 300 V	2)
		Derating Gradient	x	0.01 - 100%/V	2)
		Change Time Constant	x	0.01 - 600 s	2)
		Event Message	x	OFF x ON x	3) 1)
SoftStart	x	Softstart On/Off	x	Off x On acFlt x On x	3) 1) 1)
		Softstart Gradient	x	0.01 - 100%/s	2)
Manual Power Reduct.	x				2)
Low V Ride Through [c, d,e,f,g,h,i,j,k,l]	x	LVFRT ON/OFF	x	OFF x ON x	3) 1)
		DeadBand Low	x	0 - 100%	2)
		DeadBand High	x	100 - 200%	2)
		LVFRT K-Factor	x	0 - 10	2)

▲▼	↵	▲▼	↵	▲▼	
DC-Injection	x	DC-I. InnerLimit Mode	x	OFF x Absolute x Relative x	3) 1) 1)
		DC-I. InnerLimit Relative	x	0 - 10%	2)
		DC-I. InnerLimit Absolute	x	0 - 10 A	2)
		DC-I. InnerLimit TripTime	x	0 - 10 s	2)
		DC-I. OuterLimit Mode	x	OFF x Absolute x Relative x	3) 1) 1)
		DC-I. OuterLimit Relative	x	0 - 10%	2)
		DC-I. OuterLimit Absolute	x	0 - 10 A	2)
		DC-I. OuterLimit TripTime	x	0 - 10 s	2)
Ripple Control	x	Mode	x	OFF x ON x	3) 1)
		Attenuation	x	0 - 90%	2)
I(delta gr.)F Compensation	x	Mode	x	OFF x ON x	3) 1)
		Udc Link Voltage	x	0 - 200 V	2)
Initial Start Time	x	1 - 900 s			2)
Reconnect Time	x	1 - 900 s			2)

The display of menu items depends on the respective country setup.

Voltage limit values

IL "Inner limit" - inner limit value
OL "Outer limit" - outer limit value



Graphic illustrating the limits
(1) Trip range

U Inner Limit Max
Upper inner grid voltage limit value in V

U IL Max TripTime
Trip time A) for exceeding the upper inner grid voltage limit value in cyl B)

U Inner Limit Min
Lower inner grid voltage limit value in V

U IL Min Trip Time
Trip time A) for falling below the lower inner grid voltage limit value in cyl B)

U Outer Limit Max
Upper outer grid voltage limit value in V

U OL Max TripTime
Trip time A) for exceeding the upper outer grid voltage limit value in cyl B)

U Outer Limit Min
Lower outer grid voltage limit value in V

U OL Min Trip Time
Trip time A) for falling below the lower outer grid voltage limit value in cyl B)

U Reconnect max
Upper voltage limit value for reconnection to the public grid following disconnection due to unauthorised parameter deviation
[V]

U Reconnect min
Lower voltage limit value for reconnection to the public grid following disconnection due to unauthorised parameter deviation
[V]

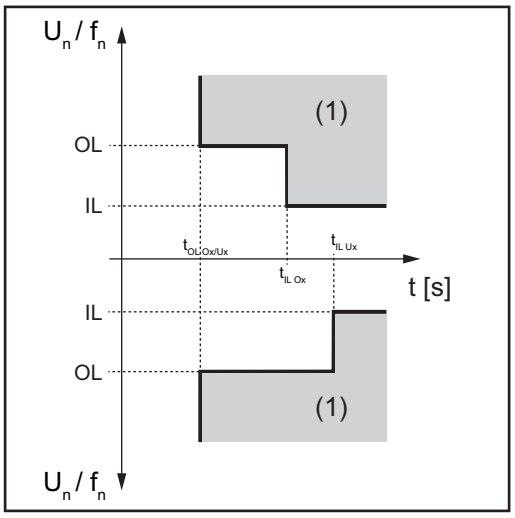
U Longtime Limit
Voltage limit value in V for the 10 minute average voltage value

A) Different trip times can be assigned to the inner limit value IL and outer limit value OL.
For example: short trip time for a deviation from the outer limit value
long trip time for a deviation from the inner limit value

B) cyl = grid periods (cycles); 1 cyl corresponds to 20 ms at 50 Hz or 16.66 ms at 60 Hz

Frequency limit values

IL "Inner limit" - inner limit value
OL "Outer limit" - outer limit value



Graphic illustrating the limits
(1) Trip range

Freq. Inner Limit Max
Upper inner grid frequency limit value in Hz

Freq IL Max TripTime
Trip time A) for exceeding the upper inner grid frequency limit value in cyl B)

Freq. Inner Limit Min
Lower inner grid frequency limit value in Hz

Freq IL Min TripTime
Trip time A) for falling below the lower inner grid frequency limit value in cyl B)

Alt Freq Mode
For activating / deactivating alternative frequency limit values
ON / OFF

Alt Freq IL Max
Alternative upper inner grid frequency limit value in Hz

Alt Freq IL Max TT
Trip time A) for exceeding the alternative upper inner grid frequency limit value in cyl B)

Alt Freq IL Min
Lower alternative inner grid frequency limit value in Hz

Alt Freq IL Min TT
Trip time A) for falling below the alternative lower inner grid frequency limit value in cyl B)

Freq Outer Limit Max
Upper outer grid frequency limit value in Hz

Freq OL Max TripTime
Trip time A) for exceeding the upper outer grid frequency limit value in cyl B)

Freq Outer Limit Min
Lower outer grid frequency limit value in Hz

Freq OL Min TripTime
Trip time A) for falling below the lower outer grid frequency limit value in cyl B)

Freq Reconnect Max
Upper grid frequency limit value for reconnection to the public grid following disconnection due to unauthorised parameter deviation
[Hz]

Freq Reconnect Min
Lower grid frequency limit value for reconnection to the public grid following disconnection due to unauthorised parameter deviation
[Hz]

A) Different trip times can be assigned to the inner limit value IL and outer limit value OL.
For example: short trip time for a deviation from the outer limit value
long trip time for a deviation from the inner limit value

B) cyl = grid periods (cycles); 1 cyl corresponds to 20 ms at 50 Hz or 16.66 ms at 60 Hz

NL-MONitor

For setting the NL-MON (neutral conductor phase monitoring) cut-out values

Auswahlmöglichkeiten	NL-MONitor On/Off / NL Uouter Limit Min / NL U OL Min TripTime / NL Uinner Limit Min / NL U IL Min TripTime / NL Uinner Limit Max / NL U IL Max TripTime / NL Uouter Limit Max / NL U OL Max TripTime
NL-MONitor On/Off	Selection options: ON / OFF / Stinger
NL Uouter Limit Min	Specification of the outer minimum cut-out value
NL U OL Min TripTime	Specification of the shutdown time of the outer minimum cut-out value
NL Uinner Limit Min	Specification of the inner minimum cut-out value
NL U IL Min TripTime	Specification of the shutdown time of the inner minimum cut-out value
NL Uinner Limit Max	Specification of the inner maximum cut-out value
NL U IL Max TripTime	Specification of the shutdown time of the inner maximum cut-out value
NL Uouter Limit Max	Specification of the outer maximum cut-out value
NL U OL Max TripTime	Specification of the shutdown time of the outer maximum cut-out value

Trip Time Delay

additional configurable switch off delay;
relates to all trip times and increases the trip times by the specified value
0 - 255 [cyl]

Reactive Power Mode

for setting special reactive power parameters

The parameters in this menu item enable the feed-in method of the inverter to be modified.

IMPORTANT! A detailed explanation of the settings can be found in the "Advanced Grid Features" section under Reactive Power Mode.

Selection options

React. P. Mode / Const. Cosφ / Const. Cosφ TimeC. / Const. Q Rel. / Const. Q Rel. TimeC. / Const. Q Abs. / Const. Q Abs. TimeC. / Ch Cosφ (P) *-* / Ch Cosφ (P) TimeC. / Ch Cosφ (P) U-LockIn / Ch Cosφ (P) U-LockOut / Ch Cosφ (P) P-LockOut / Ch Q (U) *-* / Ch Q (U) Initial Delay / Ch Q (U) Offset Factor / Ch Q (U) TimeC. / Ch Q (U) P-LockIn / Ch Q (U) P-LockOut / Ch Q (U) Cosφ Min. / Ch Q (P) *-* / Ch Q (P) TimeC. / Ch Q (P) U-LockIn / Ch Q (P) U-LockOut / Ch Q (P) P-LockOut

- 0-0 / 0-1 / 1-0 / 1-1 / 2-0 / 2-1 / 3-0 / 3-1 respectively

React. P. Mode
for activating / deactivating reactive power mode

Selection options	C. cosφ / C. Qrel / C. Qabs / cosφ/P / Q/U / Q/P / OFF
C. cosφ	Constant cos phi specification
C. Qrel	Constant specification of the relative reactive power in %
C. Qabs	Constant specification of absolute reactive power in VAr
cosφ/P	Cos phi specification depending on effective power
Q/U	Relative reactive power specification depending on current grid voltage
Q/P	Relative reactive power specification depending on effective power
OFF	Reactive power mode deactivated

- first select one of the reactive power modes from the selection options
- then set the parameters in the relevant reactive power mode

The reactive power modes:

Const. Cosφ	Constant cos phi specification Once 'Enter' has been pressed, the value for the cos φ power factor can be set: -0.85 (ind.) - +0.85 (cap.) -- Galvo -0.70 (ind.) - +0.70 (cap.) -- Symo S, Symo M 8k2, Symo Hybrid, Primo 8k2, Primo US 8k2 -0.00 (ind.) - +0.00 (cap.) -- Symo M 20, Primo 15, Eco, Symo US 12, Symo US 24, Symo US (Eco)
Const. Cosφ TimeC.	Time constant at which a new set value of the power factor cos φ is activated
Const. Q Rel.	Constant specification of the relative reactive power in % Once "Enter" has been pressed, the value for the reactive power relative to the nominal apparent power can be set.
Const. Q Rel. TimeC.	Time constant at which a new set value of the relative reactive power is activated
Const. Q Abs.	Constant specification of absolute reactive power in VAr Once "Enter" has been pressed, the value for absolute reactive power can be set from 0 to the max. device output (inductive/ capacitive) in VAr.
Const. Q Abs. TimeC.	Time constant at which a new set value of the absolute reactive power is activated

Ch Cosφ (P) *-*	Cosφ (P) characteristic: Cos phi specification depending on effective power
Ch Cosφ (P) TimeC.	Time constant at which a new set value of the (respective) control is compensated for. - Compensation after ~3x the time constant
Ch Cosφ (P) U-LockIn	Input of a voltage value; when this voltage value is exceeded the Cosφ (P) characteristic is activated. 80 - 120%
Ch Cosφ (P) U-LockOut	Input of a voltage value; when this voltage value is undershot the Cosφ (P) characteristic is deactivated. 80 - 120%
Ch Cosφ (P) P-LockOut	Input of a power value; when this power value is undershot the Cosφ (P) characteristic is deactivated. 0 - 100%
Ch Q (U) *-*	Q (U) characteristic: Relative reactive power specification depending on current grid voltage
Ch Q (U) Initial Delay	Delays the application of the Q (U) control after the values Ch Q (U) 1 - x or 2 - x are undershot/exceeded 0 - 60 s
Ch Q (U) Offset Factor	Moves the Q (U) characteristic along the Q axis by a factor of -1 to +1
Ch Q (U) TimeC.	Time constant at which a new set value of the (respective) control is compensated for. - Compensation after ~3x the time constant
Ch Q (U) P-LockIn	Input of a power value; when this power value is exceeded the Q (U) characteristic is activated. 0 - 100%
Ch Q (U) P-LockOut	Input of a power value; when this power value is undershot the Q (U) characteristic is deactivated. 0 - 100%
Ch Q (U) Cos. φ Min.	Input of a minimum cos phi value at which the inverter may feed in power. 0 - 1.0
Ch Q (P) *-*	Q (P) characteristic: Relative reactive power specification depending on effective power
Ch Q (P) TimeC.	Time constant at which a new set value of the (respective) control is compensated for. - Compensation after ~3x the time constant

Ch Q (P) U-LockIn	Input of a voltage value; when this voltage value is exceeded the Q (P) characteristic is activated. 80 - 120%
Ch Q (P) U-LockOut	Input of a voltage value; when this voltage value is undershot the Q (P) characteristic is deactivated. 80 - 120%
Ch Q (P) P-LockOut	Input of a power value; when this power value is undershot the Q (P) characteristic is deactivated. 0 - 100%

- 0-0 / 0-1 / 1-0 / 1-1 / 2-0 / 2-1 / 3-0 / 3-1 respectively
4 characteristic points 0 / 1 / 2 / 3 with the coordinates 0 (x) and 1 (y)

Freq dep. Power Red

Frequency Dependent Power Reduction
(from grid frequency dependent power reduction)

When the GFDPR function is enabled and the specified grid frequency limit value is exceeded, the effective power is reduced according to a defined gradient.

IMPORTANT! A detailed explanation of the settings can be found in the "Advanced Grid Features" section under GFDPR - Grid frequency-dependent power reduction P(f).

Selection options	GFDPR On/Off / Enable Limit / Initial Delay / Derating Gradient / Change Time Constant / Frequency Test Time / Disable Limit Min. / Disable Limit Max. / Alt. Ret. Grad Thr. / Return Gradient 1 / alt. Return Grad. 1 / Use Return Grad. 2 / Return Gradient 2 /

GFDPR On/Off
Activation or deactivation of function

Selection options	Off / On DisHyst / On
Off	Function deactivated
On DisHyst	Function activated, no hysteresis
On	Function activated, with hysteresis

Enable Limit
for setting the frequency limit value above which power reduction takes place

Initial Delay
Delays the application of the P (f) control after the Enable Limit is exceeded
0 - 60 s

Derating Gradient
for setting the gradient at which the effective power is reduced
0.01 - 100%/Hz

Reference variable	current power at the start of power reduction

Change Time Constant
Time constant at which a new set value of the (respective) control is compensated for.
- Compensation after ~3x the time constant
0 - 60 s

Frequency Test Time
for setting the waiting time after which the inverter will increase the power again (once the power has reduced such that the grid frequency is within the permitted frequency range between Disable Limit Max. and Disable Limit Min.).
0 - 600 s

Disable Limit Min. / Disable Limit Max.
for setting the upper / lower frequency range limit value

Alt. Ret. Grad Thr.
for setting the threshold above which the "Return Gradient 1" or the "Alt. Return Grad. 1" is applied.

e.g.:
If the difference between the nominal output and the current reduced power is less than or equal to the threshold, "Return Gradient 1" is applied.
If the difference between the nominal output and the current reduced power is greater than the threshold, "alt. Return Grad. 1" is applied.
0.01 - 100%

100% means that "Return Gradient 1" is always applied.

Return Gradient 1
for setting the rate of change at which the inverter increases the effective power from the current reduced value to the original value.
0.01 - 100%/s

Reference variable	Device nominal output

alt. Return Grad. 1
for setting the rate of change at which the inverter increases the effective power from the current reduced value to the original value;
is activated if the difference between the nominal output and the current reduced power is greater than the "Alt. Ret. Grad Thr." threshold.
0.01 - 100%/s

Reference variable	Difference between the output at the start of power reduction and the current output

Use Return Grad. 2
for activating/deactivating the rate of change at which the inverter increases the effective power from the original value to the device nominal output.

Selection options	OFF / ON
OFF	the effective power is increased from the original value to the device nominal output in line with "Return Gradient 1"
ON	the effective power is increased from the original value to the device nominal output in line with "Return Gradient 2"

Return Gradient 2
for setting the rate of change at which the inverter increases the effective power from the original value to the device nominal output.
0.01 - 100%/s

Reference variable	Device nominal output

Volt. dep. Power Red

Voltage Dependent Power Reduction
(from grid voltage dependent power reduction)

When the GVDPR function is activated and the specified grid voltage limit value is exceeded, the maximum effective power is reduced.
The power is reduced by a specified gradient according to the phase with the highest voltage.

IMPORTANT! A detailed explanation of the settings can be found in the "Advanced Grid Features" section under GVDPR - Grid voltage-dependent power reduction P(U).

Selection options	GVDPR On/Off / Enable Limit / Derating Gradient / Change Time Constant / Event Message

GVDPR On/Off
Activation or deactivation of function

Selection options	Off / On
Off	Function deactivated
On	Function activated

Enable Limit
for setting the grid voltage limit value above which power reduction takes place
208 - 300 V

Derating Gradient
for setting the gradient at which the effective power is reduced
0.01 - 100%/V

Change Time Constant
for setting a time constant by which the inverter approaches the limitation target
0.01 - 600 s

Event Message
for activating / deactivating event messages

Selection options	OFF / ON

Manual Power Reduction

for manual specification of a max. output power value

Setting range	150 - max. W (kW) dependent on the inverter size

SoftStart

Activation and deactivation of the SoftStart function, setting the gradient for the startup ramp

Selection options	Softstart On/Off / Softstart Gradient

Softstart On/Off
for activating and deactivating the SoftStart function

Off	Function deactivated
On acFlt	Function activated; The SoftStart gradient is only applied in the event of a prior AC error.
On	Function activated; The SoftStart gradient is applied whenever start up is energised.

Softstart Gradient
for setting the startup ramp
0.01 - 100 %/s

Low V Ride Through

"Low Voltage Ride Through"
Function for bridging a grid voltage drop

IMPORTANT! A detailed explanation of the settings can be found in the "Advanced Grid Features" section under LVFRT - Dynamic grid backup during temporary drops in grid voltage.

Selection options	LVFRT On/OFF / DeadBand Low / DeadBand High / LVFRT K-Factor
LVFRT On/OFF	for activating and deactivating the dynamic reactive current feed during a voltage drop
DeadBand Low	for entering the lower limit value for the reactive current feed 0 - 100%
DeadBand High	for entering the upper limit value for the reactive current feed 100 - 200%
LVFRT K-Factor	for entering the K-Factor (= increase in characteristic that defines the reactive current feed during a voltage drop) 0 - 10

DC-Injection

DC-I. InnerLimit Mode
deactivates/activates the lower set limit values for DC injection

Selection options:	OFF / ABSOLUTE / RELATIVE
DC-I I.L. Absolute:	Inner absolute DC injection limit value 0 - 10 A
DC-I I.L. Relative:	Inner relative DC injection limit value based on the device nominal current 0 - 10%
DC-I I.L. TripTime:	Trip time in seconds for violation events when the inner absolute and relative limit value is exceeded 0 - 10 s

DC-I. OuterLimit Mode
deactivates/activates the lower set limit values for DC injection

Selection options:	OFF / ABSOLUTE / RELATIVE
DC-I O.L. Absolute:	Outer absolute DC injection limit value 0 - 10 A
DC-I O.L. Relative:	Outer relative DC injection limit value based on the device nominal current 0 - 10%
DC-I O.L. TripTime:	Trip time in seconds for violation events when the outer absolute and relative limit value is exceeded 0 - 10 s

Ripple Control

The inverter can influence the ripple control signal. The compensation factor can compensate for this influence

Selection options:	Mode / Attenuation
Mode:	The compensation can be activated using Mode
Attenuation:	The ripple control signal attenuation is configured to a default value and can be adjusted when necessary using this value

I(delta gr.)F Compensation	Selection options:	Mode / Udc Link Voltage
	Mode:	Using Mode the intermediate circuit voltage can be increased to reduce unavoidable leakage currents in the event of high module capacities to ground
	Udc Link Voltage:	The intermediate circuit voltage increase is configured to a default value and can be adjusted when necessary using this value

Initial Start Time, Reconnect Time	**Initial Start Time** Grid monitoring time before the inverter is started up in s 1 - 900 s
	Reconnect Time Grid monitoring time before the inverter is started up after a grid fault in s 1 - 900 s

"Advanced Grid Features": Reactive Power Mode

General information about reactive power mode

The country setup entered on the inverter ensures that the relevant operating modes and settings for local standards and guidelines are specified.
However, in some situations it may be worthwhile to adapt the preset country-specific operating modes and settings to the local grid situation.

This will help to ensure more reliable operation of the inverter in the grid, while enabling the inverter to actively support the public grid. For this purpose, the grid voltage and grid frequency must be within defined limits.
The voltage and frequency stability can be actively influenced via the inverter by monitoring the feeding of effective power and reactive power into the grid.

Simply decreasing the effective power in order to reduce high grid voltage levels can reduce the energy generated by the photovoltaic system.
One alternative is to switch the reactive power between the inverter and the grid. Even though the reactive power is not consumed or converted into effective power and simply oscillates between the inverter and the grid, the electricity fed in will increase.

Regardless of the active power and therefore regardless of the energy yield, switching the reactive power can cause the voltage to both rise and to fall:
- In over-excited mode or capacitive mode, reactive power is supplied to the grid. The grid voltage rises.
- In under-excited mode or inductive mode, reactive power is taken from the inverter. The grid voltage falls.

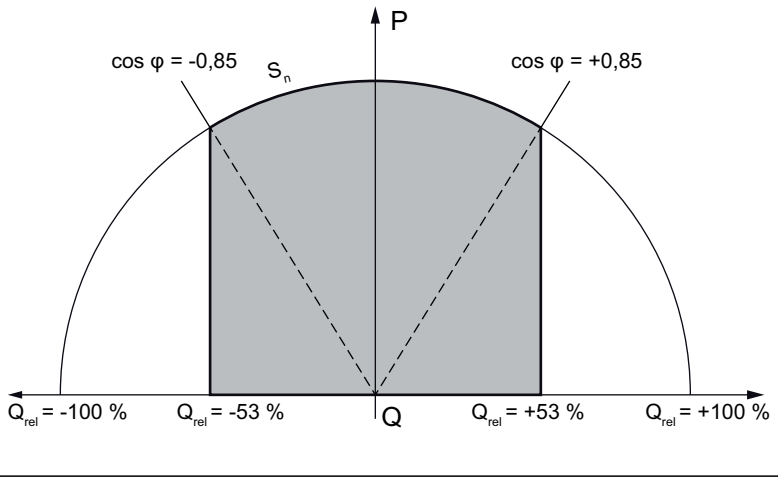
Capacitive mode is shown on the inverter display by a positive sign +.
Inductive mode is shown on the inverter display by a negative sign -.

a	Fronius Galvo	g	Fronius Primo US -15
b	Fronius Symo S	h	Fronius Eco
c	Fronius Symo M -8k2	i	Fronius Symo US -12
d	Fronius Symo M -20	j	Fronius Symo US -24
e	Fronius Symo Hybrid	k	Fronius Symo US (Eco)
f	Fronius Primo -8k2	l	Fronius Primo US -8k2

Potential operating range of the inverter in conjunction with reactive power

Reactive power mode is restricted by the maximum output current (maximum apparent power) as well as by the operational reactive power limits of the inverter:
- cos phi = 0.85, Q_{rel} = 53% [a]
- cos phi = 0.70, Q_{rel} = 71% [b,c,e,f,l]
- cos phi = 0.00, Q_{rel} = 100% [d,g,h,i,j,k]

The figure below shows the potential operating range of the inverter. All valid operating points defined by effective power P and reactive power Q are within the grey area.



Q = reactive power [VAr]
P = effective power [W]
S_n = nominal apparent power [VA]

Example for Fronius Galvo

For example, fixed values or curves can be specified within the operating range that define the reactive power response of the inverter. Reactive power operation is only possible when a DC supply is present.

Overview of reactive power control options

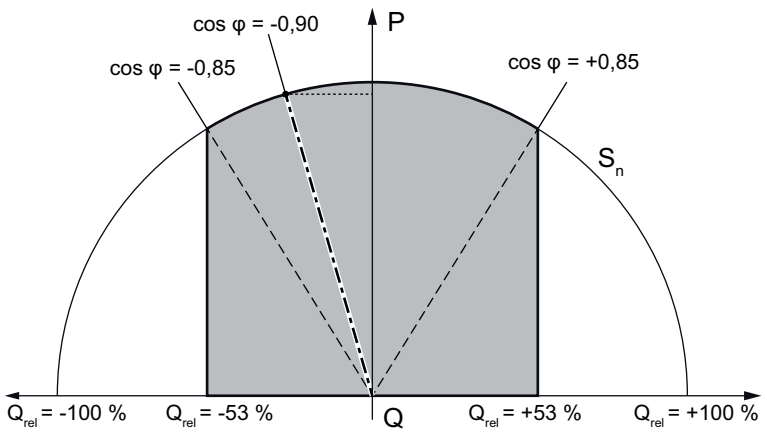
The following options for switching reactive power and for controlling the inverter are available:
- Const. Cos φ
- Const. Q Rel
- Const. Q Abs
- Ch Cos φ(P)
- Ch Q (U)
- Ch Q (P)

Only one reactive power mode can be used at any one time to control the inverter.

Const. Cos φ Constant specification of power factor cos φ

Setting range:
- -0.85 - +0.85 [a]
- -0.70 - +0.70 [b,c,e,f,l]
- -0.00 - +0.00 [d,g,h,i,j,k]

Example:
cos φ = -0.9



Q = reactive power [VAr]
P = effective power [W]
Sn = nominal apparent power [VA]

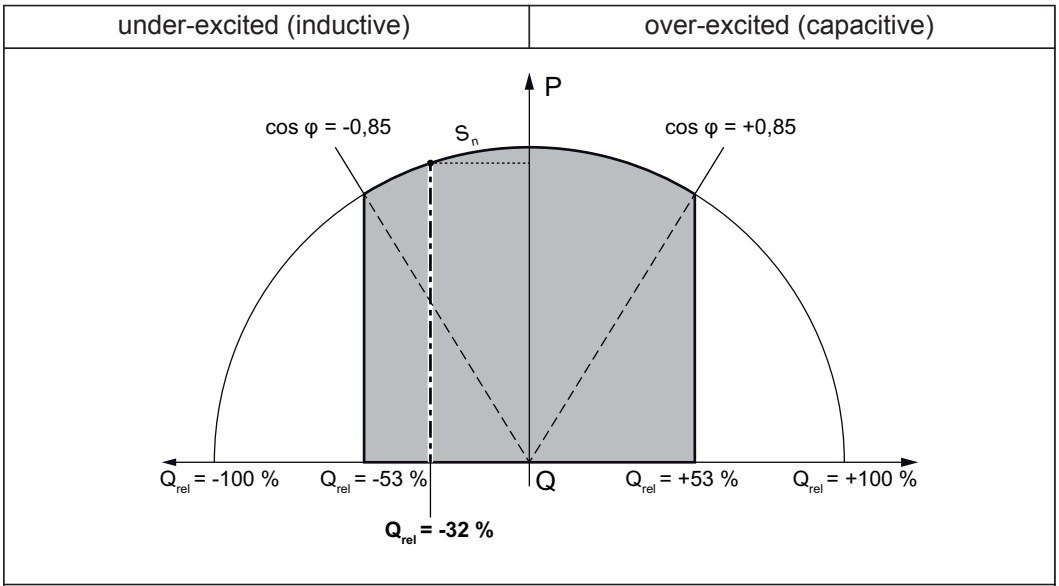
Example for Fronius Galvo

Const. Q Rel

Constant specification for relative reactive power in % in relation to the nominal apparent power of the inverter

Setting range:
- -53 - 0 - +53 [a]
- -71 - 0 - +71 [b,c,e,f,l]
- -100 - 0 - +100 [d,g,h,i,j,k]

Example:
Q_{rel} = -32%



Example for Fronius Galvo

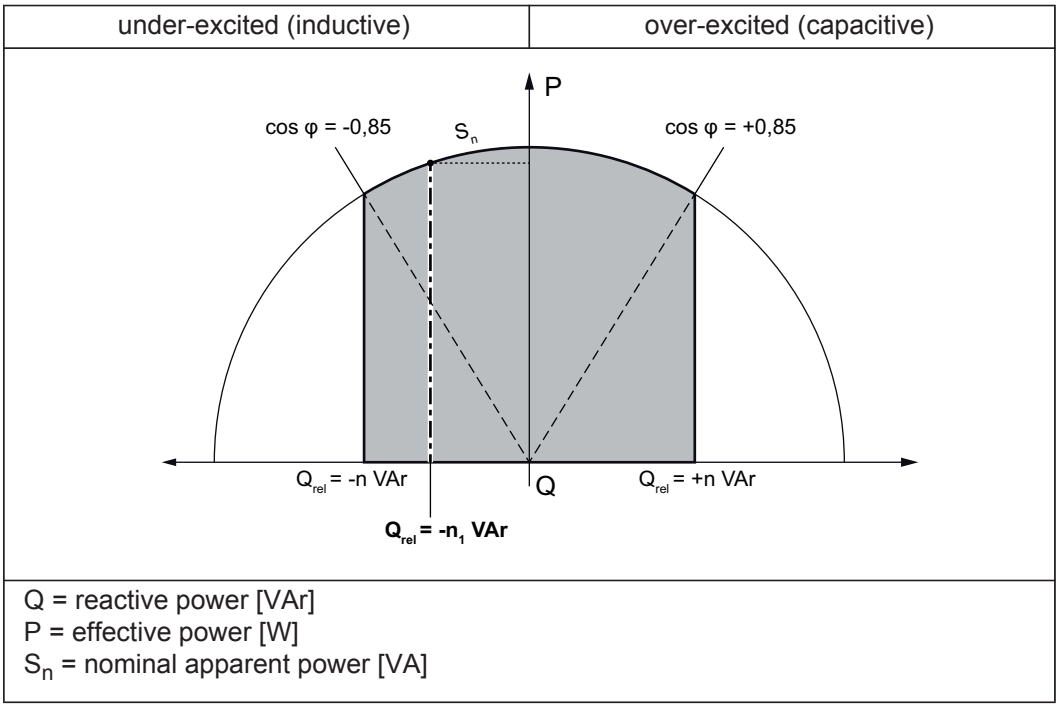
Const. Q Abs

Constant specification of absolute reactive power in VAr

Setting range: -n - 0 - +n [VAr]

n = dependent maximum settable reactive power for the relevant inverter

Example:
$Q_{rel} = -n_1$ VAr



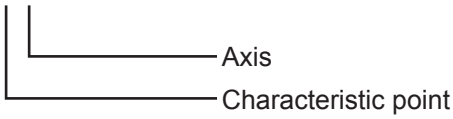
Example for Fronius Galvo

Ch Cos φ (P) Specification of the power factor cos φ depending on effective power P

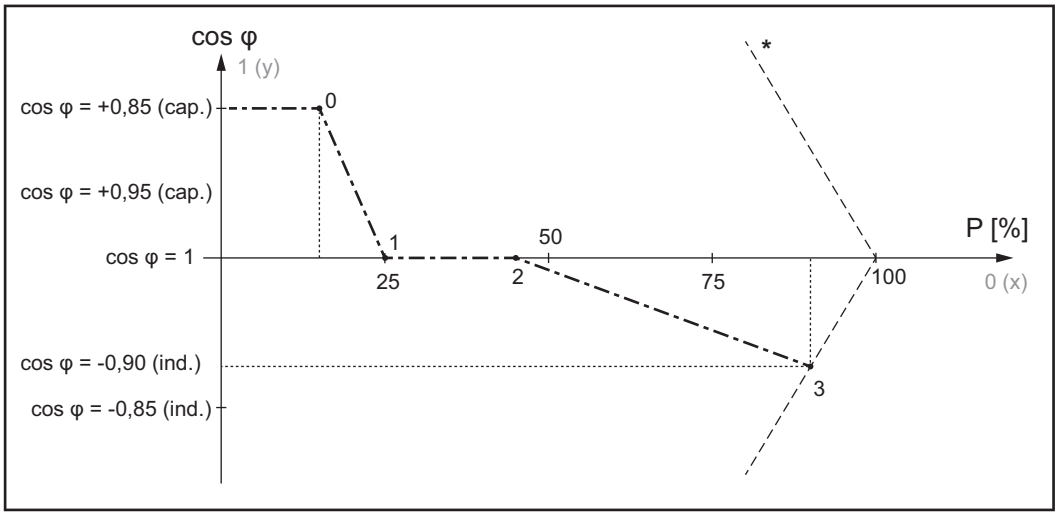
The characteristic is defined by max. 4 characteristic points 0 - 1 - 2 - 3.
The coordinates must be entered for the characteristic points on the 0 (x) axis and on the 1 (y) axis.

- -0,85 - 1 - +0,85 [a]
- -0,70 - 1 - +0,70 [b,c,e,f,l]
- -0,00 - 1 - +0,00 [d,g,h,i,j,k]

Characteristic point	Coordinates	Setting range
0	0-0 (x)	P: 0 - 100 %
	0-1 (y)	cos φ (see table)
1	1-0 (x)	P: 0 - 100 %
	1-1 (y)	cos φ (see table)
2	2-0 (x)	P: 0 - 100 %
	2-1 (y)	cos φ (see table)
3	3-0 (x)	P: 0 - 100 %
	3-1 (y)	cos φ (see table)



Example:
Curve defined by 4 characteristic points
0: P = 15 %, cos φ = +0.85
1: P = 25 %, cos φ = 1
2: P = 45 %, cos φ = 1
3: P = 90 %, cos φ = -0.90



Example for Fronius Galvo

* Apparent power limit

Ch Q (U)

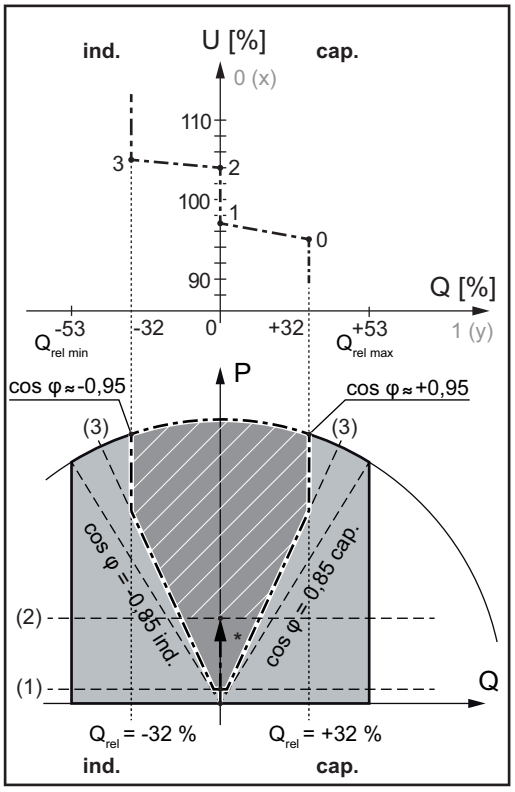
Specification of relative reactive power depending on grid voltage

The characteristic is defined by max. four characteristic points 0 - 1 - 2 - 3.
The coordinates must be entered for the characteristic points on the 0 (x) axis and on the 1 (y) axis.

- -53 - 0 - +53 [a]
- -71 - 0 - +71 [b,c,e,f,l]
- -100 - 0 - +100 [d,g,h,i,j,k]

Characteristic point	Coordinates	Setting range
0	0-0 (x)	U: 80 -120%
	0-1 (y)	Q (see table)
1	1-0 (x)	U: 80 -120%
	1-1 (y)	Q (see table)
2	2-0 (x)	U: 80 -120%
	2-1 (y)	Q (see table)
3	3-0 (x)	U: 80 -120%
	3-1 (y)	Q (see table)

Axis
Characteristic point

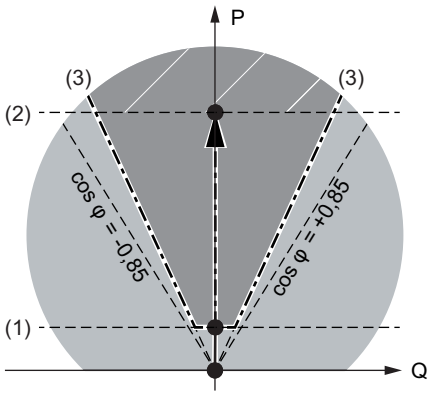


Example for Fronius Galvo

Example:
Characteristic defined by four characteristic points
0: U = 95%, Q = 32%
1: U = 97% Q = 0%
2: U = 104%, Q = 0%
3: U = 105%, Q = -32%

(1) Ch Q (U) P-Lockout = 5%
(2) Ch Q (U) P-Lockin = 30%
(3) Ch Q (U) Cos. φ Min. = 0.9

* Detail:



Ch Q (P)

Specification of relative reactive power depending on effective power

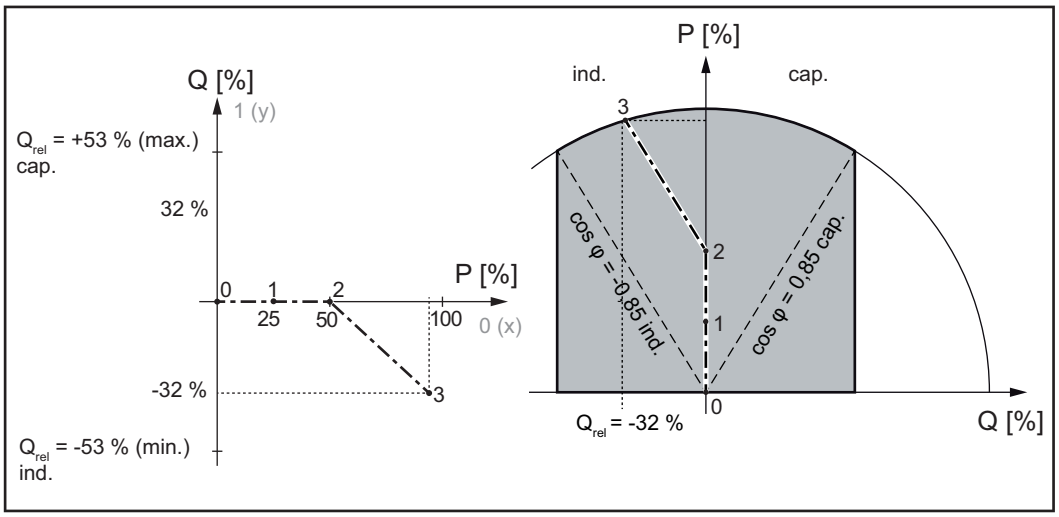
The characteristic is defined by max. 4 characteristic points 0 - 1 - 2 - 3.
The coordinates must be entered for the characteristic points on the 0 (x) axis and on the 1 (y) axis.

- -53 - 0 - +53 [a]
- -71 - 0 - +71 [b,c,e,f,l]
- -100 - 0 - +100 [d,g,h,i,j,k]

Characteristic point	Coordinates	Setting range
0	0-0 (x)	P: 0 -100 %
	0-1 (y)	Q (see table)
1	1-0 (x)	P: 0 -100 %
	1-1 (y)	Q (see table)
2	2-0 (x)	P: 0 -100 %
	2-1 (y)	Q (see table)
3	3-0 (x)	P: 0 -100 %
	3-1 (y)	Q (see table)

Axis
Characteristic point

Example:
Characteristic defined by 4 characteristic points
0: P = 0 %, Q = 0 %
1: P = 25 %, Q = 0 %
2: P = 50 %, Q = 0 %
3: P = 95 %, Q = -32 %



Example for Fronius Galvo

Lock-In / Lock-Out for characteristic operating mode

The characteristic operating mode for switching reactive power can also be enabled or disabled using the Lock-In / Lock-Out parameters.

If a defined starting threshold is exceeded (Lock-In), the characteristic operating mode is enabled and the inverter feeds in reactive power according to the relevant characteristic.
If a defined starting threshold is undershot (Lock-Out), the characteristic operating mode is disabled regardless of whether another parameter has exceeded or is about to exceed the Lock-In threshold. Lock-Out takes priority over Lock-In.
When the characteristic operating mode is disabled, reactive power is no longer fed into the grid.

"Advanced Grid Features": GFDPR - Grid frequency-dependent power reduction P(f)

GFDPR - Function description

GFDPR = Grid Frequency Dependent Power Reduction

When the GFDPR function is enabled and the defined grid frequency limit value is exceeded, the effective power is reduced according to a defined gradient.
Once the grid frequency falls within the permitted frequency range again following successful power reduction, return to full power takes place depending on the country setup as follows:

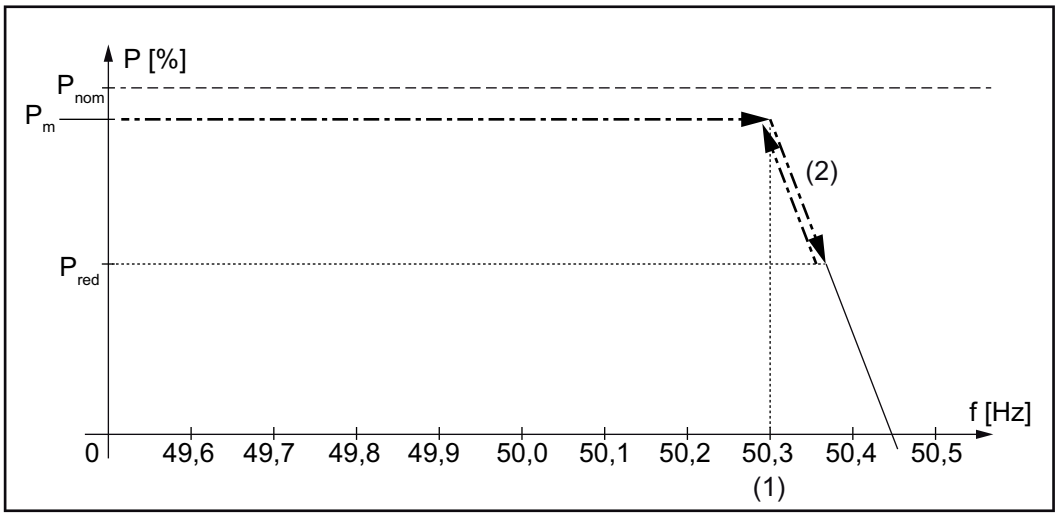
- GFDPR ON DisHyst mode
  The inverter increases the power from the current reduced value to the original value in accordance with the same gradient used for power reduction.
- GFDPR ON mode
  The inverter will not increase the power to the original value until the frequency is in the command value range for a specific length of time.

GFDPR - Application example On DisHyst

GFDPR ON/OFF = On DisHyst

(1) Enable Limit = 50.3 Hz
(2) Derating Gradient = 84 %/Hz

P_{nom} Nominal output
P_m Actual power at the moment the limit value is exceeded
P_{red} Reduced power

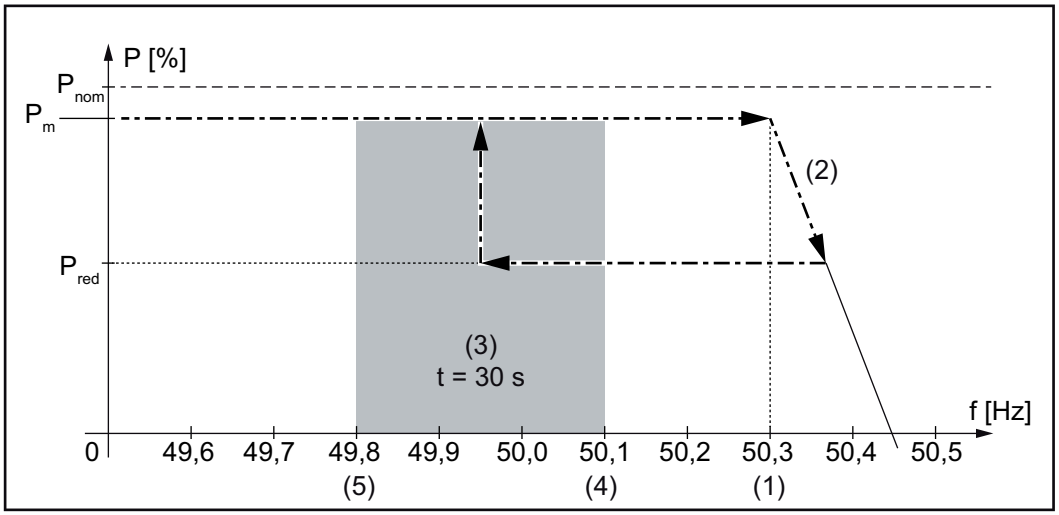


GFDPR - Application example On

GFDPR ON/OFF = On

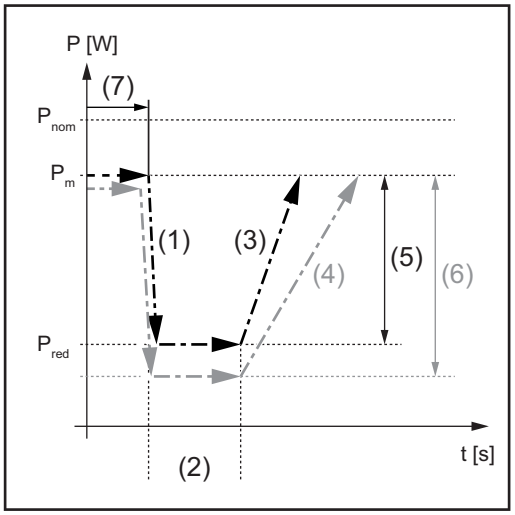
(1) Enable Limit = 50.3 Hz
(2) Derating Gradient = 84 %/Hz
(3) Frequency Test Time = 30 s
(4) Disable Limit Max. = 50.1 Hz
(5) Disable Limit Min = 49.8 Hz

P_{nom} Nominal output
P_m Actual power at the moment the limit value is exceeded
P_{red} Reduced power



GFDPR - Application example with "alt. Return Grad. 1" and "Alt. Ret. Grad Thr."

Example:
Alt. Ret. Grad Thr. = 25 %



P_{nom} Nominal output
P_m Actual power at the moment the limit value is exceeded
P_{red} Reduced power

(1) Derating Gradient
(2) Frequency Test Time
(3) Return Gradient 1
(4) alt. Return Grad. 1
(5) Alt. Ret. Grad Thr. $P_m - P_{red}$ </= 25 %
(6) Alt. Ret. Grad Thr. $P_m - P_{red}$ > 25 %
(7) Initial Delay

At P_{red} the grid frequency returns to the permissible range.
After the end of the delay time (2) specified by the standard, the power is increased by one of the following gradients to the output value P_m:

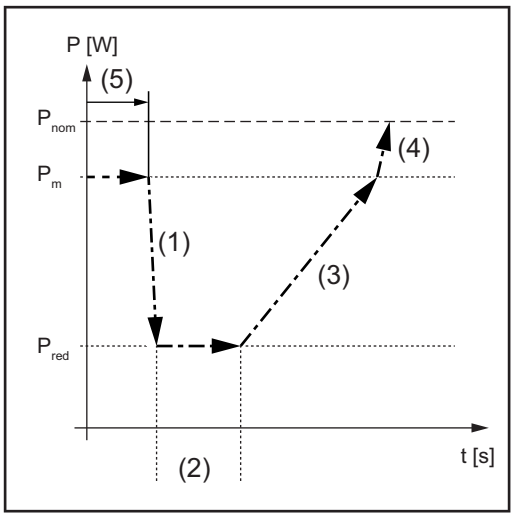
Curve 1 - black

The difference between the current power P_m and the reduced power P_{red} is less than or equal to the value entered for "Alt. Ret. Grad Thr." of 25 % (5).
This increases the power by the nominal output related gradient "Return Gradient 1" (3) to the output value P_m.

Curve 2 - grey

The difference between the current power P_m and the reduced power P_{red} is greater than the value entered for "Alt. Ret. Grad Thr." of 25 % (5).
This increases the power by the alternative difference power related gradient "alt. Return Grad. 1" (4) to the output value P_m.

GFDPR - Application example with "Return Gradient 2"



P_{nom}	Nominal output
P_m	Actual power
P_{red}	Reduced power

(1)	Derating Gradient
(2)	Frequency Test Time
(3)	Return Gradient 1
(4)	Return Gradient 2
(5)	Initial Delay

Settings:
Use Return Grad. 2 = 1
Return Gradient 2 = n %/s

n to value

At P_{red} the grid frequency returns to the permissible range.
After the end of the delay time (2) specified by the standard, the power is increased by one of the nominal output related gradients (3) to the output value P_m.
The power is then increased by one of the other nominal output related gradients (4) to the device nominal output P_{nom}.

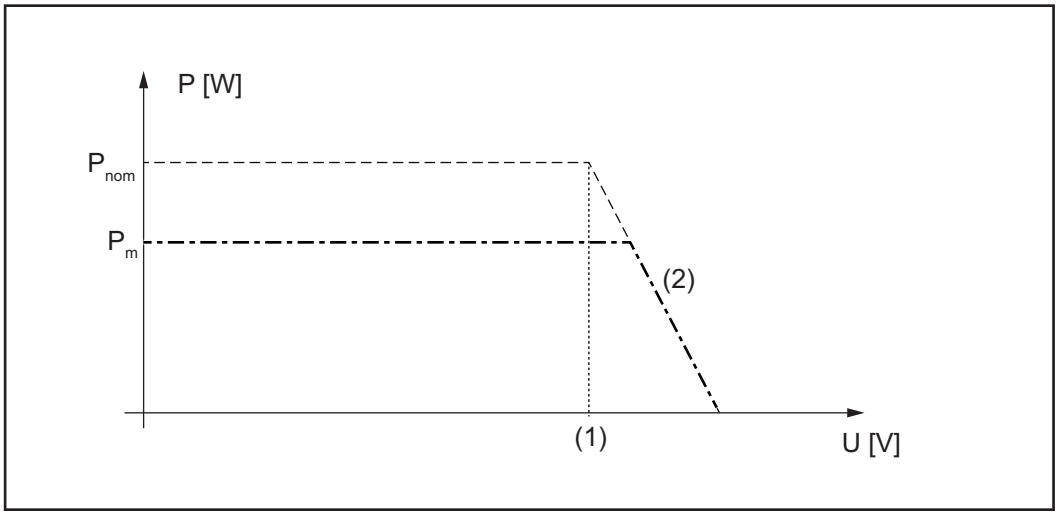
"Advanced Grid Features": GVDPR - Grid voltage-dependent power reduction P(U)

GVDPR - Function description

GVDPR = Gradual Voltage Dependent Power Reduction

To largely prevent the inverter being switched off when the grid voltage is too high due to the requirements of various standards and directives, the GVDPR function can be used to slightly reduce the feed-in power in accordance with the highest phase voltage. This makes the yield losses less than they would be if the inverter was completely switched off.

(1)	Enable Limit [V]	P_{nom}	Nominal output
(2)	Derating Gradient [%/V]	P_m	Actual power at the moment the limit value is exceeded



Power waveshape as a function of grid voltage

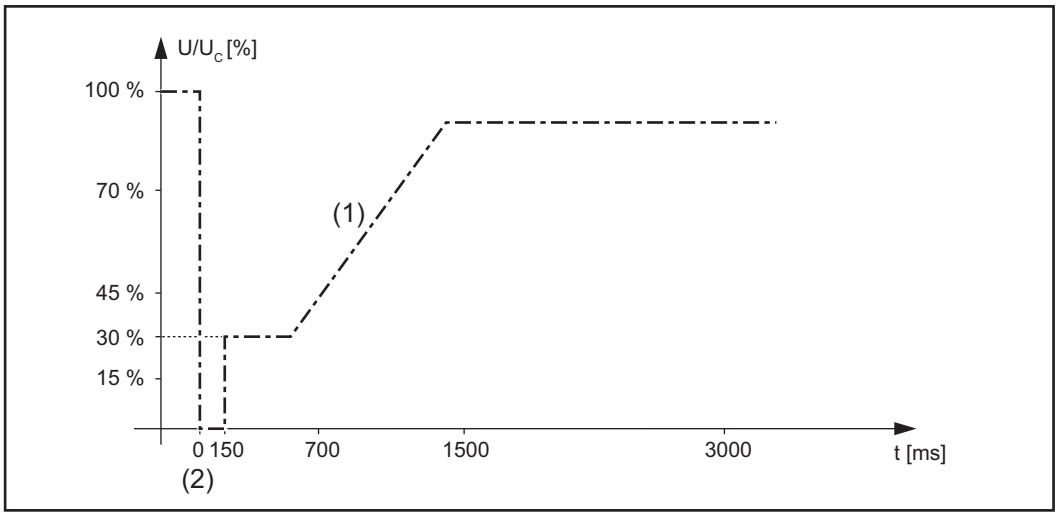
"Advanced Grid Features": LVFRT - Dynamic grid backup during temporary drops in grid voltage

LVFRT - Function description

LVFRT = Low Voltage Fault Ride Through
(dynamic grid backup during drops in grid voltage in the high voltage and highest voltage grid in order to prevent an undesirable shutdown of the feed-in power and the collapse of the system)

When the LVFRT function is enabled, the inverter supports the grid in the event of a voltage drop for a defined period (e.g. up to 1500 ms).
Rather than disconnecting from the grid and having to wait for the defined reconnection time, the inverter remains active following the grid problem and continues to feed in the full power.
If required by the energy supply company, the inverter has to feed in a defined reactive current during the voltage drop.

Example:
Voltage drop up to 0 % lasting for </= 150 ms
(2) = Time at which failure occurs



Example for LVFRT - Voltage waveshape limiting curves

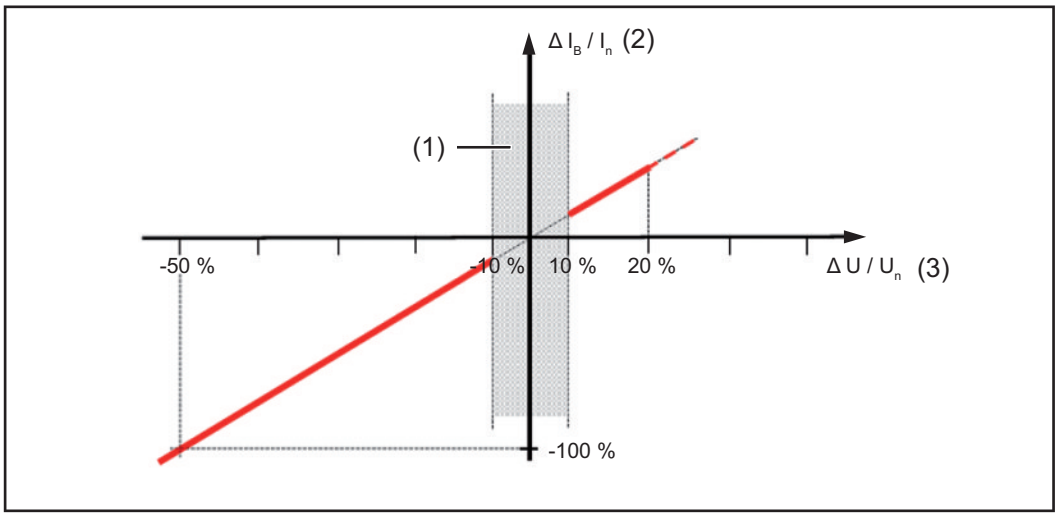
- If the voltage is above the limit line (1), the inverter may not switch off.
  If a short circuit current could be fed in during a voltage drop, the grid operator must be consulted.
- If the voltage is below the limit line (1), the inverter can be disconnected from the grid.
  The inverter is always safely disconnected from the grid according to the set trip values for the inner and outer voltage limit values.

When the LVFRT function is disabled, the inverter feed-in none dynamic reactive current if the voltage drops rapidly.

LVFRT - K-Factor

The K-Factor and the upper and lower voltage limits define the voltage level at which feeding in of reactive power is activated and also how high this current value should be. When K-Factor = 0 the inverter does not feed reactive current into the grid in the event of a voltage drop.

The K-Factor can be determined from the following graph:



Un	Nominal voltage
U_0	Voltage before the failure
U	Current voltage (during the failure)
I_n	Nominal current
I_{B0}	Reactive current before the failure
I_B	Reactive current

$\Delta U = U - U_0$; $\Delta I_B = I_B - I_0$

(1)	Deadband
(2)	Required additional reactive current
(3)	Voltage drop or voltage rise

Reactive current droop:

$$k = \frac{\Delta I_B / I_n}{\Delta U / U_n}$$

Typical example for set values from the graph:
U_{max} = 110 %
U_{min} = 90 %
k = 2.0

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