Application Note

Setting Grid Parameters for coolcept fleX and coolcept³ fleX Inverters

Table of Contents

1. Introduction 2
2. Germany – Country Code 4901 – D AR4105:2019 3
3. Austria – Country Code 4302 – TOR ERZEUGER 4
4. Country Code 50549 – EN 50549:2019 6
5. Italy – Country Code 3911 – Italia locale und 3912 – Italia esterno 9
6. Belgium – Country Code 3204 – Belgique C10/11 ed2.1 10
7. Denmark – Country Code 4500 – Danmark DK1 TR V1.2 und 4501 – Danmark DK2 TR V1.2 12
8. Australia – Country Code 6101 – Australia 13

1. Introduction

During the initial commissioning of inverters of the Brand Steca coolcept flex and coolcept³ flex the inverter and the interface protection and automatic disconnection device are being configured with the default settings requested by relevant standards based on the Country code chosen.

Due to local grid conditions at the point of connection the grid operator may demand changing those parameters.

Parameters can be changed

- after the initial commissioning and before the DC disconnector is switched into the ON position: under "Settings"->"Service"->"All Parameters" (protected by password)

by a qualified specialist.

This document provides a list of changeable settings and their corresponding parameter for each country code.

Please be aware:

The installation and commissioning instructions in the manual of Steca inverters are not being replaced by the information in this document.

Changing settings without explicit specification by the grid operator may affect conformity with relevant standards and regulations.

For changes in the password protected settings menu the qualified specialist is asked to contact the technical support of Steca/KATEK (customerservice@stecasolar.com) or one of the local service partners.

Legally required parameters can be changed in the service menus. Any change may have a negative effect on the performance of the inverter and possibly even break a law.

- Only specialists that can ensure that changes do not violate any applicable regulations and standards are allowed to perform any changes on the parameters of the service menus.

2. Germany – Country Code 4901 – D AR4105:2019

2.1 Configuration of the automatic disconnection device

Tripping thresholds of the automatic disconnection device can be configured with the following parameters.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
7	U UpAve	Voltage rise protection U>	110	%

2.2 Response to a change in frequency/ P(f) characteristics

The response to a change in frequency (P(f)) can be adjusted with the following parameters.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
20	F Derate	P(f) overfrequency threshold	50,2	Hz
26	F GradReduc	Gradient of P(f)	40	%/Hz

2.3 Response to a change in voltage/ P(U) characteristics

Overvoltage based reduction in active power production can be activated with the following parameter.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
65	P(U) type	P(U) Enabling: 0 = disabled 1 = enabled	0	

2.4 Additional reactive power settings

The configuration of reactive power characteristics is done during the initial commissioning or in the service menu in the submenu "Reactive power".

2.5 Additional settings

The maximum power produced by the inverter – e.g. for the 70% limitation – can be limited by the following parameter.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
39	P UserLimit	Power Limit of the inverter	Nominal Power	W

3. Austria – Country Code 4302 – TOR ERZEUGER

3.1 Configuration of the automatic disconnection device

Voltage and frequency tripping thresholds of the automatic disconnection device can be configured with the following parameters. Ueff> is implemented as a 10 minute average, therefor the tripping delay is not applicable

ID	Parameter	Nomenclature in the standard	Default Value	Unit
3	U 1UpLimit	Overvoltage Ueff>>	115	%
4	U 1UpTime	Overvoltage Ueff>> tripping delay	0,1	s
7	U UpAve	Overvoltage Ueff>	111	%
	n/a	Overvoltage Ueff> tripping delay		s
88	U UpperRR	Overvoltage relapse ratio	95	%
51	U 2LoLimit	Undervoltage Ueff<<	25	%
52	U 2LoTime	Undervoltage Ueff<< tripping delay	0,5	s
1	U 1LoLimit	Undervoltage Ueff<	80	%
2	U 1LoTime	Undervoltage Ueff< tripping delay	1,5	s
89	U LowerRR	Undervoltage relapse ratio	105	%
12	F 1LoLimit	Underfrequency	47,5	Hz
13	F 1LoTime	Underfrequency tripping delay	0,1	s
14	F 1UpLimit	Overfrequency	51,5	Hz
15	F 1UpTime	Overfrequency tripping delay	0,1	s

3.2 Response to a change in frequency/ P(f) characteristics / LFSM-O

The droop of the LFSM-O mode is adjusted as a gradient. The gradient can be calculated with the following formula. Percentages have to be converted, e.g. a droop of 5 % has to be written as 0,05. The gradient has to be converted as well, e.g. 0,4 1/Hz is equivalent to 40 %/Hz

$$gradient = \frac{1}{50\ \text{Hz} \cdot droop}$$

The delay can be deactivated by setting a negative value

ID	Parameter	Nomenclature in the standard	Default Value	Unit
20	F Derate	Frequency threshold of the LFSM-O	50,2	Hz
26	F GradReduc	Droop of the LFSM-O	40	%/Hz
64	F ActDelay	Activation delay	-10	ms

3.3 Response to a change in voltage/ P(U) characteristics

The response of the inverter to a change in voltage can be configured with the following parameters. No artificial delay is implemented.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
65	P(U) type	Method of power reduction 0 = disabled 1 = method a) 2 = method b)	1	
66	P(U)+Uentry	Breakpoint of P(U) curve UKnick (setpoint a)	110	%
67	P(U)+Uend	UGrenz of P(U) curve (setpoint b)	112	%
76	P(U) CRTime	Dynamic of the P(U)-control	5	s

3.4 Additional reactive power settings

The configuration of reactive power characteristics is done during the initial commissioning or in the service menu in the submenu "Reactive power".

3.5 Additional settings

Watiting time and gradient of the soft ramp up of the inverter after starting or reconnecting can be set by the following parameters

ID	Parameter	Nomenclature in the standard	Default Value	Unit
24	Recon Time	Waiting time after reconnecting	300	s
25	Recon Grad	Gradient of power increase after reconnecting	10	%/min
92	T Standard	Waiting time after starting	60	s

Disconnection because of a rate of change in frequency may be required by the grid operator. It can be configured with the following parameters.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
31	F Rocof	Change of frequency per interval	0	Hz
32	T Rocof	Interval length	1	s

4. Country Code 50549 – EN 50549:2019

4.1 Configuration of the automatic disconnection device

Voltage and frequency tripping thresholds of the automatic disconnection device can be configured with the following parameters.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
1	U 1LoLimit	Undervoltage threshold stage 1 [27<]	85	%
2	U 1LoTime	Undervoltage operate time stage 1 [27<]	1,5	s
51	U 2LoLimit	Undervoltage threshold stage 2 [27<<]	0	%
52	U 2LoTime	Undervoltage operate time stage 2 [27<<]	0	s
3	U 1UpLimit	Overvoltage threshold stage 1 [59>]	115	%
4	U 1UpTime	Overvoltage operate time stage 1 [59>]	5	s
49	U 2UpLimit	Overvoltage threshold stage 2 [59>>]	120	%
50	U 2UpTime	Overvoltage operate time stage 2 [59>>]	0,2	s
7	U UpAve	Threshold overvoltage 10 min mean protection	110	%
12	F 1LoLimit	Underfrequency threshold stage 1 [81<]	47,5	Hz
13	F 1LoTime	Underfrequency operate time stage 1 [81<]	0,5	s
55	F 2LoLimit	Underfrequency threshold stage 2 [81<<]	0	Hz
56	F 2LoTime	Underfreuqency operate time stage 2 [81<<]	0	s
16	F PLoLimit	Underfrequency threshold narrow frequency band	0	Hz
17	F PLoTime	Underfrequency operate time narrow frequency band	0	s
14	F 1UpLimit	Overfrequency threshold stage 1 [81>]	52	Hz
15	F 1UpTime	Overfrequency operate time stage 1 [81>]	0,5	s
53	F 2UpLimit	Overfrequency threshold stage 2 [81>>]	0	Hz
54	F 2UpTime	Overfrequency operate time stage 2 [81>>]	0	s
18	F PUpLimit	Overfrequency threshold narrow frequency band	0	Hz
19	F PUpTime	Overfrequency operate time narrow frequency band	0	s

4.2 Response to a change in frequency/ P(f) characteristics

The droop of the LFSM-O mode is adjusted as a gradient. The gradient can be calculated with the following formula. Percentages have to be converted, e.g. a droop of 5 % has to be written as 0,05. The gradient has to be converted as well, e.g. 0,4 1/Hz is equivalent to 40 %/Hz

$$gradient = \frac{1}{50\ \text{Hz} \cdot droop}$$

The delay can be deactivated by setting a negative value.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
20	F Derate	Overfrequency Threshold frequency f_1	50,2	Hz
26	F GradReduc	Overfrequency droop	40	%/Hz
64	F ActDelay	Overfrequency Intentional Delay Underfrequency Intentional Delay	-10	ms
62	F ExitRecon	Overfrequency Deactivation threshold f_stop	50,2	Hz
28	F ExitDelay	Overfrequency deactivation time t_stop	30	s
27	F BackGrad	Overfrequency mode: 0: Deactivation Threshold disabled 1: Deactivation Threshold enabled	0	
70	P(F)-Limit	Underfrequency Threshold frequency f_1	49,8	Hz
86	P(f)-Grad	Underfrequency droop	40	%/Hz

4.3 Response to a change in voltage/ P(U) characteristics

Overvoltage based reduction in active power production can be activated with the following parameter.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
65	P(U) type	P(U) Enabling: 0 = disabled 1 = enabled	0	

4.4 Additional reactive power settings

The configuration of reactive power characteristics is done during the initial commissioning or in the service menu in the submenu "Reactive power". Additionally the following parameters can be configured under "All Parameters"

ID	Parameter	Nomenclature in the standard	Default Value	Unit
87	CosPhiLimit	Minimal cos Phi for Q(U)	0,35	
45	Q P_LockIn	Lock in power for Q(U)	0	%
46	Q P_LockOut	Lock out power for Q(U)	0	%

4.5 Additional settings

"Highvoltage Fault Ride Through" and "Lowvoltage Fault Ride Through" can be configured with the following parameters

ID	Parameter	Nomenclature in the standard	Default Value	Unit
84	U Hvfrt	Static voltage range overvoltage	120	%
85	U Lvfrt	Static voltage range undervoltage	50	%

Watiting time and gradient of the soft ramp up of the inverter after starting or reconnecting can be set by the following parameters. If parameters are used for both situations they have to be set to the stricter requirement.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
21	F LoRecon	Reconnecting – Lower frequency Starting – Lower frequency	49,5	Hz
22	F UpRecon	Reconnecting – Upper frequency Starting – Upper frequency	50,1	Hz
9	U LoRecon	Reconnecting – Lower voltage Starting – Lower voltage	85	%
10	U UpRecon	Reconnecting – Upper voltage Starting – Upper voltage	110	%
24	Recon Time	Reconnecting – observation time	60	s
25	Recon Grad	Reconnecting – Active power increase gradient	10	%/min
92	T Standard	Starting – observation time	60	s
83	StartupGrad	Starting – Active power increase gradient	100	%/min

5. Italy – Country Code 3911 – Italia locale und 3912 – Italia esterno

5.1 Response to a change in frequency/ P(f) characteristics

The droop of the LFSM-O mode is adjusted as a gradient. The gradient can be calculated with the following formula. Percentages have to be converted, e.g. a droop of 2,6 % has to be written as 0,026. The gradient has to be converted as well, e.g. 0,77 1/Hz is equivalent to 77 %/Hz

$$gradient = \frac{1}{50\ \mathrm{Hz} \cdot droop}$$

The delay can be deactivated by setting a negative value

ID	Parameter	Nomenclature in the standard	Default Value	Unit
26	F GradReduc	Overfrequency droop	77	%/Hz
64	F ActDelay	Overfrequency Intentional Delay	-10	ms

5.2 Response to a change in voltage/ P(U) characteristics

Voltage based active power reduction is activated by default.

5.3 Additional reactive power settings

The configuration of reactive power characteristics is done during the initial commissioning or in the service menu in the submenu "Reactive power". Additionally the following parameters can be configured under "All Parameters"

ID	Parameter	Nomenclature in the standard	Default Value	Unit
42	Q U_LockIn	Lock In Voltage Q(P)	105	%
43	Q U_LockOut	Lock Out Voltage Q(P)	100	%
45	Q P_LockIn	Lock in power for Q(U)	20	%
96	QU actDelay	Q(U) activation delay	0	s

5.4 Additional settings

Waiting time and gradient of the soft ramp up of the inverter after starting or reconnecting can be set by the following parameters. If parameters are used for both situations they have to be set to the more strict requirement

ID	Parameter	Nomenclature in the standard	Default Value	Unit
21	F LoRecon	Reconnecting – Lower frequency Starting – Lower frequency	49,9	Hz
22	F UpRecon	Reconnecting – Upper frequency Starting – Upper frequency	50,1	Hz
24	Recon Time	Reconnecting – observation time	300	s
92	T Standard	Starting – observation time	30	s

6. Belgium – Country Code 3204 – Belgique C10/11 ed2.1

6.1 Configuration of the automatic disconnection device

Voltage and frequency tripping thresholds of the automatic disconnection device can be configured with the following parameters. Tripping delay do include the intrinsic delay of the disconnection device.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
1	U 1LoLimit	Undervoltage trip setting	80	%
2	U 1LoTime	Undervoltage trip delay	0,2	s
3	U 1UpLimit	Overvoltage trip setting	115	%
4	U 1UpTime	Overvoltage trip delay	0,2	s
7	U UpAve	Overvoltage 10 min mean trip setting	110	%
12	F 1LoLimit	Underfrequency trip setting	47,5	Hz
13	F 1LoTime	Underfrequency trip delay	0,2	s
14	F 1UpLimit	Overfrequency trip setting	51,5	Hz
15	F 1UpTime	Overfrequency trip delay	0,2	s

6.2 Response to a change in frequency/ P(f) characteristics

The droop of the LFSM-O mode is adjusted as a gradient. The gradient can be calculated with the following formula. Percentages have to be converted, e.g. a droop of 5 % has to be written as 0,05. The gradient has to be converted as well, e.g. 0,4 1/Hz is equivalent to 40 %/Hz

$$gradient = \frac{1}{50\ \mathrm{Hz} \cdot droop}$$

The delay can be deactivated by setting a negative value

ID	Parameter	Nomenclature in the standard	Default Value	Unit
20	F Derate	Overfrequency Threshold frequency f_1	50,2	Hz
26	F GradReduc	Overfrequency droop	40	%/Hz
64	F ActDelay	Overfrequency Intentional Delay Underfrequency Intentional Delay	-10	ms
62	F ExitRecon	Overfrequency Deactivation threshold f_stop	50,2	Hz
28	F ExitDelay	Overfrequency deactivation time t_stop	30	s
27	F BackGrad	Overfrequency mode: 0: Deactivation Threshold disabled 1: Deactivation Threshold enabled	0	
70	P(F)-Limit	Underfrequency Threshold frequency f_1	49,8	Hz
86	P(f)-Grad	Underfrequency droop	0	%/Hz

6.3 Response to a change in voltage/ P(U) characteristics

Overvoltage based reduction in active power production can be activated with the following parameter.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
65	P(U) type	P(U) Enabling: 0 = deactivated 1 = activated	0	

6.4 Additional reactive power settings

The configuration of reactive power characteristics is done during the initial commissioning or in the service menu in the submenu "Reactive power". Additionally the following parameters can be configured under "All Parameters"

ID	Parameter	Nomenclature in the standard	Default Value	Unit
87	CosPhiLimit	Minimal cos Phi for Q(U)	0,35	
45	Q P_LockIn	Lock in power for Q(U)	0	%
46	Q P_LockOut	Lock out power for Q(U)	0	%

6.5 Additional settings

Watiting time and gradient of the soft ramp up of the inverter after starting or reconnecting can be set by the following parameters. If parameters are used for both situations they have to be set to the more strict requirement

ID	Parameter	Nomenclature in the standard	Default Value	Unit
21	F LoRecon	Reconnecting – Lower frequency Starting – Lower frequency	49,5	Hz
22	F UpRecon	Reconnecting – Upper frequency Starting – Upper frequency	50,1	Hz
9	U LoRecon	Reconnecting – Lower voltage Starting – Lower voltage	85	%
10	U UpRecon	Reconnecting – Upper voltage Starting – Upper voltage	110	%
24	Recon Time	Reconnecting – observation time	60	s
25	Recon Grad	Reconnecting – Active power increase gradient	10	%/min
92	T Standard	Starting – observation time	60	s
83	StartupGrad	Starting – Active power increase gradient	20	%/min

7. Denmark – Country Code 4500 – Danmark DK1 TR V1.2 und 4501 – Danmark DK2 TR V1.2

7.1 Configuration of the automatic disconnection device

Voltage and frequency tripping thresholds of the automatic disconnection device can be configured with the following parameters.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
1	U 1LoLimit	Undervoltage step 1 U< - Setting	85	%
2	U 1LoTime	Undervoltage step 1 U< - Trip Time	50	s
51	U 2LoLimit	Undervoltage step 2 U<< - Setting	80	%
52	U 2LoTime	Undervoltage step 2 U<< - Trip Time	0,2	s
3	U 1UpLimit	Overvoltage step 1 U> - Setting	110	%
4	U 1UpTime	Overvoltage step 1 U> - Trip Time	60	s
49	U 2UpLimit	Overvoltage step 2 U>> - Setting	115	%
50	U 2UpTime	Overvoltage step 2 U>> - Trip Time	0,2	s
12	F 1LoLimit	Underfrequency f< - Setting	47,5	Hz
13	F 1LoTime	Underfrequency f< - Trip Time	0,2	s
14	F 1UpLimit	Overfrequency f> - Setting	51,5	Hz
15	F 1UpTime	Overfrequency f> - Trip Time	0,2	s

7.2 Response to a change in frequency/ P(f) characteristics

The droop of the LFSM-O mode is adjusted as a gradient. The gradient can be calculated with the following formula. Percentages have to be converted, e.g. a droop of 5 % has to be written as 0,05. The gradient has to be converted as well, e.g. 0,4 1/Hz is equivalent to 40 %/Hz

$$gradient = \frac{1}{50\ \text{Hz} \cdot droop}$$

ID	Parameter	Nomenclature in the standard	Default Value	Unit
20	F Derate	frequency threshold f_RO LFSM-O	DK1: 50,2 DK2: 50,5	Hz
26	F GradReduc	droop of active power reduction LFSM-O	DK1: 40 DK2: 50	%/Hz

7.3 Additional reactive power settings

The configuration of reactive power characteristics is done during the initial commissioning or in the service menu in the submenu “Reactive power”.

7.4 Additional settings

Disconnection because of a rate of change in frequency can be configured with the following parameters.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
31	F Rocof	Rate of change of frequency per second	2,5	Hz

8. Australia – Country Code 6101 – Australia

8.1 Voltage Disconnection Limits

The automatic disconnection of the inverter based on average voltage for a 10 minute period can be configured with the parameter

ID	Parameter	Nomenclature in the standard	Default Value	Unit
7	U UpAve	Average voltage Vnom_max over 10 minute period	106,2	%

8.2 Response to an increase in frequency

The response to an overfrequency can be configured with the following parameter

ID	Parameter	Nomenclature in the standard	Default Value	Unit
91	P(f)+F-Stop	f stop	52	Hz

8.3 Power derating for voltage variation / Volt-Watt response mode

The Volt-Watt response mode is enabled by default. The reference values can be set by the following parameters.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
66	P(U)+Uentry	Volt-watt response V3	110	%
67	P(U)+Uend	Voltage where P=0W. Calculated with V_3 and V_4 and their corresponding power levels p_{V3} and p_{V4} $$V_{0W} = \frac{p_{V4}V_3 - p_{V3}V_4}{p_{V4} - p_{V3}}$$	112	%

8.4 Additional reactive power settings

The configuration of reactive power characteristics is done during the initial commissioning or in the service menu in the submenu "Reactive power". Reactive power regulation for voltage variation (Volt-VAr mode) can be set by choosing "Q(U) lin".

8.5 Additional settings

The soft ramp up of the inverter after connecting or reconnecting can be set by the following parameters

ID	Parameter	Nomenclature in the standard	Default Value	Unit
25	Recon Grad	Gradient of power rate limit W_{Gra} reconnecting after tripping the disconnection device	16,67	%/min
83	StartupGrad	Gradient of power rate limit W_{Gra} after connecting	16,67	%/min

The Demand Response Mode can be enabled with the following parameter. For details regarding the required electrical connection please consider the corresponding document.

ID	Parameter	Nomenclature in the standard	Default Value	Unit
48	RapidShut	Shutdown enabling 0 = disabled 2 = DRM0 activated	0	