

Flexi | X

Specification and functionalities

Supported Concycle® systems:

CW150xRP8.x / CW200xRP8.x / CW150xXX4.x / CW200xXX4.x

Supported power stack types:

ConverterTec Service stack™ / Infineon ModSTACK™ / Semikron RAC™

Version “B”

June 2024

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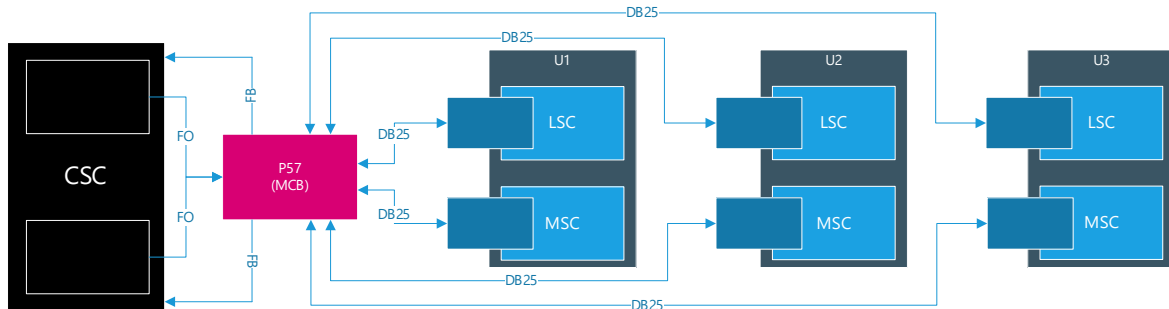
Contents

1. Technology overview	4
1.1. General system block diagram	4
1.2. P57 component blocks	4
1.2.1. P57 Manual stack type selection	4
1.2.2. P57 Automatic stack type detection	5
2. Specification	6
2.1. Electrical parameters	6
2.2. Interfaces	6
2.2.1. LSC interface block	6
2.2.2. MSC interface block	6
3. Configuration	7
3.1. Manual stack type selection	7
3.1.1. Stack type selection	7
3.1.2. Channel Enable/Disable	7
3.1.3. System type selection	7
3.2. Automatic stack type detection	8
3.2.1. Automatic channel detection	8
3.2.2. System type selection	9
4. Functionalities	10
4.1. Power supply monitoring	10
4.2. Error monitoring	10
4.2.1. Service stack™ / Semikron RAC™ error list	11
4.2.2. Infineon ModSTACK™ error list	12
5. Power stack interfaces	13
6. Document revision history	14

1. Technology overview

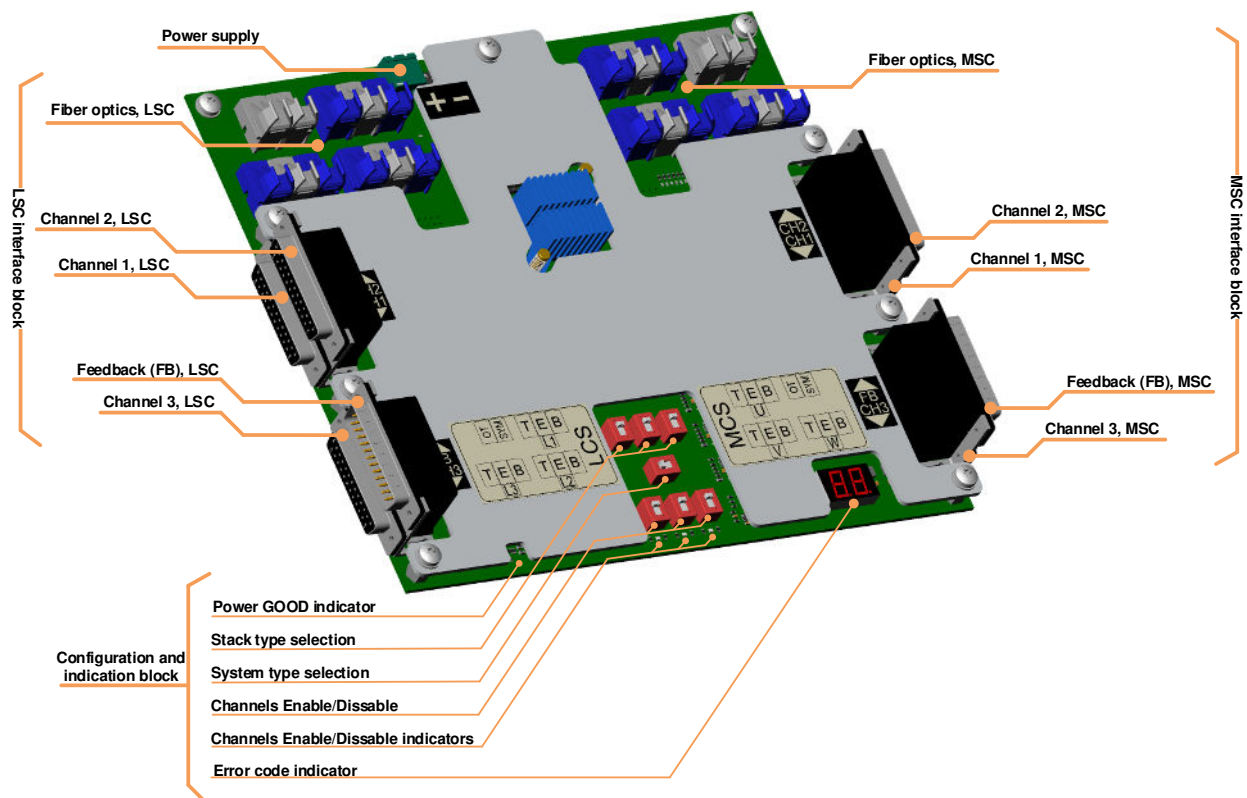
Flexi | X technology allows parallel operation of different types of power stacks within one system. It enables replacement of a single stack with our proprietary Service stack™. It does not incorporate a Master/Slave topology, which increases flexibility. P57 main control board (MCB) is the core of the Flexi | X technology.

1.1. General system block diagram



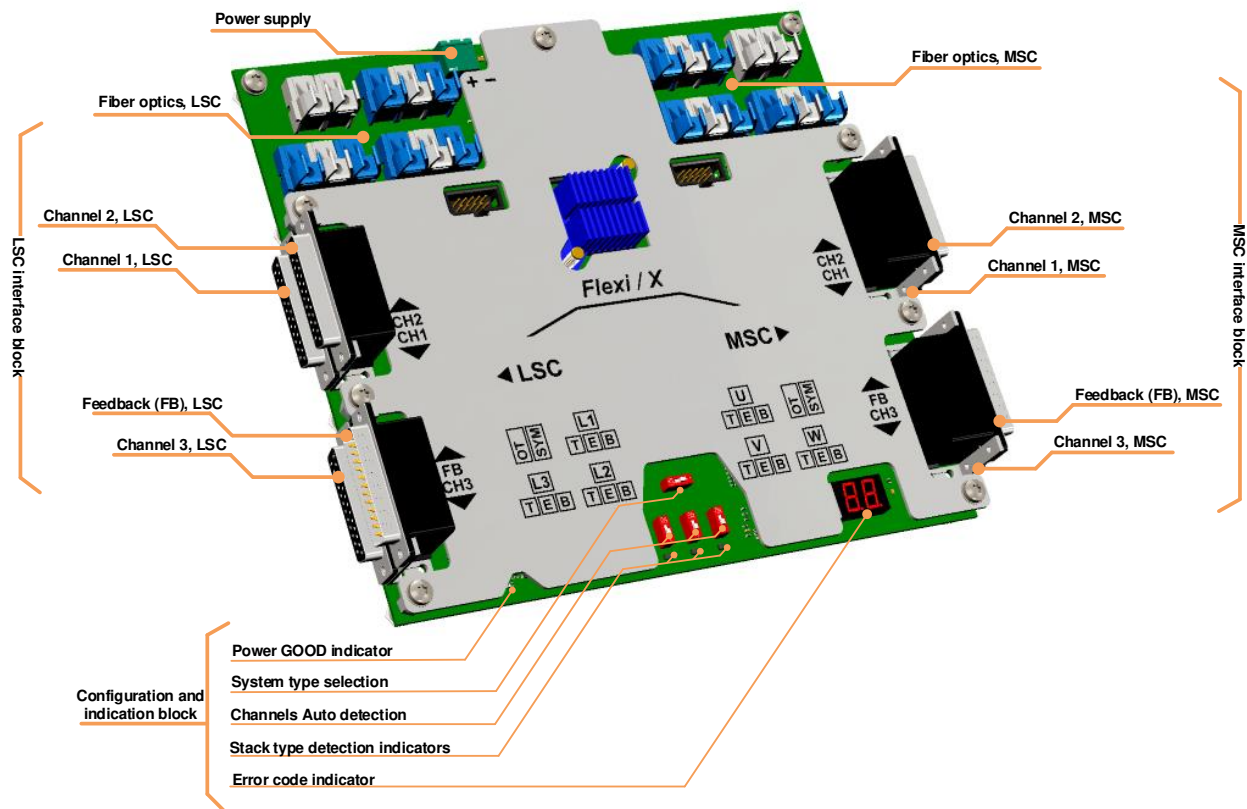
1.2. P57 component blocks

1.2.1. P57 Manual stack type selection



*Supported power stack types:
ConverterTec Service stack™ / Infineon ModSTACK™.

1.2.2. P57 Automatic stack type detection



*Supported power stack types:

ConverterTec Service stack™ / Infineon ModSTACK™ / Semikron RAC™.

**P57 Automatic stack type detection supersedes P57 Manual stack type selection.

2. Specification

2.1. Electrical parameters

	Min	Nominal	Max	Unit
Supply voltage	24	27.5	30	VDC
Supply current	-	-	6	A
Operating ambient temperature	-5	-	+60	°C

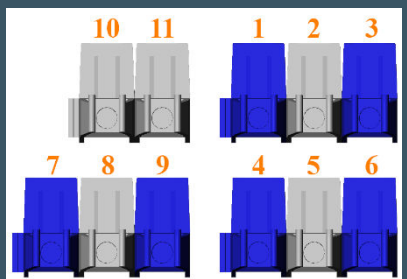
2.2. Interfaces

2.2.1. LSC interface block

Converter		Type		
LSC	Power stack	D-SUB 25 female	3	pcs.
	Control	D-SUB 25 male	1	
	Control	Fiber optic	11	

2.2.1.1 Fiber optics

#	Phase	Signal type	Function
1	L1	Input	Drive signal, TOP side
2		Output	Phase error
3		Input	Drive signal, BOT side
4	L2	Input	Drive signal, TOP side
5		Output	Phase error
6		Input	Drive signal, BOT side
7	L3	Input	Drive signal, TOP side
8		Output	Phase error
9		Input	Drive signal, BOT side
10	-	Output	Over temperature error
11	-	Output	Current asymmetry error

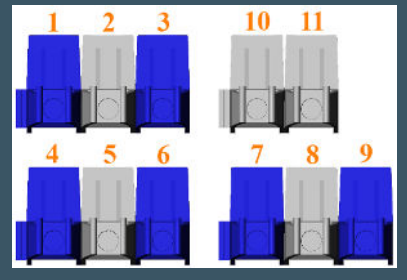


2.2.2. MSC interface block

Converter		Type		
MSC	Power stack	D-SUB 25 female	3	pcs.
	Control	D-SUB 25 male	1	
	Control	Fiber optic	11	

2.2.2.1 Fiber optics

#	Phase	Signal type	Function
1	U	Input	Drive signal, TOP side
2		Output	Phase error
3		Input	Drive signal, BOT side
4	V	Input	Drive signal, TOP side
5		Output	Phase error
6		Input	Drive signal, BOT side
7	W	Input	Drive signal, TOP side
8		Output	Phase error
9		Input	Drive signal, BOT side
10	-	Output	Over temperature error
11	-	Output	Current asymmetry error



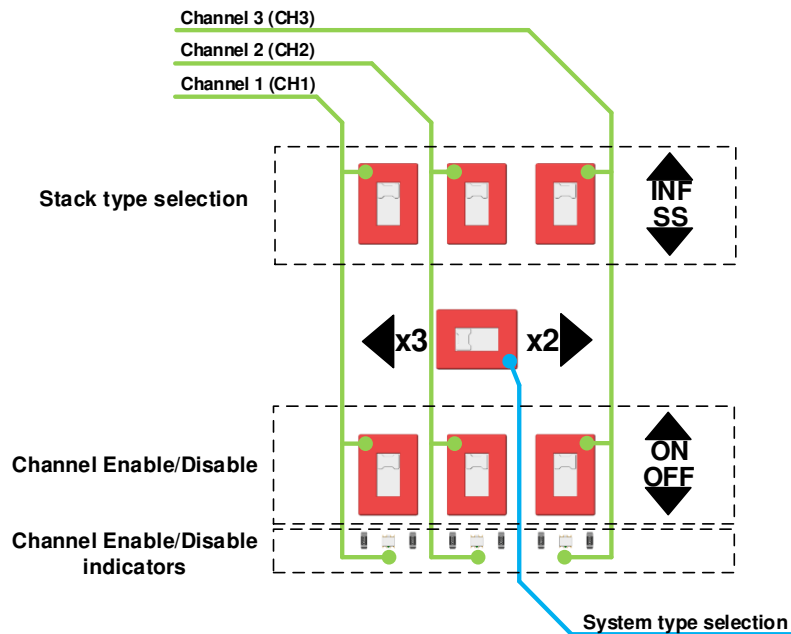
*TOP corresponds to High(+) side switch. BOT corresponds to Low(-) side switch.

3. Configuration

P57 MCB allows parallel operation of up to 3 power stacks. Each stack is being connected to one of the 3 available channels. The configuration block controls simultaneously LSC and MSC side of each channel.

(!) Changes in configuration must be made when the board is not powered.

3.1. Manual stack type selection



3.1.1. Stack type selection

Each channel has two options, controlled by 2-position switch. Depending of the type of the power stack being connected to the channel, the switch must be moved to the proper position:

- ▲ **INF** – Infineon ModSTACK™
- ▼ **SS** – Service stack™

3.1.2. Channel Enable/Disable

Each channel can be switched ON or OFF, depending from the number of channels used in the system. To each ON/OFF switch there is a corresponding LED indicator, which will show the current state of the channel.

- ▲ **ON** – Channel is ON and the LED indicator will light in green 
- ▼ **OFF** – Channel is OFF and the LED indicator will light in red 

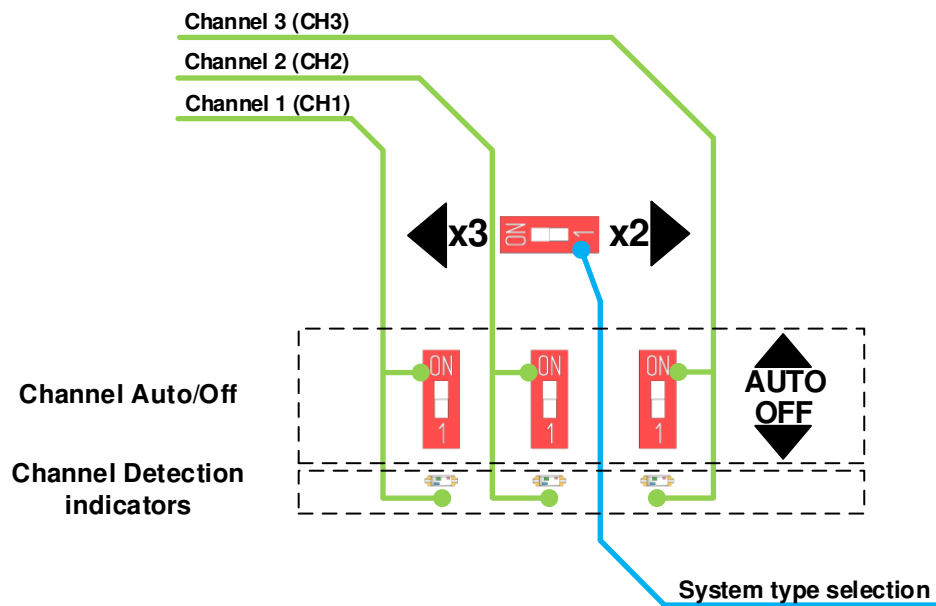
(!) All unused channels must be switched off.

3.1.3. System type selection

The type of the system must be configured correctly to ensure proper operation. The system type selection switch must be moved to the corresponding position:

- ◀ **x3** – For systems of CW200xRP8.x family.
- **x2** ▶ – For systems of CW150xRP8.x family.

3.2. Automatic stack type detection



3.2.1. Automatic channel detection

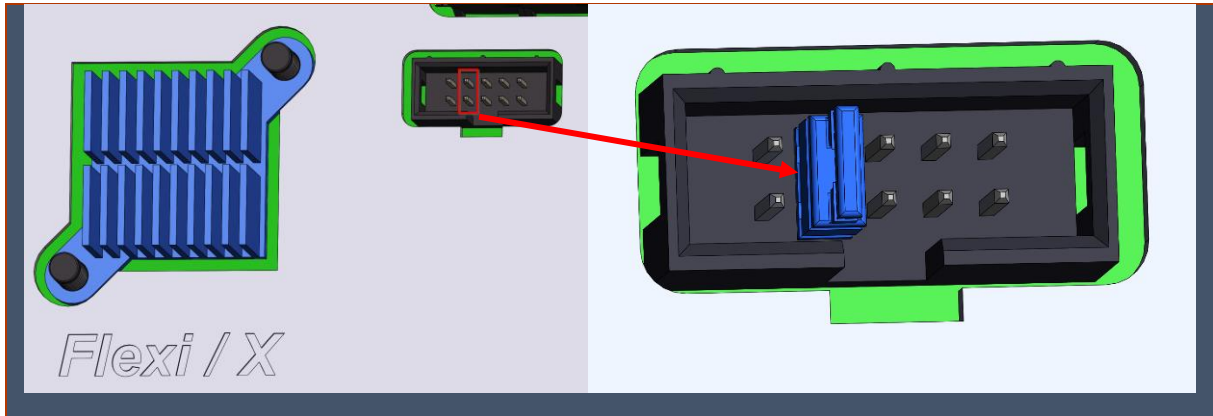
Each channel can detect automatically the connected stack type. The 2-position switch can be switched to AUTO or OFF. To each switch there is a corresponding LED indicator, which will show one of the following options shown below.

- ▲ AUTO** – Channel is set to automatic detection and the LED indicator will light in the following according to the connected stack type:
 - Service stack™ as green.
 - ModSTACK™ as yellow.
 - Semikron RAC™ 313/314 as blue.
 - Semikron RAC™ 310/311S as magenta.
 - Channel left unconnected as red.
- ▼ OFF** – Channel is OFF and the LED indicator will light in red. This position is used for derating purposes. It will power on the power stack when connected, but with disabled driving signals.

In standard operation all channels should be left in AUTO. If a channel is not used, it will automatically detect the unused channel when there is no power stack connected to it.

(!) All used channels must be switched to AUTO.

(!)When P57 board is used in a Semikron™ system, a jumper setting needs to be performed.



3.2.2. System type selection

The type of the system must be configured correctly to ensure proper operation. The system type selection switch must be moved to the corresponding position:

- ◀x3 – For systems of:
CW200xRP8.x(ModSTACK™), CW2000RP4.x(Semikron RAC™) family
- x2▶ – For systems of:
CW150xRP8.x(ModSTACK™), CW150xXXx.x(Semikron RAC™) family.

4. Functionalities

4.1. Power supply monitoring

The power good (or PGOOD) LED will be illuminated according to voltage level of the power supply line (refer to “[P57 component blocks](#)” for the position of PGOOD LED). The power supply monitoring is only for indication purposes. It will not trigger any events or change the behavior of the system.

Low power supply voltage might cause sporadic failures or other unusual behavior of the system, caused by insufficient power supply of the power stacks.

	Nominal system power supply	*Threshold	LED state
Power supply is in the acceptable range	27.5VDC	>24.8VDC	green 
Power supply is NOT in the acceptable range		<24.8VDC	red 

**Voltage level at the board power supply connector. (The voltage level, measured on the terminals of the power supply unit will differ from the level, measured on the board)*

4.2. Error monitoring

To ease the troubleshooting efforts, the error code indicator will provide a numeric code when a power stack error is triggered (refer to “[P57 component blocks](#)” for the position of the error code indicator). When unexpected shutdown occurs, multiple events can be registered, but only the first one will be displayed. The error codes have to be interpreted according to the type of the power stack connected to the corresponding channel.

4.2.1. Service stack™ / Semikron RAC™ error list

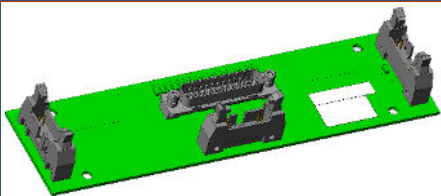
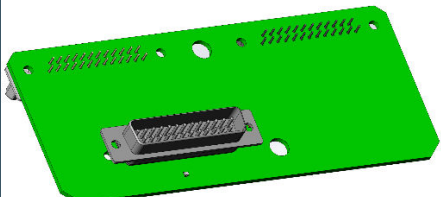
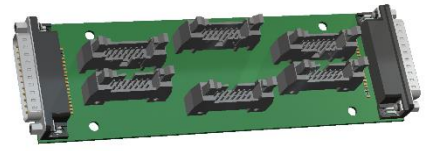
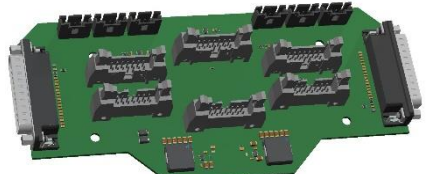
Error code	Channel	Converter	Phase	Error description	Note
10	CH1	LSC	L1	Phase error	
11	CH1	LSC	L1	Over temperature error	
12	CH1	LSC	L2	Phase error	
13	CH1	LSC	L2	Over temperature error	
14	CH1	LSC	L3	Phase error	
15	CH1	LSC	L3	Over temperature error	
20	CH1	MSC	U	Phase error	
21	CH1	MSC	U	Over temperature error	
22	CH1	MSC	V	Phase error	
23	CH1	MSC	V	Over temperature error	
24	CH1	MSC	W	Phase error	
25	CH1	MSC	W	Over temperature error	
30	CH2	LSC	L1	Phase error	
31	CH2	LSC	L1	Over temperature error	
32	CH2	LSC	L2	Phase error	
33	CH2	LSC	L2	Over temperature error	
34	CH2	LSC	L3	Phase error	
35	CH2	LSC	L3	Over temperature error	
40	CH2	MSC	U	Phase error	
41	CH2	MSC	U	Over temperature error	
42	CH2	MSC	V	Phase error	
43	CH2	MSC	V	Over temperature error	
44	CH2	MSC	W	Phase error	
45	CH2	MSC	W	Over temperature error	
50	CH3	LSC	L1	Phase error	
51	CH3	LSC	L1	Over temperature error	
52	CH3	LSC	L2	Phase error	
53	CH3	LSC	L2	Over temperature error	
54	CH3	LSC	L3	Phase error	
55	CH3	LSC	L3	Over temperature error	
60	CH3	MSC	U	Phase error	
61	CH3	MSC	U	Over temperature error	
62	CH3	MSC	V	Phase error	
63	CH3	MSC	V	Over temperature error	
64	CH3	MSC	W	Phase error	
65	CH3	MSC	W	Over temperature error	
90	-	LSC	-	Current asymmetry	
91	-	MSC	-	Current asymmetry	
92	CH1	-	-	Configuration fault	CH1 is not properly configured
93	CH2	-	-	Configuration fault	CH2 is not properly configured
94	CH3	-	-	Configuration fault	CH3 is not properly configured
95	-	-	-	Configuration fault	Two or more channels not properly configured. See LEDs for more information
96	-	-	-	Configuration fault	Two or more channels not properly configured. See LEDs for more information
97	-	-	-	Configuration fault	Two or more channels not properly configured. See LEDs for more information

4.2.2. Infineon ModSTACK™ error list

Error code	Channel	Converter	Phase	Error description	Note
10	CH1	LSC	L1	Phase error	
11	CH1	LSC	-	Over temperature error	L1, L2 or L3 over temperature error
12	CH1	LSC	L2	Phase error	
13	CH1	LSC	L2	N/A	
14	CH1	LSC	L3	Phase error	
15	CH1	LSC	-	Overcurrent error	Activated in combination with the corresponding phase error
20	CH1	MSC	U	Phase error	
21	CH1	MSC	-	Over temperature error	U, V or W over temperature error
22	CH1	MSC	V	Phase error	
23	CH1	MSC	V	N/A	
24	CH1	MSC	W	Phase error	
25	CH1	MSC	W	Overcurrent error	Activated in combination with the corresponding phase error
30	CH2	LSC	L1	Phase error	
31	CH2	LSC	-	Over temperature error	L1, L2 or L3 over temperature error
32	CH2	LSC	L2	Phase error	
33	CH2	LSC	L2	N/A	
34	CH2	LSC	L3	Phase error	
35	CH2	LSC	-	Overcurrent error	Activated in combination with the corresponding phase error
40	CH2	MSC	U	Phase error	
41	CH2	MSC	-	Over temperature error	U, V or W over temperature error
42	CH2	MSC	V	Phase error	
43	CH2	MSC	V	N/A	
44	CH2	MSC	W	Phase error	
45	CH2	MSC	-	Overcurrent error	Activated in combination with the corresponding phase error
50	CH3	LSC	L1	Phase error	
51	CH3	LSC	-	Over temperature error	L1, L2 or L3 over temperature error
52	CH3	LSC	L2	Phase error	
53	CH3	LSC	L2	N/A	
54	CH3	LSC	L3	Phase error	
55	CH3	LSC	-	Overcurrent error	Activated in combination with the corresponding phase error
60	CH3	MSC	U	Phase error	
61	CH3	MSC	-	Over temperature error	U, V or W over temperature error
62	CH3	MSC	V	Phase error	
63	CH3	MSC	V	N/A	
64	CH3	MSC	W	Phase error	
65	CH3	MSC	-	Overcurrent error	Activated in combination with the corresponding phase error
90	-	LSC	-	Current asymmetry error	
91	-	MSC	-	Current asymmetry error	
92	CH1	-	-	Configuration fault	CH1 is not properly configured
93	CH2	-	-	Configuration fault	CH2 is not properly configured
94	CH3	-	-	Configuration fault	CH3 is not properly configured
95	-	-	-	Configuration fault	Two or more channels not properly configured. See LEDs for more information
96	-	-	-	Configuration fault	Two or more channels not properly configured. See LEDs for more information
97	-	-	-	Configuration fault	Two or more channels not properly configured. See LEDs for more information

5. Power stack interfaces

The connection interface between a power stack and P57 MCB is not direct. Additional equipment is required to establish it. The following items were designed to be used in conjunction with P57 MCB.

Power stack type	Kit reference	Description	
Service stack™	I-03053	SDB-SS (Distribution board kit)	
Infineon ModSTACK™	I-02817	IB-30x (Interface kit)	
Semikron RAC 313/314	I-01313	IB-SK	
Semikron RAC 310/311s	I-01310	IB-SK-ET	

**Refer to the installation manual for more information.*

6. Document revision history

Date	Version	Changes
February 2022	01	Initial release.
September 2022	-	Changes in 2.2, 4, 5.2.
February 2024	A	Changes in 1.2, 3, 4.1, 4.2.1, 4.2.2, 5.
June 2024	B	Changes in 1.2, 2.2.