FPC

MXH
HIGH VOLTAGE
HIGH CURRENT

Hardware Manual

Revision 2023.9.18

Table of Contents

1   Introduction

MXH is a rack for the high voltage or high current matrix (scanner) cards, connection of the measuring devices and connection of the testing adapter with DUT.
To control MXH from the FPC funTEST software is necessary the plugin. For reference, see the MXH Programmer's Manual.

In this hardware manual are described all available cards including the internal connection to the MXH.
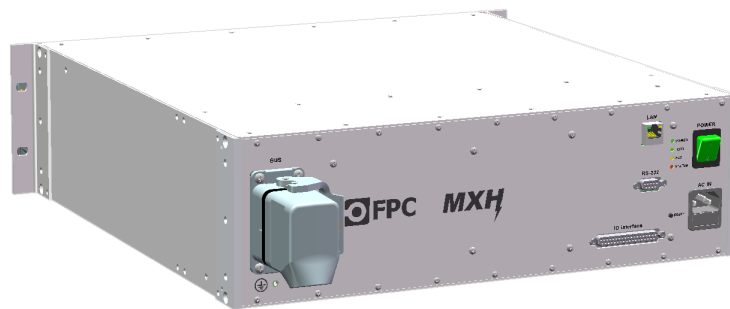
⚠	**Caution**
	Because of the possibility of electrical shock, it is not allowed to use the MXH without all card's position equipped by cards or blanks!

2   Main

2.1   Features

- 19" rack size / 3U
- Ethernet (main communication interface)
- RS232 (service interface)
- Two internal buses for Kelvin measurements
- Up to six cards in one system
- Integrated digital input and output interface
- Panel with the LED indicators

2.2   Main panel
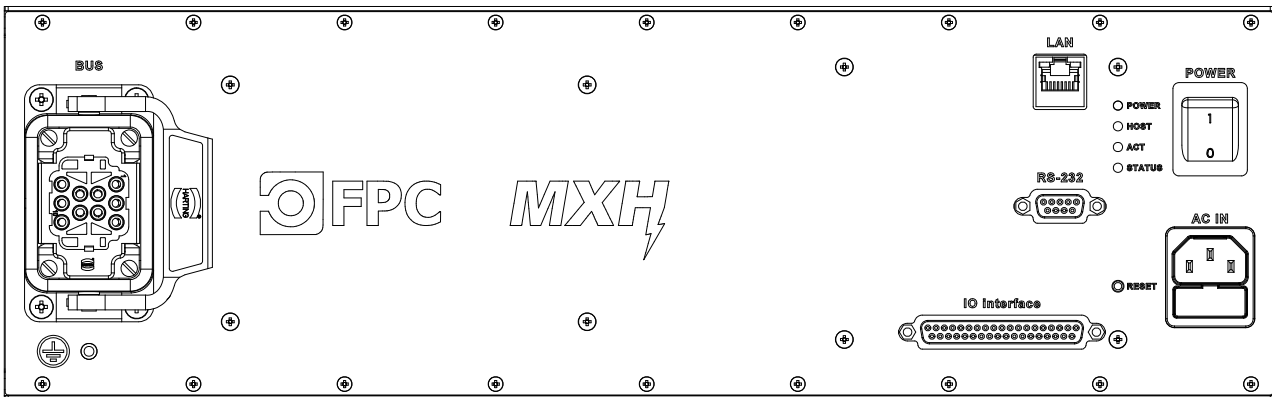
2.2.1   Power

The AC IN mains socket and the power switch.

AC IN	AC mains 85 - 264 VAC
FUSE	AC mains fuse T/2,5A

The device is turned on when switch is in position (1) and this state is indicated by the green back-light and turned off when it is in position (0).

2.2.2   LEDs

LED	Color	Description
POWER	Green	Power indication of MXH
HOST	Green	Connection between the MXH and the plug-in is active
ACT	Red	Any relay are activate
STATUS	Red/Yellow	Common status of MXH None or green: OK Red: FAULT

2.2.3 LAN

Communication channel is done via ethernet base connection and RJ45 shielded connector at the front panel.

|	
Default IP	192.168.100.240
Mask	255.255.255.0

Configuration can be reverted into default values by holding "RESET" button more than 10s. After default values are restored, "ACT" LED blink once.

2.2.4 I/O Interface

Device has general purpose IO interface to control external devices.
This interface is compatible with the Advantech PCIE-1730 card.

16I/16O   Digital optical-isolated IO interface
                                                 16 inputs (active-low) and 16 OC outputs
   Canon 37 female connector (CAN37-F)
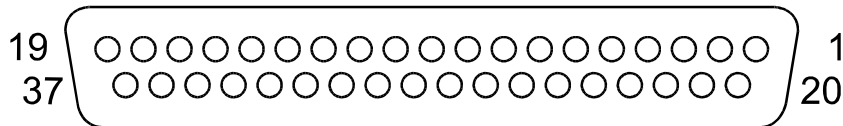
Pinout:

| Pin	Description	Pin	Description
1	IN 0	20	IN 1
2	IN 2	21	IN 3
3	IN 4	22	IN 5
4	IN 6	23	IN 7
5	IN 8	24	IN 9
6	IN 10	25	IN 11
7	IN 12	26	IN 13
8	IN 14	27	IN 15
9	IO_ECOM0	28	IO_ECOM1
10	IO_PCOM0	29	IO_GND
11	OUT 0	30	OUT 1
12	OUT 2	31	OUT 3
13	OUT 4	32	OUT 5
14	OUT 6	33	OUT 7
15	OUT 8	34	OUT 9
16	OUT 10	35	OUT 11
17	OUT 12	36	OUT 13
18	OUT 14	37	OUT 15
19	IO_PCOM1		

IO_**x**COM**x** are the IO power supply from the remote application in range +5 to +30V DC (typically +24V):
- IO_ECOM0 is supply for IN0 to IN7
- IO_ECOM1 is supply for IN8 to IN15

- IO_PCOM0 is supply for OUT0 to OUT7
- IO_PCOM1 is supply for OUT8 to OUT15
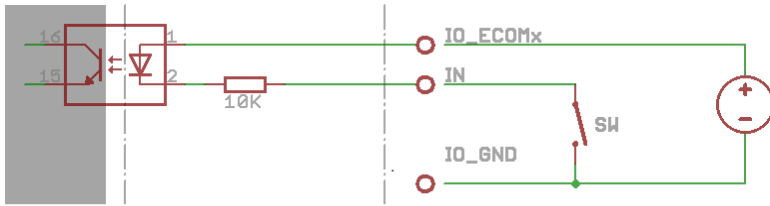
Internal wiring of single input with typical IN connection
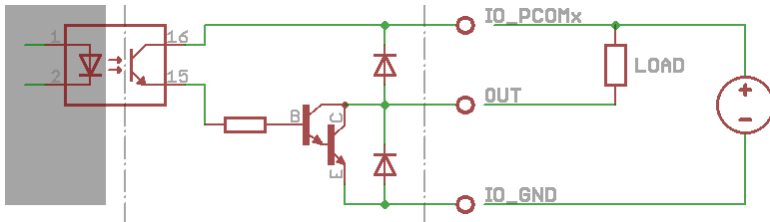
Internal wiring of single output with typical OUT connection

2.2.5 Connector

Input connector type is dependent on rack type according to target application.
More information is in the Box chapter.

2.3   Supported cards

| Catalog name	Catalog number	Description
MXCHV/A	BOM-0319-01	High voltage 4TP card up to 7kVAC/10kVDC
MXCHV/B	BOM-0319-02	High voltage 16TP card up to 3,5kVAC/5kVDC
MXCHC/A	BOM-0319-03	High current 10TP card up to 50A/30VDC

Different card types are not allowed in one system at once due their different characteristics!

2.4   Power supply

Each MXHR box (rack) is equipped with 24V / 6,5A power supply and it is capable of activating all TP (low or high) relays at the same time.
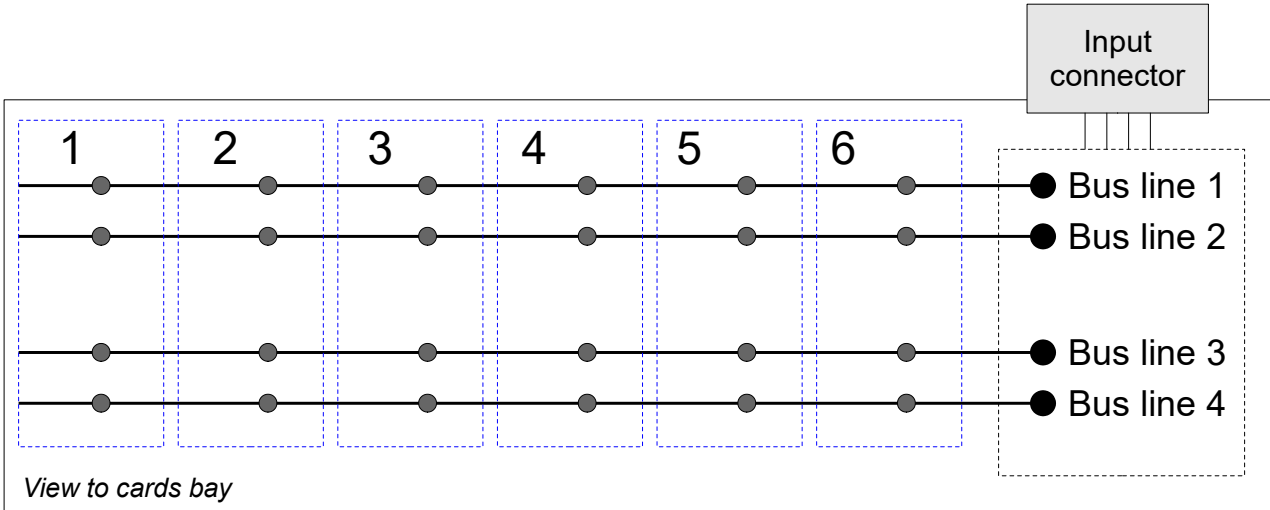
2.5   Dimensions

Standard 19" 3U rack.
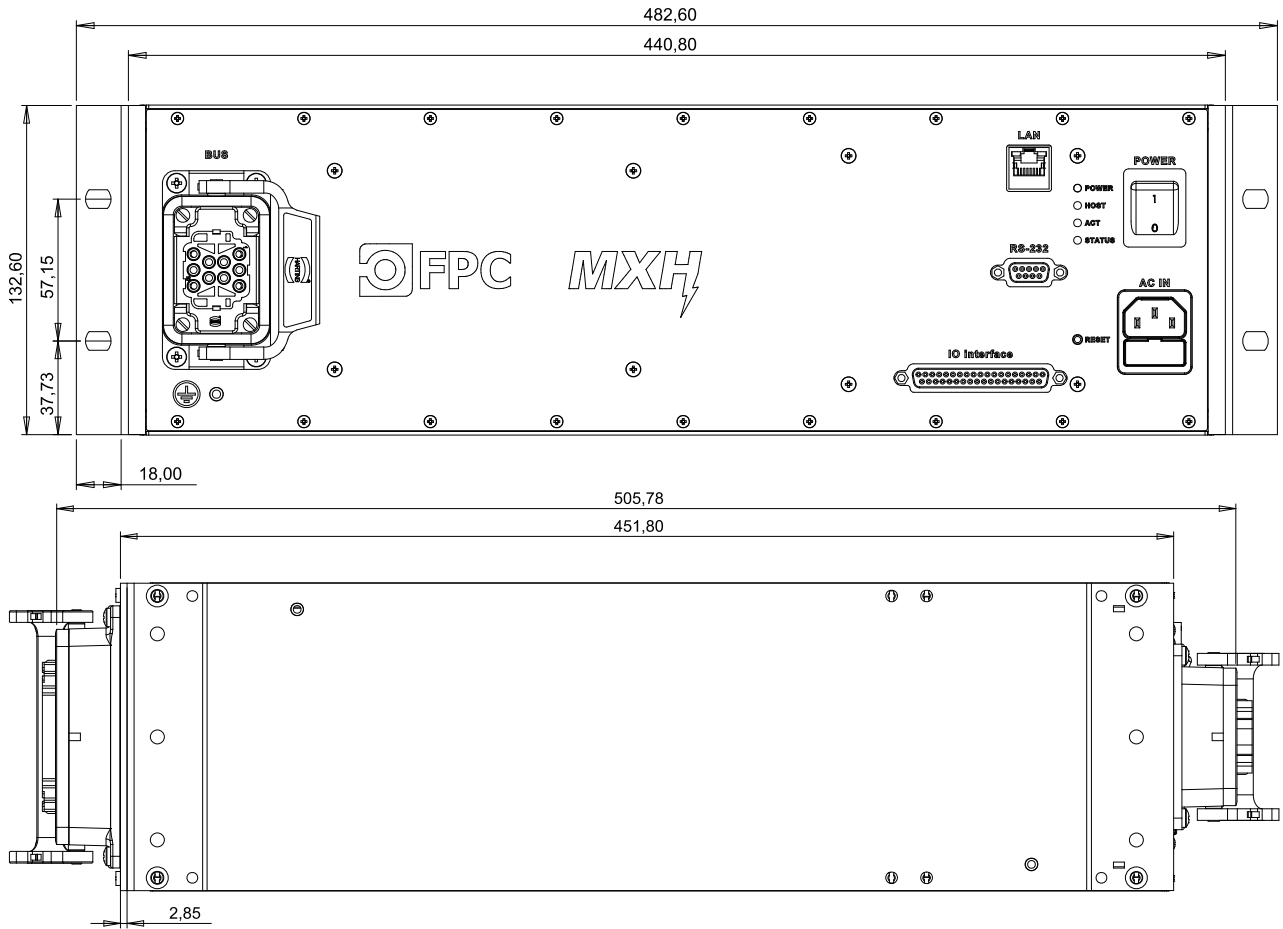
3   Box

The system bus has 2 buses and the box can be equipped up to 6 cards of same type.

View to cards bay

Input connector type and the meaning of the bus lines are depended on type of cards used and for correct function of Plugin control must be fulfilled requirements in the next chapters.

3.1   MXHR/HV bus

High voltage connector and bus connection up to 7,5kVAC and 5Arms.
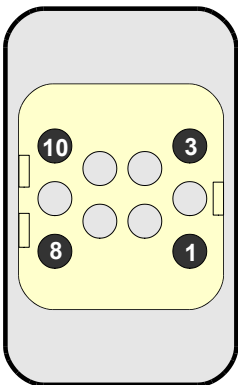
MXCHV/A limited voltage (4W)

Pin	Bus line	Meaning
1	Bus line 1	HIGH 1
3	Bus line 2	HIGH 2
8	Bus line 3	LOW 2
10	Bus line 4	LOW 1

MXCHV/A maximum voltage (2W)

Pin	Bus line	Meaning
1	Bus line 1	HIGH 1
3	Bus line 2	HIGH 1
8	Bus line 3	LOW 2
10	Bus line 4	LOW 2

MXCHV/B (4W)

Pin	Bus line	Meaning
1	Bus line 1	LOW 1
3	Bus line 2	HIGH 1
8	Bus line 3	HIGH 2
10	Bus line 4	LOW 2

3.1.1 Input connector type

Harting connector type	Rack side (male)	Recommended generator side (female)
Housing	09 30 006 0301	-
Housing insert	09 32 010 3001	09 32 010 3101
Pins (4)	09 33 000 6127	09 33 000 6227

3.2   MXHR/HC bus

High current connector and bus connection up to 70A and 50VDC.
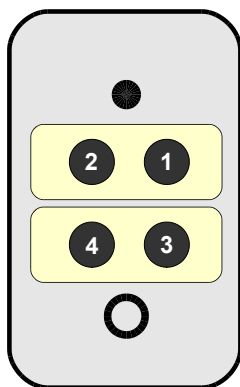
MXCHC/A (4W)

Pin	Bus line	Meaning
1	Bus line 1	LOW 1
3	Bus line 2	HIGH 1
8	Bus line 3	HIGH 2
10	Bus line 4	LOW 2

3.2.1 Input connector type

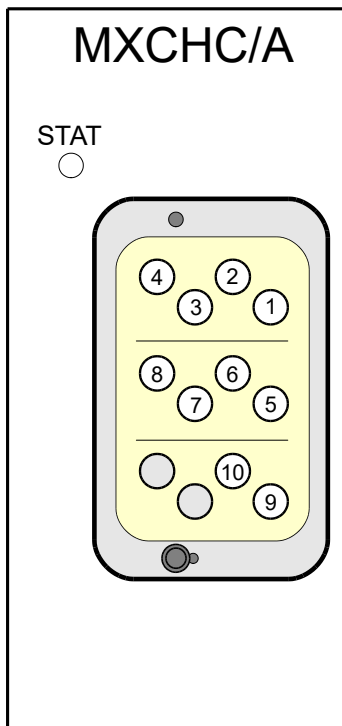| Harting connector type	Rack side (male)	Recommended generator side (female)
Housing	09 30 006 0301	-
Housing insert	09 14 002 2641	09 14 002 2741
Pins	screw terminal (cable >6mm^2)	(cable 6-16mm^2)

4   Cards

4.1   MXCHV/A

High-voltage/low-current matrix card with 4 test points.

Parameters:

Test point count	Max. voltage	Max. switching current	Continuous current	Switch time (operate / release)
2 + 2	3500 VAC / 5000 VDC	3 A	3 A	3ms / 1,5ms
4	7000 VAC / 10000 VDC	3 A	3 A	

*Switching current value is defined for the resistive load.

4.1.1   Card panel

Status   **Description**
Red   Any TP active (danger)
Red   Card refused, because in the box are
(blinking)   more cards of different type
Green   Card detected and valid

Pin	Testpoint	**Bus lines**
1	TP1	4 (low) x 1 (high)
3	TP2	4 (low) x 1 (high)
8	TP3	3 (low) x 2 (high)
10	TP4	3 (low) x 2 (high)

Caution: For higher voltage level is needed externally interconnect bus lines 1 with 2 and bus lines 3 with 4 !

4.1.2 Block schematic
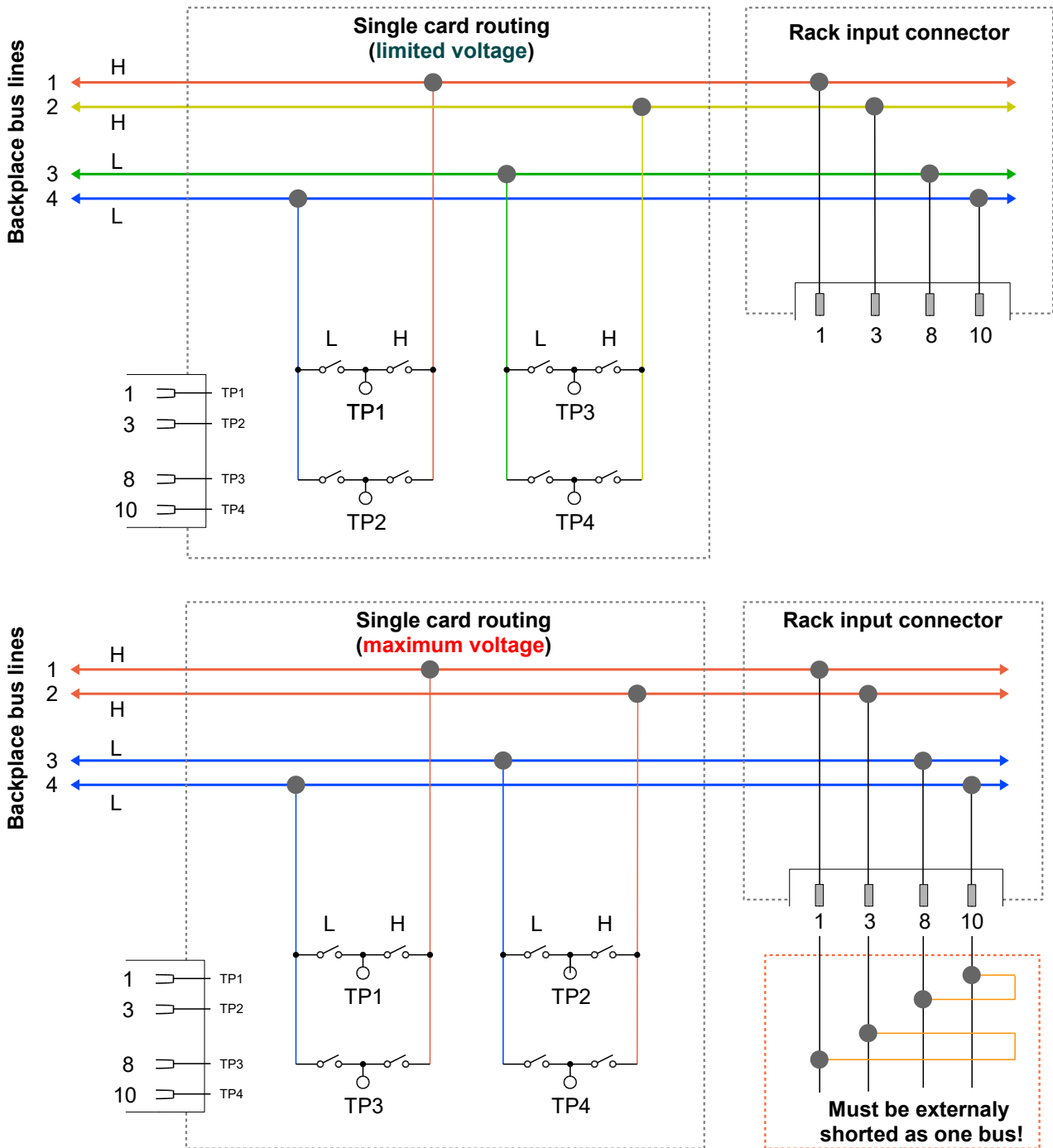
4.1.3 Output connector type

Harting connector type	Card side (female)	Recommended application side (male)
Housing	09 30 006 0301	-
Housing insert	09 32 010 3101	09 32 010 3001
Pins (4)	09 33 000 6227	09 33 000 6127

4.1.4 Power consumption

Card consumption	
Standby	0-5mA; 24V
Single relay	42mA; 24V
Four relays (2TP low and 2TP high active)	168mA; 24V

4.2   MXCHV/B

High-voltage/low-current matrix card with 16 test points.

Parameters:

Test point count	Max. voltage	Max. switching current	Continuous current	Non-continuous current	Switch time (operate / release)
8 + 8	3500 VAC / 5000 VDC	5A / <110VDC 5A / <250VAC	3A	up to 5A	15ms / 5ms

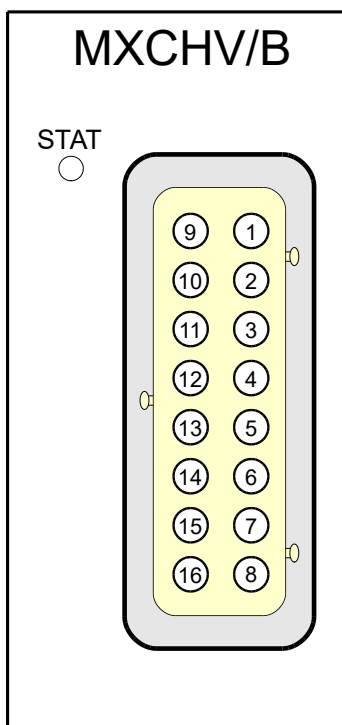*Switching current value is defined for the resistive load.

Limitations:

Current	Ton / Toff ratio [%]	Ton max. duration [s]
3A	-	unlimited
5A	30 : 70	60

Maximum number of activated relays in system	Ton / Toff ratio [%]	Ton max. duration [s]
32	-	unlimited
96	20 : 80	30

4.2.1   Card panel

| Status	Description
Red	Any TP active (danger)
Red *(blinking)*	Card refused, because in the box are more cards of different type
Green	Card detected and valid

Pin	Testpoint	**Bus lines**
1	TP1	1 (low) x 2 (high)
2	TP2	1 (low) x 2 (high)
3	TP3	1 (low) x 2 (high)
4	TP4	1 (low) x 2 (high)
5	TP5	3 (high) x 4 (low)
6	TP6	3 (high) x 4 (low)
7	TP7	3 (high) x 4 (low)
8	TP8	3 (high) x 4 (low)
9	TP9	1 (low) x 2 (high)
10	TP10	1 (low) x 2 (high)
11	TP11	1 (low) x 2 (high)
12	TP12	1 (low) x 2 (high)
13	TP13	3 (high) x 4 (low)
14	TP14	3 (high) x 4 (low)
15	TP15	3 (high) x 4 (low)
16	TP16	3 (high) x 4 (low)

4.2.2 Block schematic
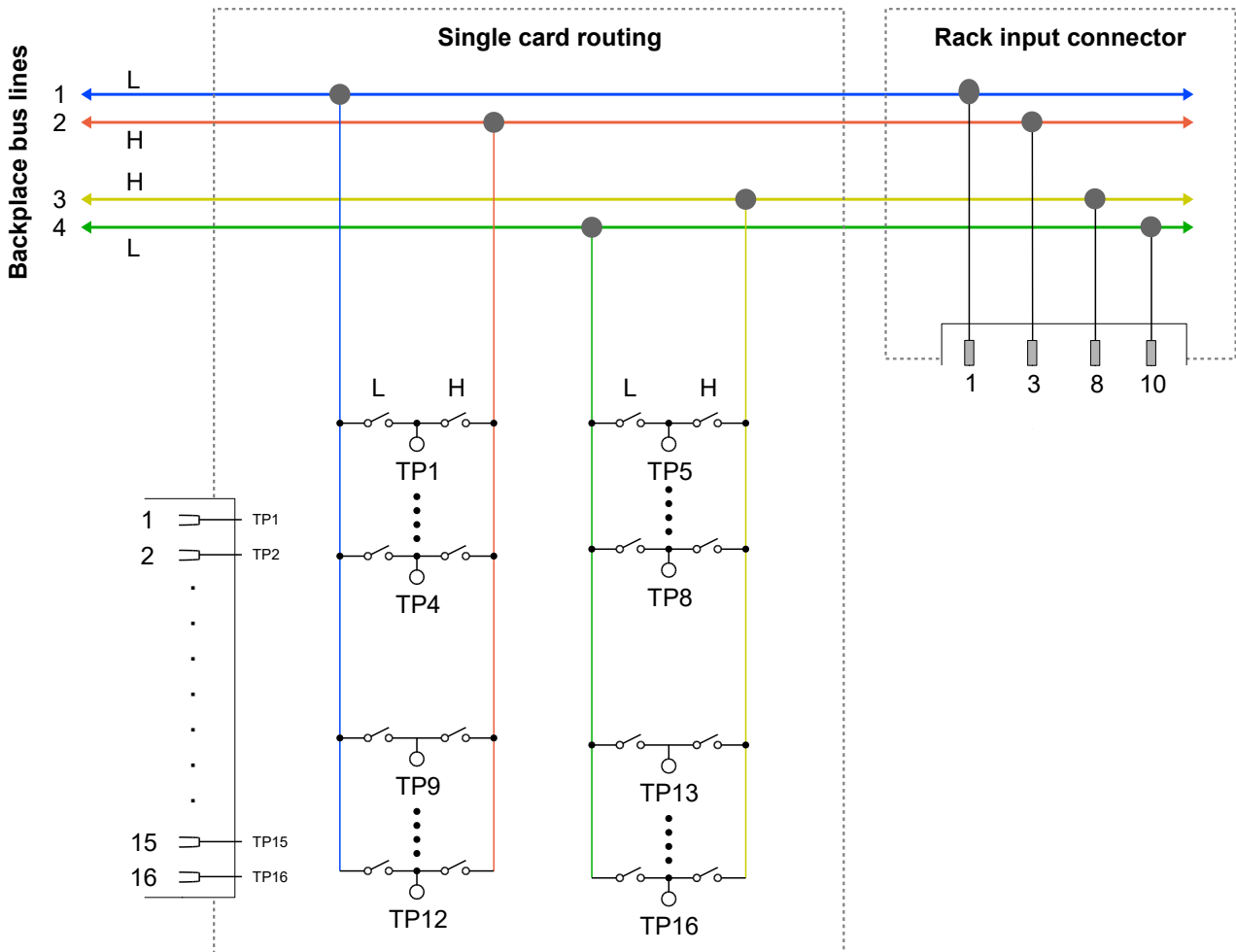
4.2.3 Output connector type

Harting connector type	Card side (female)	Recommended application side (male)
Housing	09 30 016 0307	-
Housing insert	09 33 016 2748	09 33 016 2648
Pins	fast-lock mechanism without crimps	fast-lock mechanism without crimps

4.2.4 Power consumption

Card consumption	
Standby	0-5mA; 24V
Single relay	33.3mA; 24V
Sixteen relays (8TP low and 8TP high active)	532mA; 24V

4.3   MXCHC/A

High-current/low-voltage matrix card with 10 test points.

Parameters:

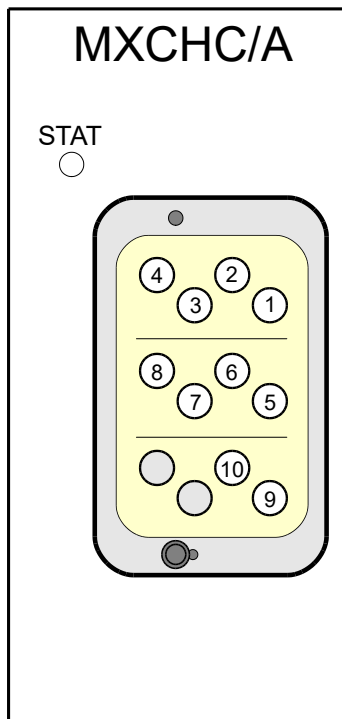| Test point count	Max. voltage	Max. switching current	Continuous current	Non-continuous current	Switch time (operate / release)
5 + 5	21VAC / 30VDC	40A / <13,5VDC 20A / <27VDC	25 A	up to 50 A	10ms / 10ms

*Switching current value is defined for the resistive load.

Limitations:

Current	Ton / Toff ratio [%]	Ton max. duration [s]
25A	-	unlimited
35A	50 : 50	300
50A	30 : 70	30

Maximum number of active relays **in system**	Ton / Toff ratio [%]	Ton max. duration [s]
4	-	unlimited
60	20 : 80	30

4.3.1   Card panel

	Status	**Description**
	Red	Any TP active (danger)
	Red	Card refused, because in the box are more cards of different
	(blinking)	type
	Green	Card detected and valid

Pin	**Testpoint**	**Bus lines**
1	TP1	1 (low) x 2 (high)
2	TP2	1 (low) x 2 (high)
3	TP3	1 (low) x 2 (high)
4	TP4	1 (low) x 2 (high)
5	TP5	1 (low) x 2 (high)
6	TP6	4 (low) x 3 (high)
7	TP7	4 (low) x 3 (high)
8	TP8	4 (low) x 3 (high)
9	TP9	4 (low) x 3 (high)
10	TP10	4 (low) x 3 (high)

4.3.2 Block schematic
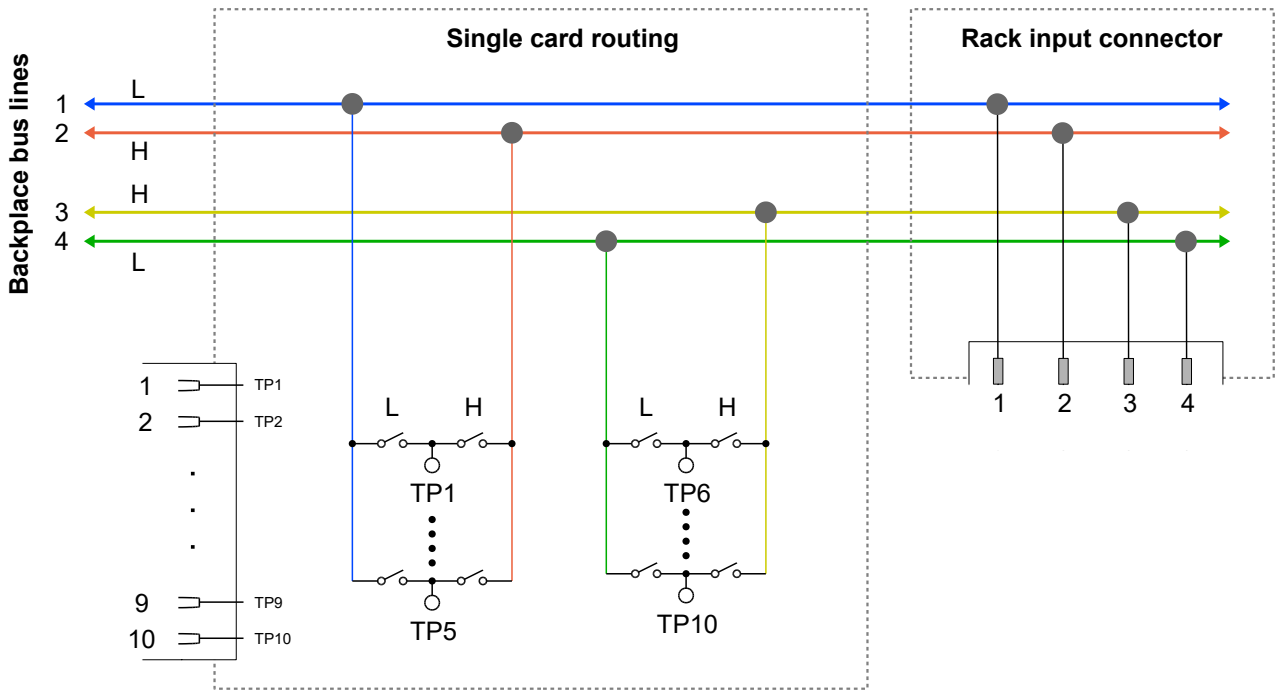
4.3.3 Output connector type

Harting connector type	Card side (female)	Recommended application side (male)
Housing	09 30 010 0305	-
Housing insert	09 14 004 3141	09 14 004 3041
Pins	09 32 000 6208	09 32 000 6108

4.3.4 Power consumption

Standby	0-5mA; 24V
Relays (1TP low)	75mA; 24V
Relays (5TP low and 5TP high active)	750mA; 24V

5   Glossary

BUS   - bus containing two physical wire lines (handle positive and negative)
MXH   - matrix box series
MXHR   - matrix box rack (without HV/HC connector/bus)
MXHR/HV   - matrix box rack (high voltage version)
MXHR/HC   - matrix box rack (high current version)
MXC   - matrix box MXH series card
MXCHV/<type>   - matrix box MXH series card high voltage version
MXCHC/<type>   - matrix box MXH series card high current version
TP   - test-point which is endpoint of the card and can be connected to the LOW or HIGH
                             side of the BUS by software

6   Revisions

2024-03-01   updated MXCHC/A parameters
2023-09-18   initial revision