Technical Datasheet
Enclosure Earth Connection

Types:	xEnergy Main Frame Parts.
Standards:	IEC 61439-1/2
Testreports:	A 2.03.00170.1.0
Technical Data	In order to fulfill IEC 61439-1 10.5. Protection against electric shock and integrity of protective circuits all exposed conductive parts of the xEnergy switchboard shall be interconnected together and to an external earthing conductor (supply or other earthing arrangements). The xEnergy framework is interconnected together by different mechanical fixings like: screws, toothed washers, metal hinges or sliding contacts. Doors and planking parts are connected to the frame by its own metal fixings. Withdrawable Units are connected to the earthing conductor by their metal supporting surfaces. Earth continuity is given for the whole mechanical assembly just by following the basic assembly instructions. Exposed conductive parts of any incorporated device which cannot be connected to the protective circuit by its own fixing, shall be connected by a separate conductor; Details are given in Table 1. Earthing conductors could be either fixed to the frame structure (different possibilities and their current carrying capabilities are described in Table 2), or directly to the PE/PEN busbar. Doors, lids or plugged covers with metal hinges/fixtures, do need to be connected to the protective circuits with separate conductors, if they carry devices with a supply voltage exceeding ELV*. In such case the highest rated current level is used for conductor dimensioning. NOTE: Certain exposed conductive parts of an xEnergy assembly do not need to be connected to a protective conductor, either because they cannot be touched on large surfaces or grasped with the hand; Further because of their small size (~50 x 50mm); Or they are located as to exclude any contact with live parts. (Eg.: screws, rivets, nameplates also magnetic cores of transformers, contactors or relays. Certain parts of releases or similar irrespective of their size.) *) ELV – Extra Low Voltage; Eg.: The Low Voltage Directive 2014/35/EU do consider voltage levels below or equal to 50V AC or 75V DC as ELV.

Table 1

Rated Operational Current I_e [A]	**Minimum cross-sectional area of a protective copper conductor [mm²]**
$I_e \leq 20$	Equal to the used phase conductor cross section
$20 \leq I_e \leq 25$	2,5
$25 \leq I_e \leq 32$	4
$32 \leq I_e \leq 63$	6
$63 \leq I_e$	10

Eaton Industries (Austria) GmbH
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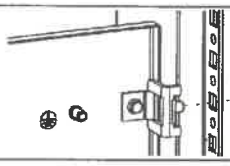
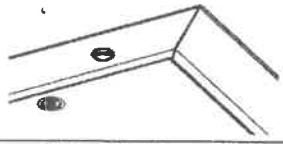
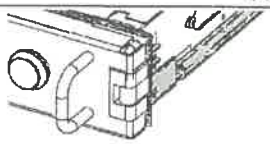
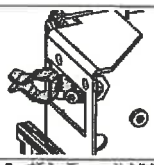
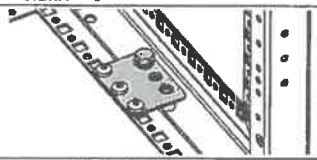
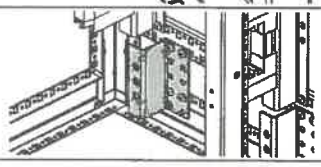
Table 2

Fixture		Joule Integral E_{th} [A²s]
Welded Bolt - M6 (provided on planking parts)		4,7 x 10^6
M6 x 12 self-tapping screw (min. 1,25 mm sheetsteel; eg.: side-, rear- and front-panels)		2,1 x 10^6
Withdrawable unit (XMW) to structure (disconnected, test or connected position)		1 x 10^4
Plug In Unit to structure (XMR) sliding contact		1 x 10^4
Earthing Spot to frame (XLASAE) (3 screws to frame)		6,3 x 10^6
PE/PEN Busbar Support to frame (XBSP/XBSPF) (min. 3 screws to frame)		6,3 x 10^6

The current carrying capacity of the above mentioned connections is based on tests and considering adiabatic behavior of the connections, Current level and time can vary based on the ratio given by the formulas below.

I_{th} ... Thermal equivalent short-time current [A]
t ... Current carrying time [s]
E ... Short time current carrying capacity [A²s]

$$E_{th} = {I_{th}}^2 \times t \qquad I_{th} = \sqrt{\frac{E_{th}}{t}} \qquad t = \frac{E_{th}}{{I_{th}}^2}$$

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Eaton Industries Austria GmbH
Product Line Low Voltage Systems

i.A.

DI(FH) Georg Reuberger
Manager Engineering Low Voltage Systems

i.A.

Johannes Thaller
Head of Product Management Low Voltage Systems