

Test Report

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Tested by	: quality assurance	Date	: September 30, 2019
Tables	: 5	Figures	: 13

1. Customer

Exteh d.o.o.
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2. Purpose

Temperature rise test for a three way feeder pillar fabricated by EXTEH with JEAN MÜLLER NH fuse switch disconnectors size 2.

3. Test requirements

Temperature rise test according IEC 61439-1: 2011 for a three way feeder pillar fabricated by EXTEH.

4. Test sample

Three way feeder pillar EXTEH
Strip type fuse switch disconnector type SL2 DELTA

Article number: S-KRO 00 (3+0)
Article no.: L2031001 (29.07.2019)



figure 1: test object

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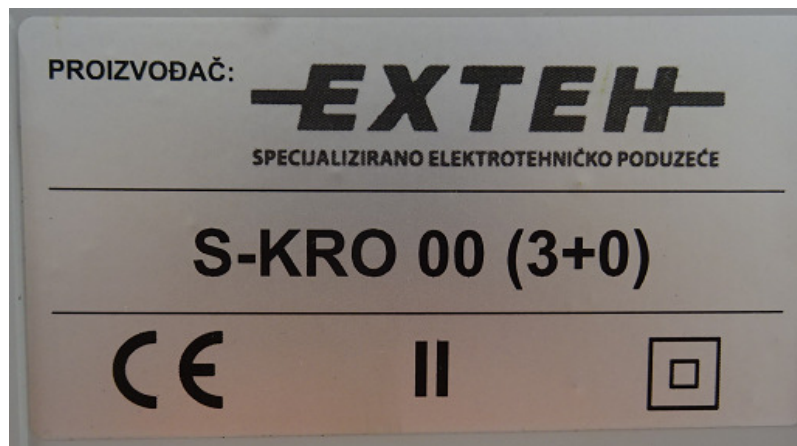


figure 2: type of feeder pillar

EXTEH d.o.o.		CE	
Norma: HRN EN 61439-1 HRN EN 61439-2 HRN EN 61439-5			
Naziv:	Samostojeći kabelski razvodni ormar		
Tip:	S-KRO 00 (3+0)		
Napon:	230/400V	Struja: 400 A	50 Hz
Zaštita:	IP 44	RDF - 0,9	IK 10
Tv. br.:	Država podrijetla: EU		

figure 3: technical data of feeder pillar

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5. Measuring instruments

test equipment	type	variant
P1608820/001	humidity sensor	sensor system
P1608920/001	barometric pressure sensor	sensor system
P0908611/033	clamp meter	Fluke 355
P0908611/006	multimeter	Metrawatt M2007
P0908611/018	multimeter	Metrawatt Metrahit Pro
P0908611/023	multimeter	Metrawatt Metrahit Pro
P0908611/024	multimeter	Metrawatt Metrahit Pro
P0908611/025	multimeter	Metrawatt Metrahit Pro
P0908611/029	multimeter	Metrawatt Metrahit Pro
P0806820/019	temperature data logger	Ahlborn (49-times)
P0927211/016	current transformer	500/5
P0927211/017	current transformer	500/5
P0927211/018	current transformer	500/5
P0927211/028	current transformer	500/5
P0927211/029	current transformer	500/5
P0927211/030	current transformer	500/5
P0505220/149	torque wrench	10-50 Nm
P0907411/010	Resistance measuring bridge	MICROHM 300/93

Table 1: Measuring instruments used

type	display reading
rel.hum.	53,3 %
atm. Pressure	997 mbar

Table 2: Climate conditions

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6. Test setup

- Busbar (30x10)mm copper / tin coated
- Torque connection strip to busbar: 35Nm
- Torque cable connection: 35Nm
- Cross section cables: 240mm² copper round with cable lug
- Test current in-comer: three-phase 400A ac ±1%



figure 4: test setup

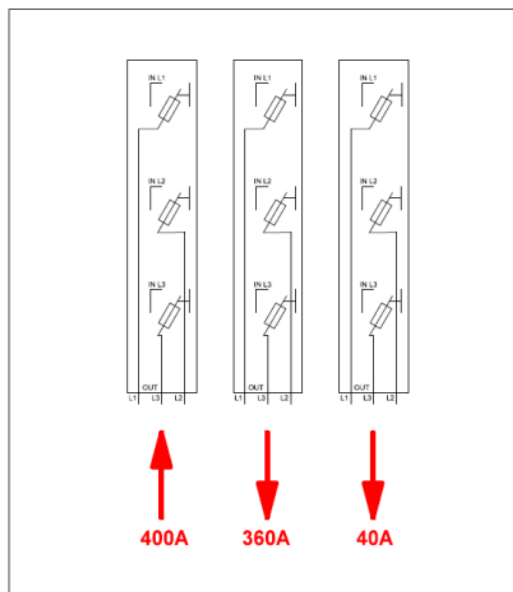


figure 5: test setup

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6.1. Temperature-measuring-points

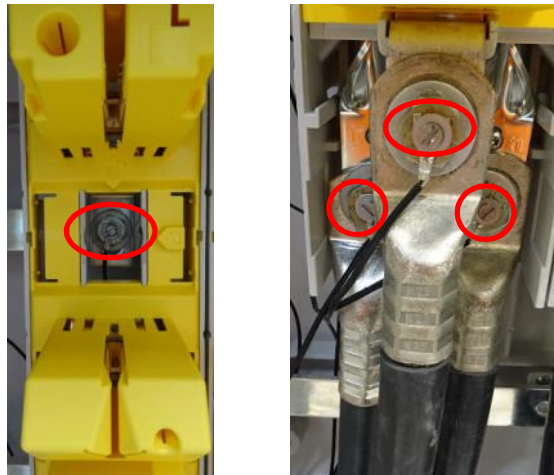


figure 6: Angular lug to busbar, cable connection L1 – L3



figure 7: Handle, cover L1, internal ambient temperature

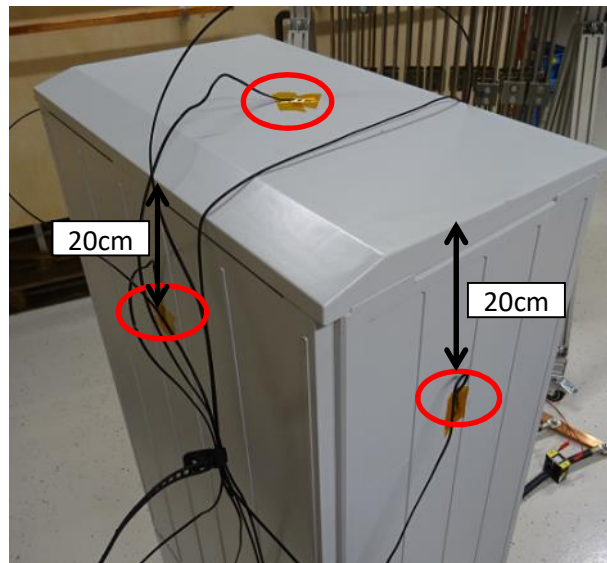


figure 8: Outside rear wall, roof middle, left side

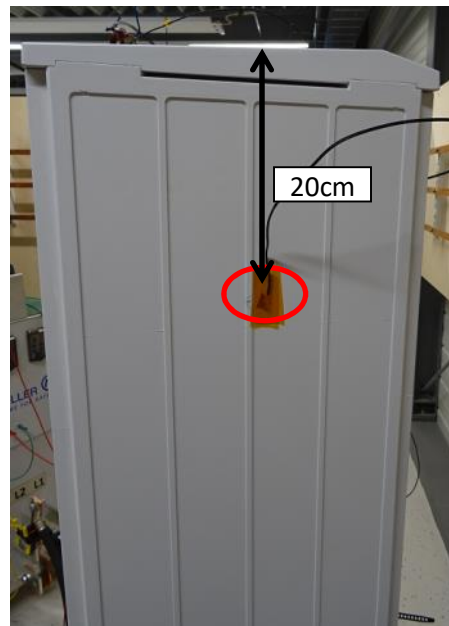


figure 9: Outside right side



figure 10: Outside front door, handle

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The base of the cabinet is insulated in ground level with 50mm of polystyrene.



figure 11: insulation of base

6.2. Used fuse links

Test 1								
Strip	I _{test} [A]	Phase	R _i [μΩ]	Power loss [W] (catalogue)	I [A]	U [V]	Article no.	Produced
1 incomer	400	L1	143	30,5	400	500	JEAN MÜLLER N2016205	07/2018
		L2	134					
		L3	142					
2 outgoing	360	L1	141					
		L2	131					
		L3	131					
3 outgoing	40	L1	140					
		L2	135					
		L3	140					
Test 2								
Strip	I _{test} [A]	Phase	R _i [μΩ]	Power loss [W] (catalogue)	I [A]	U [V]	Article no.	Produced
1 incomer	400	L1	125	26,8	400	500	HAGER LNH2400T	week 32/18
		L2	127					
		L3	126					
2 outgoing	360	L1	126					
		L2	125					
		L3	126					
3 outgoing	40	L1	140	30,5	400	500	JEAN MÜLLER N2016205	07/2018
		L2	135					
		L3	140					

table 3: Used fuse links

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7. Results

7.1. Test 1: RDF 0,9 with JEAN MÜLLER fuse links

No.		Measuring points	Temp. [°C]	Temp. rise [K]	Permissible max. temp. Rise limit [K]	Temp. difference to standard [K]
RT1	--	ambient temperature 1	22,9		--	--
RT2	--	ambient temperature 2	23,1		--	--
1	iv strip 1 - incomer	angular lug to busbar L1	115,3	92,3	105	12,7
2		angular lug to busbar L2	102,8	79,8	105	25,2
3		angular lug to busbar L3	88,9	65,9	105	39,1
4		cable connection L1	81,5	58,5	70	11,5
5		cable connection L2	84,4	61,4	70	8,6
6		cable connection L3	91,8	68,8	70	1,2
7		handle	59,9	36,9	25+25 *)	13,1
8		cover L1	99,3	76,3	--	--
11	iv strip 2 - outgoing	angular lug to busbar L1	111,0	88,0	105	17,0
12		angular lug to busbar L2	99,0	76,0	105	29,0
13		angular lug to busbar L3	85,5	62,5	105	42,5
14		cable connection L1	77,6	54,6	70	15,4
15		cable connection L2	75,9	52,9	70	17,1
16		cable connection L3	78,2	55,2	70	14,8
17		handle	60,2	37,2	25+25 *)	12,8
18		cover L1	95,5	72,5	--	--
21	iv strip 3 - outgoing	angular lug to busbar L1	101,8	78,8	105	26,2
22		angular lug to busbar L2	89,1	66,1	105	38,9
23		angular lug to busbar L3	77,9	54,9	105	50,1
24		cable connection L1	40,7	17,7	70	52,3
25		cable connection L2	38,7	15,7	70	54,3
26		cable connection L3	39,6	16,6	70	53,4
27		handle	54,7	31,7	25+25 *)	18,3
28		cover L1	65,6	42,6	--	--
29	I	internal ambient temperature	88,7	65,7	--	--
30	cabinet	outside rear wall	48,3	25,3	40	14,7
31		outside roof middle	62,2	39,2	40	0,8
32		outside left	45,3	22,3	40	17,7
33		outside right	40,2	17,2	40	22,8
34		outside front door	46,3	23,3	40	16,7
35		door handle	25,9	2,9	25	22,1

table 4: Results test 1 with JEAN MÜLLER fuse links

*) IEC 61439-1, table 6 index c: Manual operating means within ASSEMBLIES which are only accessible after the ASSEMBLY has been opened, for example draw-out handles which are operated infrequently, are allowed to assume a 25 K increase on these temperature-rise limits.

The test was passed.

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7.2. Test 2: RDF 0,9 with HAGER fuse links

No.		Measuring points	Temp. [°C]	Temp. rise [K]	Permissible max. temp. Rise limit [K]	Temp. difference to standard [K]
RT1	--	ambient temperature 1	23,1		---	---
RT2	--	ambient temperature 2	23,1		---	---
1	lv strip 1 - in-comer	angular lug to busbar L1	112,7	89,6	105	15,4
2		angular lug to busbar L2	99,8	76,7	105	28,3
3		angular lug to busbar L3	88,3	65,2	105	39,8
4		cable connection L1	82,0	58,9	70	11,1
5		cable connection L2	84,5	61,4	70	8,6
6		cable connection L3	92,7	69,6	70	0,4
7		handle	58,5	35,4	25+25 *)	14,6
8		cover L1	88,1	65,0	--	--
11	lv strip 2 - outgoing	angular lug to busbar L1	108,6	85,5	105	19,5
12		angular lug to busbar L2	96,1	73,0	105	32,0
13		angular lug to busbar L3	84,5	61,4	105	43,6
14		cable connection L1	77,3	54,2	70	15,8
15		cable connection L2	75,0	51,9	70	18,1
16		cable connection L3	79,1	56,0	70	14,0
17		handle	57,8	34,7	25+25 *)	15,3
18		cover L1	79,9	56,8	--	--
21	lv strip 3 - outgoing	angular lug to busbar L1	99,7	76,6	105	28,4
22		angular lug to busbar L2	86,7	63,6	105	41,4
23		angular lug to busbar L3	76,9	53,8	105	51,2
24		cable connection L1	40,5	17,4	70	52,6
25		cable connection L2	38,6	15,5	70	54,5
26		cable connection L3	39,4	16,3	70	53,7
27		handle	53,6	30,5	25+25 *)	19,5
28		cover L1	64,2	41,1	--	--
29	cabinet	internal ambient temperature	87,5	64,4	--	--
30		outside rear wall	46,7	23,6	40	16,4
31		outside roof middle	60,4	37,3	40	2,7
32		outside left	43,7	20,6	40	19,4
33		outside right	40,0	16,9	40	23,1
34		outside front door	44,8	21,7	40	18,3
35		door handle	25,6	2,5	25	22,5

table 5: Results test 2 with HAGER fuse links

*) IEC 61439-1, table 6 index c: Manual operating means within ASSEMBLIES which are only accessible after the ASSEMBLY has been opened, for example draw-out handles which are operated infrequently, are allowed to assume a 25 K increase on these temperature-rise limits.

The test was passed.

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8. Appendix – Possibilities to improve the product

The fuse strips are mounted without any gap in between. The temperature of the strips can be reduced if they are mounted at a distance. This has also a positive influence on the lifetime of the fuse links and the strips.



figure 12: Fuse strips close to each other

The busbars are not straight which reduces the possible contact points between strip and busbar.



figure 13: Busbars not straight

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