LOCCIONI

northvolt

PROTECTION DEVICES

03NAB20001--

From data to value

loccioni.com

Project **Northvolt Discharging Station**
03NAB20001--

Issue Date 13/10/2023

Customer Northvolt AB
reg. no. 559015-8894
Gamla Brogatan 26 SE-111 20
Stockholm Sweden

To the k.a. of:

Mats Larsson
Mikael Thorslund

General Impianti srl Via Collefreddo 8/9 16, 60030 Maiolati spontini, Ancona, Italy
Phone +39 0731 8161 Fax +39 0731 814700 info@loccioni.com
C.F. – P. Iva 00686250424
www.loccioni.com

General Impianti Srl

Antonio Giovannelli
Andrea Sottanelli
Key account Manager
antonio.giovannelli@revoltsrl.it
a.sottanelli@loccioni.com

Andrea Cascavilla
Project Engineer
a.cascavilla@loccioni.com

Matteo Marchetti
Project Manager
matteo.marchetti@loccioni.com

TABLE OF REVISIONS

Rev.	Date	Addendum	Author	Approved by
00	12/10/2023	First issue	M. Malandra	A. Cascavilla

INDEX

Glossary

Term	Definition
AFE	Active Front End
Customer	Northvolt AB
EMS	Energy Management System
Loccioni	General Impianti Srl
SOH	Battery State Of Health
BMS	Battery Management System
ESS/BESS	Battery Energy Storage System
PCS	Power Conversion System
PPE	Personal Protective System
SOC	State of Charge
SPD	Surge Protection Device
RCD	Residual Current Device
AC	Alternating Current
DC	Direct Current

1 ABOUT

This document aims to show and describe all the protection devices participating in the system electrical protection.
An overall description of the protection functions will be provided as well.

2 PROTECTION DEVICES

Over Current Protection			
Section	**Tag**	**Device**	**Function**
AC	FC31	Molded Case Circuit Breaker	It protects cables and devices from short circuit and overload
	FC32, FC301÷308, FC313. FC314, FC317, FC319, FC320, FC323÷330, FC340÷343	Modular Thermal Magnetic Circuit Breakers	They protect cables and devices from short circuit and overload
	FU301, FU302, FU304 FU312, FU313, FU101÷103, FU104	AC Fuses	They protect cables and devices from short circuit and overload.
DC	FU105/106, FUIMD+/-, FU601/602, FU603/604, FU605/606, FU701/702, FU703/704, FU705/706. FU801/802, FU803/804, FU805/806, FU901/902, FU903/904, FU905/906, FC610, FC611, FC612, FC710, FC711, FC712, FC810, FC811, FC812, FC910, FC911, FC912, FU401/402, FU403/404, FU405/406, FU407/408,	DC Fuses	They protect cables and devices from short circuit and overload.

	FU409/410, FU411/412, FU501/502, FU503/504, FU505/506/, FU507/508, FU509/510, FU511/512		
Surge Protection			
AC	SPD0	SPD (Surge Protection Device)	It is a voltage limiting SPD useful to protect low voltage application from direct and indirect lightning strikes
Protection from Direct Contact			
		Safety Enclosures	These enclosures are used as a protection from accidental contacts
Protection from Indirect Contact			
AC	FC309, FC312, FC316, FC318	RCD (Residual Current Device)	They protect against indirect contacts
DC	IMD1	Insulation Monitoring Device	In earth-insulated distribution systems, it monitors the insulation level and signals the first fault to earth.
Other Protections			
	INV01, DC601÷603, DC701÷703, DC801÷803, DC901÷903,	PCS undervoltage alarm	It disconnects the system under a programmable threshold

	INV01, DC601÷603, DC701÷703, DC801÷803, DC901÷903,	PCS overvoltage alarm	It disconnects the system over a programmable threshold
	INV01, DC601÷603, DC701÷703, DC801÷803, DC901÷903,	PCS overcurrent alarm	It disconnects the system over a programmable threshold
	INV01, DC601÷603, DC701÷703, DC801÷803, DC901÷903,	PCS underfrequency alarm	It disconnects the system under a programmable threshold
	INV01, DC601÷603, DC701÷703, DC801÷803, DC901÷903,	PCS overfrequency alarm	It disconnects the system over a programmable threshold
	FC31, KM101, KDC6.1+/-, KDC6.2+/-, KDC6.3+/-, KDC7.1+/-, KDC7.2+/-, KDC7.3+/-, KDC8.1+/-, KDC8.2+/-, KDC8.3+/-, KDC9.1+/-, KDC9.2+/-, KDC9.3+/-, QB401÷406, QB501÷506, FFU, T154, BJB1, GDU1, KM1001, SBJ800, SBJ801, SBJ900, SBJ901,	Emergency Circuit	The emergency circuit can be triggered by several signals and actions. When the emergency circuit is activated, it can open: • The main circuit breaker (FC31) • The AC contactor (KM101) and/or the DC contactors in the DC/DC Converter Cabinets. • The disconnectors present in the Power Battery Container • Furthermore, the emergency circuit can send a quick stop signal to the inverter.

			The emergency circuit can be activated by: • Firefighting Unit. • Thermal Protection Unit, that monitors the winding and core temperature of the transformer. • Safety Switch Door Contact, that trips the alarm if the transformer room door is opened while the transformer is functioning. • Gas Detective Unit, that monitors the presence of anomalous gases in the battery containers. • Pushbuttons, each one present in the discharge container, battery containers and in the customer's control room.

Product data sheet
Characteristics

GV2ME32
Motor circuit breaker, TeSys GV2, 3P, 24-32 A, thermal magnetic, screw clamp terminals

Green Premium

Main

Range	TeSys
Product name	TeSys GV2
Device short name	GV2ME
Device application	Motor
Trip unit technology	Thermal-magnetic

Complementary

Poles description	3P
Network type	AC
Utilisation category	AC-3 conforming to IEC 60947-4-1 Category A conforming to IEC 60947-2
Network frequency	50/60 Hz conforming to IEC 60947-4-1
Fixing mode	35 mm symmetrical DIN rail: clipped Panel: screwed (with adaptor plate)
Operating position	Any position
Motor power kW	15 KW at 400/415 V AC 50/60 Hz 18.5 KW at 500 V AC 50/60 Hz 22 KW at 690 V AC 50/60 Hz
Breaking capacity	3 KA Icu at 690 V AC 50/60 Hz conforming to IEC 60947-2 50 KA Icu at 230/240 V AC 50/60 Hz conforming to IEC 60947-2 6 KA Icu at 440 V AC 50/60 Hz conforming to IEC 60947-2 4 KA Icu at 500 V AC 50/60 Hz conforming to IEC 60947-2 10 KA Icu at 400/415 V AC 50/60 Hz conforming to IEC 60947-2
[Ics] rated service short-circuit breaking capacity	100 % at 230/240 V AC 50/60 Hz conforming to IEC 60947-2 75 % at 690 V AC 50/60 Hz conforming to IEC 60947-2 75 % at 500 V AC 50/60 Hz conforming to IEC 60947-2 50 % at 400/415 V AC 50/60 Hz conforming to IEC 60947-2 50 % at 440 V AC 50/60 Hz conforming to IEC 60947-2
Control type	Push-button
[In] rated current	32 A
Trip unit rating	24…32 A
Magnetic tripping current	416 A
[Ue] rated operational voltage	690 V AC 50/60 Hz conforming to IEC 60947-2
[Ui] rated insulation voltage	690 V AC 50/60 Hz conforming to IEC 60947-2
[Ith] conventional free air thermal current	32 A conforming to IEC 60947-4-1
[Uimp] rated impulse withstand voltage	IEC 60947-2 6 kV
Power dissipation per pole	2.5 W
Mechanical durability	100000 Cycles

Maximum operating rate	25 Cyc/H
Rated duty	Continuous conforming to IEC 60947-4-1
Connections - terminals	Screw clamp terminals 2 cable(s) 1…6 mm² solid Screw clamp terminals 2 cable(s) 1.5…6 mm² flexible without cable end Screw clamp terminals 2 cable(s) 1…4 mm² flexible with cable end
Tightening torque	1.7 N.M on screw clamp terminals
Suitability for isolation	Yes conforming to IEC 60947-1
Phase failure sensitivity	Yes conforming to IEC 60947-4-1
Height	89 Mm
Width	45 Mm
Depth	78.5 Mm
Net weight	0.26 Kg

Environment

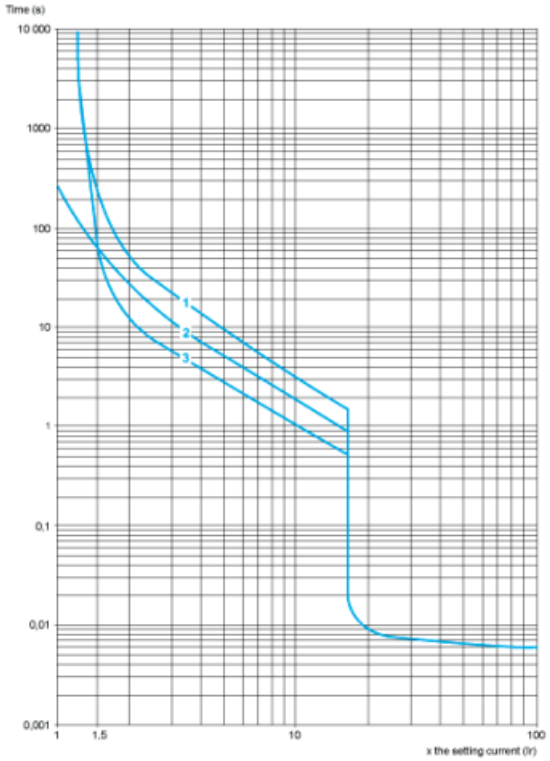
Standards	EN/IEC 60947-2 EN/IEC 60947-4-1 CSA C22.2 No 60947-4-1 UL 60947-4-1
Product certifications	IECEE CB Scheme UL CSA CCC EAC ATEX BV LROS (Lloyds register of shipping) DNV-GL RINA
Protective treatment	TH
IP degree of protection	IP20 conforming to IEC 60529
IK degree of protection	IK04
Ambient air temperature for operation	-20…60 °C
Ambient air temperature for storage	-40…80 °C
Fire resistance	960 °C conforming to IEC 60695-2-1
Operating altitude	2000 m

Packing Units

Unit Type of Package 1	PCE
Number of Units in Package 1	1
Package 1 Weight	281.67 G
Package 1 Height	4.6 Cm
Package 1 width	8.7 Cm
Package 1 Length	9.4 Cm

Thermal-Magnetic Tripping Curves for GV2ME and GV2P

Average Operating Times at 20 °C Related to Multiples of the Setting Current



1 3 poles from cold state
2 2 poles from cold state
3 3 poles from hot state

Current Limitation on Short-Circuit for GV2ME and GV2P (3-Phase 400/415 V))

Dynamic Stress

I peak = f (prospective Isc) at 1.05 Ue = 435 V

Surge Protection Device:
ZOTUP SPD for low voltage

L 13/40 230 ff

L 13/40 230 ff is a limiting type surge arrester with the following applications, features and benefits.
Typical locations: in Main Distribution Boards (MDB) or at the origin of low voltage systems.

- **Impulse test classification: class I and II tests** (according to IEC 61643-11 Ed. 1.0 2011-03);
- L 13/40 230 ff is a voltage limiting SPD useful to protect low voltage applications against direct and indirect lightning strikes;
- **Overcurrent protection is not required for Isccr ≤ 4,5 kA rms;**
- Short circuit current up to 100 kA rms with max. back-up fuse;
- It is a **NFC No Follow Current®** SPD because it prevents the circulation of grid follow up currents after operation;
- **Three coloured levels Status Indicator with progressive indication of performance**;
- The special case allows to match the Pollution Degree 3 (Conductive pollution or dry non conductive pollution that becomes conductive due to condensation occurs. To be found in industrial environment or construction sites (harsh environments);
- Surge protection device with different discharge capacity and maximum continuous voltage can be supplied under request.

TECHNICAL DATA

Type L 13/40...			230 ff
CODE			**204 100**
Nominal ac Voltage		U_N	230/400 V ac
Number of poles			1
Max Continuous Operating Voltage		U_c	335 V ac / 420 V dc
Test Class (acc. to IEC 61643-11 Ed. 1.0 2011-03)			I e II
Type (acc. to CEI EN 61643-11 2012-10)			T1 e T2
Impulse discharge current (10/350)		I_{imp}	13 kA
Nominal discharge current (8/20 µs)		I_n	25 kA
Max. discarge current (8/20 µs)		I_{max}	70 kA
Voltage protection level with I:	1 kA	U_p	≤ 0,80 kV
	13 kA	U_p	≤ 1,25 kV
	20 kA	U_p	≤ 1,35 kV
	25 kA	U_p	≤ 1,50 kV
	40 kA	U_{res}	≤ 1,80 kV
Reaction time		t_a	≤ 25 ns
Short circuit current withstand			0CFM
Short Circuit Current withstand with max overcurrent protection fuse (L)		I_{scc}	100 kA rms
Max- mains-side (L) overcurrent protection for Iscc	≤ 4,5 kA eff		Not required
	≤ 100 kA eff		125/160 A gG*
Prevents follow up current circulation			NFC No Follow Current®
Status indicator			3 coloured levels with performance's indication
Operating temperature range			-40 .... +80 °C
Terminal-Conductor size			4-25 mm² stranded
Clamp per Connecting bus bar			connector busbar16 mm²
Mounting			indoor, 35 mm top hat DIN rail
Case material / flammability grade			BMC / V-0 in accordance with UL 94
Pollution degree			3
Degree of protection		IP	20
Approximate weight			140 g
Dimensions width			17,5 mm (1 module)
Certification			CTI

Type L 13/40...with remote signal contact			230 ff
CODE			**214 100**
Remote signal contact			Volt free changeover contact
Switch conductor size			max. 1,5 mm² stranded
Switching capacity			ac: 250 V / 0,1 A – dc: 125 V / 0,2 A ; 75 V / 0,5 A

*with fuse 125 A gG Iimp= 10 kA and Imax= 40 kA

Protistor® size 70 aR

1200VDC (IEC)

SEMICONDUCTOR PROTECTION FUSES

SQUARE BODY HIGH-SPEED FUSE-LINKS DC PROTECTION

Mersen DC offers provide a very high performant protection for railway power and auxiliary circuits. Mersen DC Semiconductor fuse-links were developed to provide improved performance required by today's new DC equipment. These fuse-links are typically operated at more elevated temperature than other fuse type, have lower I^2t to minimize damage to protected components on short circuits, lower watts loss and longer life.

TECHNICAL DATA OVERVIEW

Voltage DC	1200 VDC
Ampere Range (A)	20 ... 215 A
Speed/Characteristic	aR
Product Size	70
Package	1
Weight	0.68 kg

FEATURES & BENEFITS

- Extremely fast acting
- Excellent cycling capability
- Very low I^2t
- Worldwide acceptability
- Current Limiting
- Superior Cycling Ability

APPLICATIONS

- Protection of inverters
- Protection of motor drives
- Protection of UPS systems
- Railway power and auxiliary circuits
- ESS Battery Rack protection up to 1500 VDC

STANDARDS

- IEC 60269-1 and IEC 60269-4 Compliance
- DC UL recognized component
  UL file E76491
  - 20A-215A, @1200VDC, L/R 10ms, 100KA
  - 20A-215A, @1500VDC, L/R 1-3ms, 100KA
- GB/T 13539.4-2016

RoHS

Protistor® size 70 aR
1200VDC (IEC)

PRODUCT RANGE

D70SF120V20QF

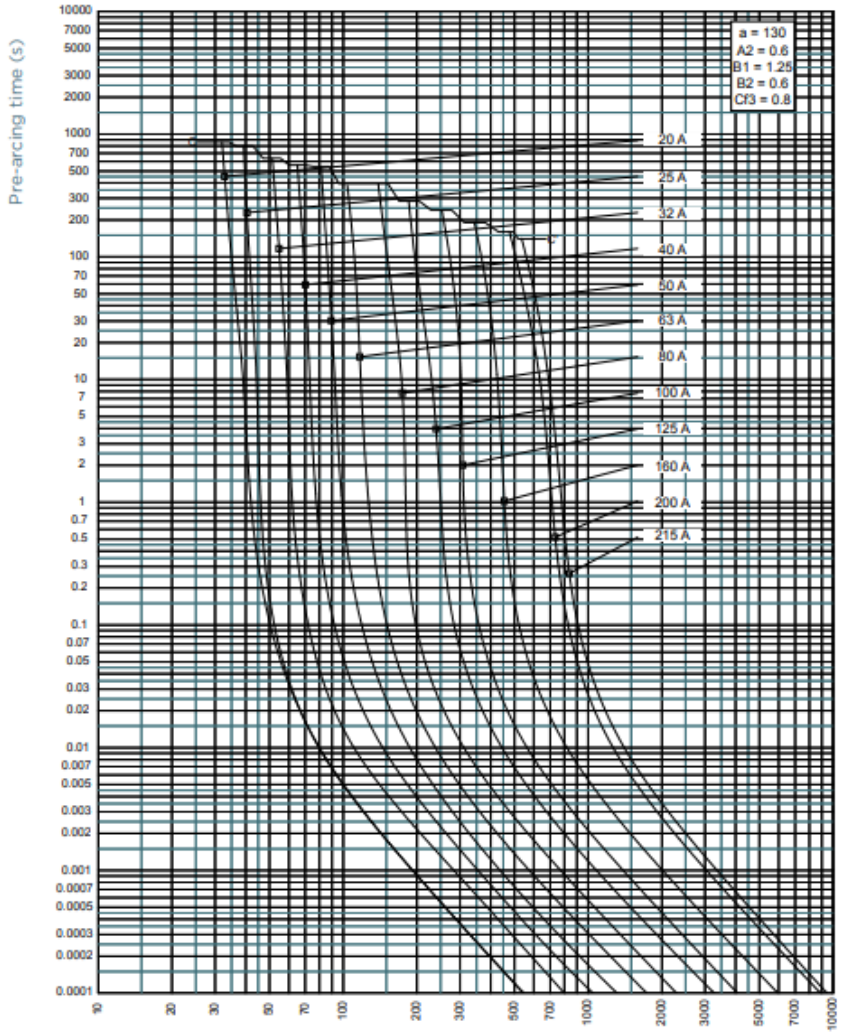
Size 70 aR 1200VDC(IEC), with striker

Catalog number	Item number	Rated voltage DC (IEC)	Rated current I_n	Rated breaking capacity DC	Max. total I^2t @1000V for L/R=15ms	Max. total I^2t @1000V for L/R=45ms	Power dissipation at I_n	Power dissipation at 0.8 I_n
D70SF120V20QF	C076638	1200 V	20 A	100 kA	0.18 kA²s	0.31 kA²s	10 W	4.5 W
D70SF120V25QF	S079435	1200 V	25 A	100 kA	0.18 kA²s	0.31 kA²s	15.5 W	7 W
D70SF120V32QF	T079436	1200 V	32 A	100 kA	0.35 kA²s	0.61 kA²s	18.5 W	8.5 W
D70SF120V40QF	V079437	1200 V	40 A	100 kA	0.58 kA²s	1 kA²s	22 W	10 W
D70SF120V50QF	W079438	1200 V	50 A	100 kA	1.03 kA²s	1.8 kA²s	26 W	12 W
D70SF120V63QF	X079439	1200 V	63 A	100 kA	1.6 kA²s	2.8 kA²s	33 W	15 W
D70SF120V80QF	Y079440	1200 V	80 A	100 kA	3.1 kA²s	5.4 kA²s	37.5 W	18.5 W
D70SF120V100QF	Z079441	1200 V	100 A	100 kA	5.8 kA²s	10 kA²s	44.5 W	21.5 W
D70SF120V125QF	A079442	1200 V	125 A	100 kA	9.2 kA²s	16 kA²s	54 W	28 W
D70SF120V160QF	B079443	1200 V	160 A	100 kA	19.2 kA²s	33.2 kA²s	64 W	34 W
D70SF120V200QF	C079444	1200 V	200 A	100 kA	45 kA²s	78.5 kA²s	65.5 W	35 W
D70SF120V215QF	D079445	1200 V	215 A	100 kA	55 kA²s	95 kA²s	89 W	46 W

Protistor® size 70 aR

1200VDC (IEC)

TIME CURRENT CHARACTERISTIC CURVES



Product data sheet
Characteristics

A9Q41225
Vigi iC60 - earth leakage add-on block - 2P - 25A - 30mA - AC type

Main

Range	Acti 9
Range of product	IC60 Reflex iC60
Product or component-type	Add-on residual current devices
Device short name	Vigi iC60
Poles description	2P
[In] rated current	25 A
Earth-leakage sensitivity	30 mA
Earth-leakage protection time delay	Instantaneous
Earth-leakage protection class	Type AC
Network type	AC
Network frequency	50/60 Hz
[Ue] rated operational-voltage	230/400 V AC 50/60 Hz conforming to EN 61009-1
Standards	EN 61009-1 IEC 61009-1
9 mm pitches	3

Complementary

Device location in system	Outgoer
Residual current tripping technology	Voltage independent
[Ui] rated insulation voltage	500 V AC 50/60 Hz conforming to IEC 60947-2
[Uimp] rated impulse withstand voltage	6 kV conforming to IEC 60947-2
Range compatibility	Acti 9 iC60
Product compatibility	Single terminal
Local signalling	Trip indicator
Mounting mode	Clip-on
Mounting support	DIN rail
Electrical connection to mcb	Plug in
Comb busbar and distribution block compatibility	Bottom : YES
Height	91 mm
Depth	73.5 mm
Product weight	0.165 kg
Connections - terminals	Tunnel type terminal downside 1 cable(s) 1...25 mm² rigid without cable end
Wire stripping length	14 mm (bottom)
Tightening torque	2 N.m (bottom)

Environment

IP degree of protection	IP20 conforming to IEC 60529
Pollution degree	3 conforming to IEC 60947-2
Electromagnetic compatibility	8/20 µs impulse withstand 250 A conforming to IEC 61009-1
Ambient air temperature for operation	-5...60 °C
Ambient air temperature for storage	-40...85 °C

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 0627 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold
Product environmental profile	Available
Product end of life instructions	Need no specific recycling operations

Contractual warranty

Warranty period	18 months

Product Life Status : Commercialised