Chloride™
Power to Protect

chloride.com

Chloride® NP90I

DC input-1 phase output

Chloride® NP90I

DC to AC inverter system

DC input - 1-phase output

1 Scope

This document describes a continuous duty DC voltage input, stand-alone, single phase Alternating Current (AC) output inverter system.

The Nuclear inverter range meets customers' technical specifications for nuclear power plant applications.

The Nuclear range is part of Chloride's know-how and 30-years relationship with Utilities, including those engaged in Nuclear power generation.

Chloride Industrial Power services include:

- Consultancy services
- Pre-engineering design and support
- Project Management (contract management, detailed engineering, documents for approval, manufacturing, product testing, witness-testing if requested, shipment, tailored user manual)
- Services (recommended commissioning spare parts, commissioning services, product lifetime spare parts, hotline, trainings, maintenance contracts, etc…)

2 General requirements

2.1. ISO certification

Chloride France S.A. is certified by the British Standard Institution (BSI), as a company with a total quality and environmental control system in accordance with the ISO 9001 and ISO 14001.

2.2. Applied standards

The Nuclear range of inverters shall have the CE mark in accordance with the Safety and EMC Directives 2006/95/EC and 2004/108/EC.
The Nuclear range of inverters is designed and manufactured in accordance with the following international standards:

- IEC60146 Semi conductor converters:
  - IEC60146-1-1 specifications of basic requirements
  - IEC60146-1-3 transformers and reactors
  - IEC60146-2 self-commutated semiconductor converters including direct dc converters.
- IEC60950 Safety of information technology equipment including electrical business equipment
- IEC60439 Low voltage switchgear and control gear assemblies
  - IEC60439-1 Type-tested and partially type-tested assemblies
  - IEC60439-2 Particular requirements for busbar trunking systems (busways)
  - IEC 60439-3 Particular requirements for LV switchgear and control gear assemblies intended to be installed in places where unskilled persons have access for their use – distribution boards
- IEC60529 Degrees of protection provided by enclosures (IP Code)
- IEC60726 Dry-type power transformers
- EN61000-6-2 Electromagnetic compatibility (EMC) Generic standards – Immunity for industrial environments
- IEC61000-6-4 Electromagnetic compatibility (EMC) Generic standards – Emission standard for industrial environments.
- IEC60068-2-6 Environmental testing - Test Fc. Vibration (sinusoidal).
- IEC60068-2-57 Environmental testing - Test Ff. Vibration. Time-history & sine-beat method.
- IEC60068-3-3 Environmental testing - Seismic test methods for equipment.

Our nuclear qualified products have a long history of reliability, proven performance, and exceptional quality. Our UPS product offering includes a complete line of Chargers, Inverters & Static Switches qualified to IEEE-650 (general & ageing), IEEE-344 (seismic), IEEE-323 (environmental) and RCC-E 2005 standards.

2.3. Nuclear quality program

The Chloride Industrial Power Quality Program meets the requirements of the nuclear industry.
Our quality program is structured to meet the requirements of:

- 10CFR50 Appendix B
- RCC-E 2005
- KTA 1401
- IAEA 50-C-Q
- NAQ-1
- SGAQ 2004/04 domaine IPS
- NTAQ07/0403 classe 1
- 10 CFR Part 21
- ISO9001 & ISO14001.

3 Range overview

The system described is a static inverter system as shown in Figure 1. The system operates on an analogue controlled IGBTs inverter. The nuclear range do not use any programmable component so that software qualification is not needed. By associating the system with a charger, a battery and by adding system components, such as paralleling kits, safety and disconnecting devices, it is possible to set up elaborated systems ensuring complete AC load protection.

3.1. The system

The inverter provides high quality AC power for electronic equipment loads. It offers the following features:

- Increased AC power quality
- Full compatibility with all types of loads
- Power blackout protection (for systems associated with battery)
- Design life up to 60 years, combined with an appropriate preventive maintenance
- Operation temperature of 0 to 40°C permanent.
- Operation under extreme earthquake conditions.

The inverter's function is to convert DC power from a DC source (a rectifier/charger or a battery circuit) to provide a clean and reliable AC output to power the AC load.

3.2. Models available

The Nuclear DC/AC 1P inverter range includes several kVA ratings output models as specified in paragraph 8. It is of the single-phase output type.

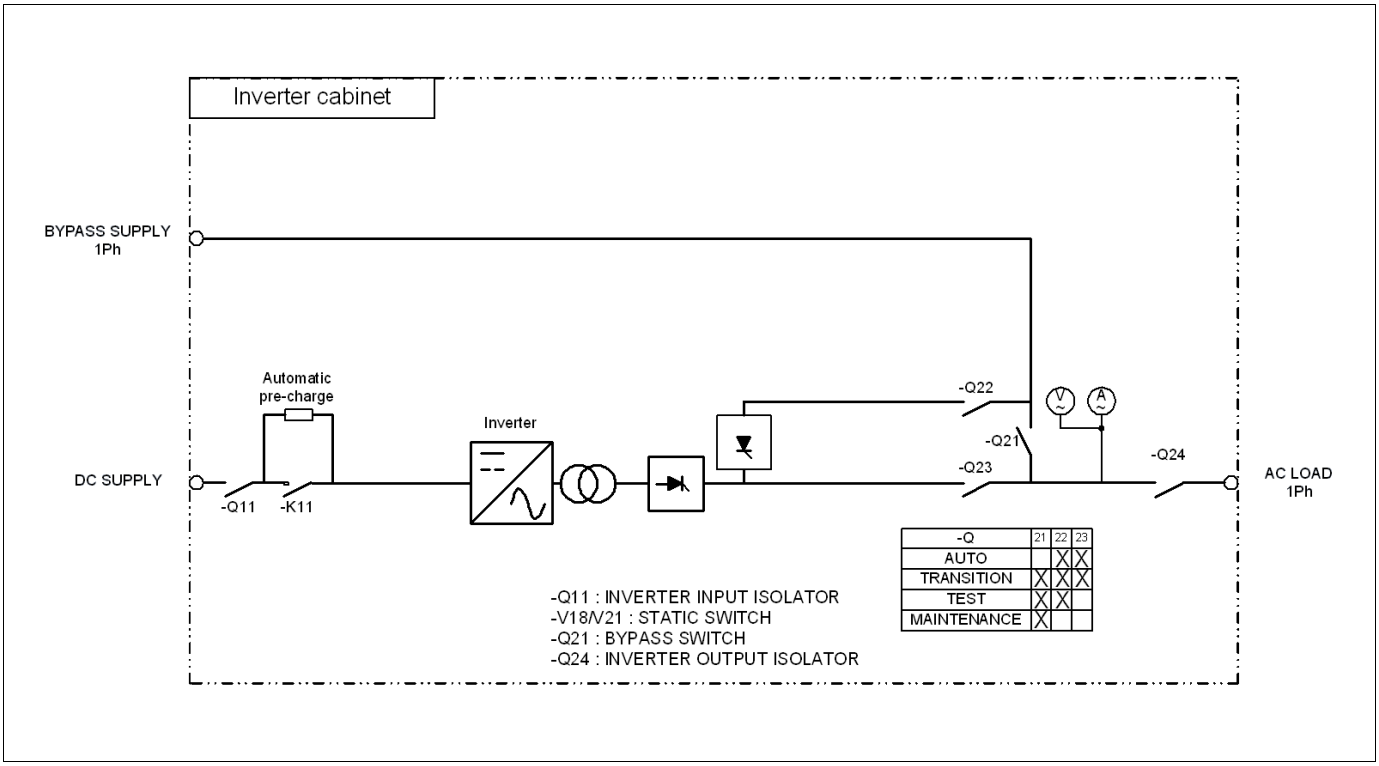


Figure 1: NUCLEAR inverter 1P single line diagram

4 System description

In this section, the main power electronic features and the operating modes of the Nuclear inverter range are described.

4.1. General description

The DC current taken from the DC source is converted to a sinusoidal and regulated AC voltage by an IGBTs inverter (Insulated Gate Bipolar Transistor), using PWM (Pulse Width Modulation). This means that the analogue control board drives the IGBTs so that the DC input voltage is divided into pulsed voltage to generate a low distortion sinewave AC output voltage with good transient response voltage regulation.
A transformer is provided at the output of the inverter bridge.

4.2. Components

- The inverter consists of the following major components:
- IGBTs bridge inverter
- One output transformer
- Electronic static switches
- Manual bypass switch
- One Control unit, based on one analogue control board
- Automatic pre-charge device
- Control and visualisation devices (meters, LEDs)

4.3. Operating modes

The Nuclear inverter operates as follow:

4.3.1. Normal operation

The critical AC load is continuously supplied by the inverter. The inverter derives power from the DC source and converts it into AC power for the critical load. The power loading can reach up to 110% of the inverter nominal rating without considering the inverter in overload conditions (when reserve supply is not available).

4.3.2. Overload operation

The inverter is considered in overload conditions when the load is beyond 105% of the inverter nominal rating and reserve supply is available.

Two cases are considered:
1) Reserve supply is available:
Upon overload detection by the inverter (above 105% of the inverter nominal rating), the static switch automatically transfers the load to reserve supply. The static switch automatically switches back the load to inverter 8 seconds after the inverter is back to normal conditions.

The reserve supply withstands overloads as shown on Figure 2.
2) Reserve supply is not available:
Upon overload detection by the inverter (above 110% and up to 150% of the inverter nominal rating):

- The system initiates a timer for a 10 minutes period.
- The AC load remains powered by the inverter for this 10 minutes period.
- Upon expiration of the 10 minutes delay, the inverter shuts down.

Upon overload detection by the inverter above 150% of the inverter nominal rating:

- The inverter keeps powering the AC load for 10 seconds after which it automatically shuts down.

This overload operation mode is shown in Figure 3.

4.3.3. Input supply failure

Upon fault of the input DC source, the inverter automatically detects it and immediately switches the load onto reserve supply without any break, unless the reserve supply is not present, in which case the load will not be supplied anymore.

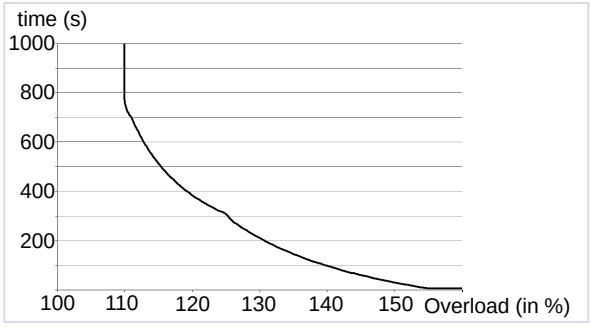


Figure 2: Reserve line overload capability

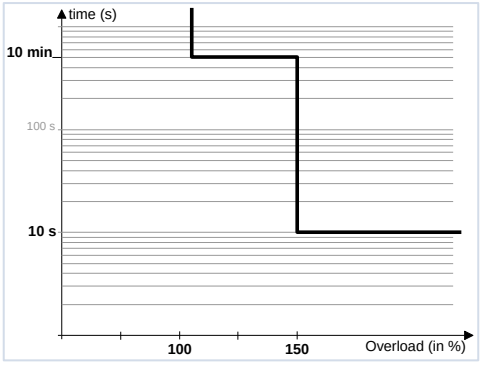


Figure 3: Inverter overload curve

4.3.4. Maintenance bypass operation

If for any reason the inverter has to be taken out of service for maintenance or repair, the Nuclear inverter is provided with a manual bypass switch. The bypass switch enables a load transfer to reserve supply without power interruption for the critical load. Bypass isolation is then complete, all serviceable components such as fuses, power modules etc. are isolated.
The transfer/retransfer is based on the make-before-break principle in order to secure the critical load: the transfer/retransfer operation is automatically accomplished by paralleling and synchronising the inverter output to the reserve supply, before closing or opening the bypass switch as appropriate.

4.4. Input supply accidental condition (Forsmark type)

4.4.1. Inverter behaviour

The Nuclear inverter range is designed to cope with the consequence on DC bus of a Forsmark accidental input supply failure. In such cases, the inverter keeps delivering the nominal and regulated output voltage (Uout), despite the DC input fluctuation (Udc) due to Forsmark effect (see figure below).

4.4.2. Static switch behaviour

The static switch of our nuclear range is designed for worst case. This means it is designed to keep supplying the load, no matter the events on the Mains power supply: If, for any reason, the inverter has to switch off, the static switch will automatically transfer the load to the reserve supply, even if the reserve supply network is out of specified tolerances.
Upon restoration of Mains power supply, the inverter will automatically restart and the static switch will automatically switch the load back onto the inverter.

NOTA
The static switch is designed to ensure full safety to the load: It is specifically designed to always switch the load onto the available power (even if this available power is out of specified tolerance).

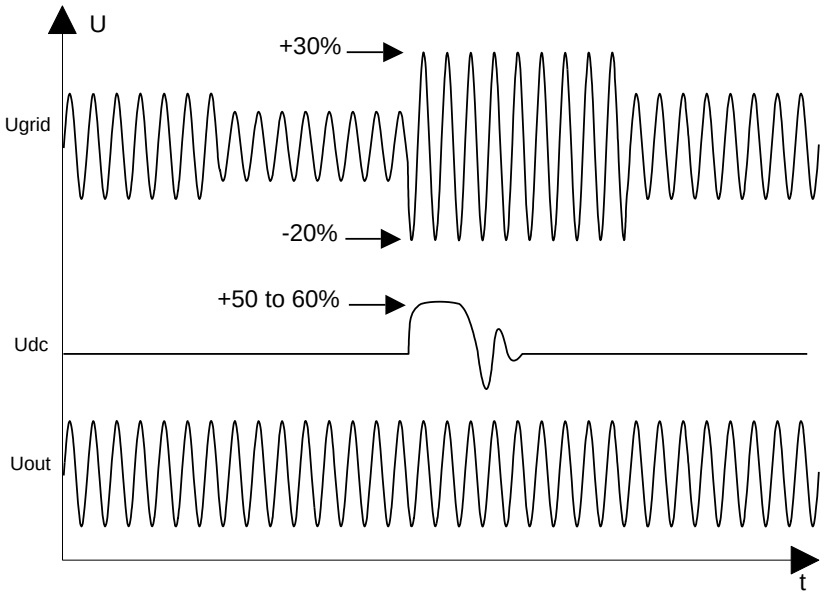


Figure 4: Forsmark case

4.5. Main electrical features

4.5.1. Output voltage harmonic distortion

The inverter provides harmonic neutralisation and filtering to limit the total harmonic distortion on the output voltage to less than 3% with a linear load. For reference non-linear load the total harmonic distortion complies with IEC62040-1-2.

4.5.2. Inverter short-circuit capacity

The Nuclear inverter short-circuit capacity is detailed in Figure 5.

NOTE:
Higher short circuit capability can also be offered upon request, such as the combination of the following:

- **6 x In /100 ms**
- **3.2 x In / 10 s**

Please note that such configurations may change the overall dimensions of the equipment.
Contact us for further details.

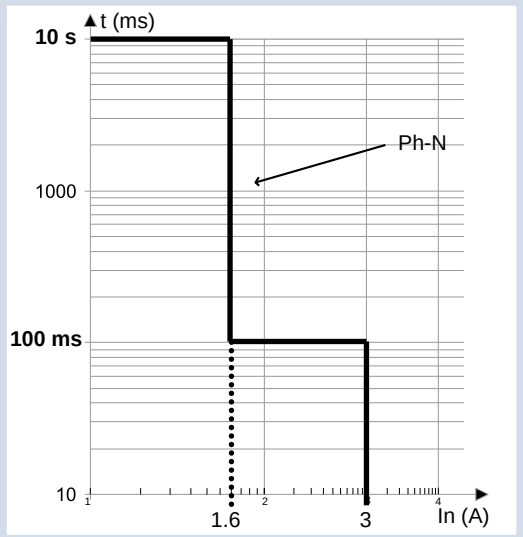


Figure 5: Nuclear inverter short circuit capacity – single phase output

4.5.3. Static Switch short-circuit capacity

The electronic static switch is capable of supporting the window of short-circuit currents as shown on Figure 6.

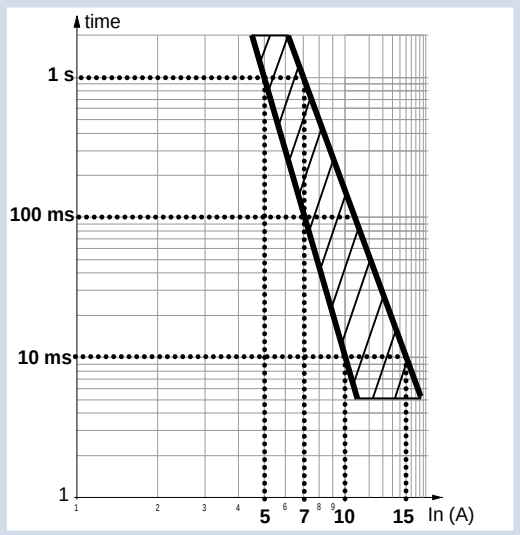


Figure 6: Nuclear range static switch short circuit capacity

5 Monitoring and Control Interfaces

The inverter incorporates the necessary controls, instruments and indicators to allow the operator to monitor the system status and performance and take any appropriate action. Furthermore, interfaces are available upon request, which allow extended monitoring and control, as well as service functions.

5.1. Light emitting diodes (LEDs)

The inverter includes 16 external Light Emitting Diodes (LEDs) to indicate the overall system operation status as well as thecondition of the functional blocks. LEDs operation is described in Figure 7.

LED colour	Description
Green	Load on Inverter
Yellow	Inverter not available
Red	Maintenance
Red	Bypass fault
Red	Inverter unsynchronised
Red	Overload / Inverter in current limit (Memorised)
Red	Inverter fault (S2 off to reset)
Red	Inverter AC overvoltage (Memorised)
Red	Inverter bridge fault (memorised)
Red	Inverter over temperature (memorised)
Red	DC High voltage
Red	Imminent shutdown
Red	End of discharge
Red	*Spare*
Red	*Spare*
Red	*Spare*

Figure 7: Nuclear inverter – Light Emitting Diodes (LED) operation description

5.2. On / off switch

Starting and Stopping the inverter is manually achieved via the front panel switch S2, available on the right part of the LED signalling panel (see Figure 8).

5.3. Measurements reading

2 analogue 72x72 measuring units (P21 and P22) are available as standard on the front panel of the equipment. These allow the user to visualise the inverter output AC voltage (P21) and the inverter output AC current (P22) – see Figure 8.

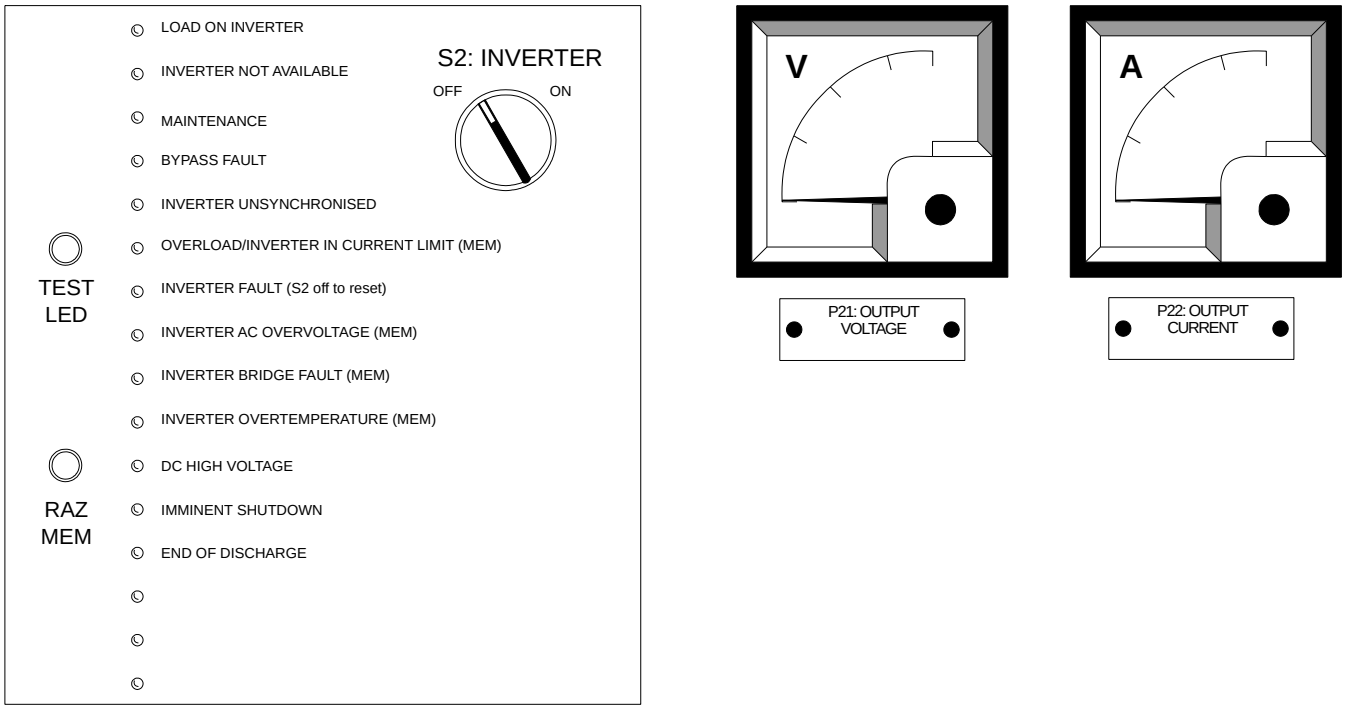


Figure 8: Nuclear inverter – Local human-machine interface.

5.4. Remote signalling and control signal

5.4.1. Logic outputs for remote indications

The Nuclear inverter is able to deliver several output information. Upon request, these output information can be made available on double-pole change-over (dpco) contacts (8A/250V AC1; 8A/30V DC1; 1A/60V DC1).

The following information can be made available on voltage-free contacts:

Inverter general alarm
Load on reserve
Inverter fault
Reserve supply fault

Further information can be added. Please consult us for more details.

When information is requested on voltage-free contact, connection of the customer cables is achieved on the identified, screw-clamp terminal blocks.

5.4.2. Logic inputs

The Nuclear inverter range allows the signalisation of specific alarms from the customer's environment and eventually takes the appropriate action on the inverter thanks to dedicated logic inputs available.

Among all possible function, the following logic inputs can be wired upon request:

Remote control on/off
Emergency power off

6 Mechanical data

6.1. Enclosure

The Nuclear inverter is housed in a space-saving modular enclosure including front doors and removable panels (standard external protection IP 20). The enclosure is made of sheet steel. The doors can be locked. The enclosure is of the floor mounted type.
For harsh environmental conditions (dust, water), a higher degree of protection, of up to IP42 is available in option.

6.2. Seismic build

Our Nuclear range of inverters is designed to meet any requirement of worldwide seismic spectrums (0.5 to 6g acceleration stress). This is basically achieved by selecting the appropriate cabinet among our choice of mechanical structures and rigorously applying nuclear dedicated manufacturing procedures.

Panel thickness is of 2mm on the complete nuclear range.

6.3. Ventilation

Fan-assisted air cooling is standard on the Nuclear inverter range.

The cooling air entry is in the base and the air exit at the top of the device. It is recommended that the enclosure is installed with at least 400 mm of free space between device and ceiling at the top in order to allow an unhindered cooling air exit.

6.4. Cable entry

Cable entry is achieved via the bottom of the cabinet. Top cable entry is also available upon request.

6.5. Enclosure design

All the surfaces of the enclosure are finished with an electrostatically applied powder-epoxy-polyester coat, cured at high temperature. Colour of the enclosure is RAL 7032 (pebble grey) textured semi-gloss. Specific surface finishing and colour of the enclosure are available upon request.

6.6. Cabling

Internal cables are halogen-free cables.These cables are of the flame-retardant type according to IEC 332-3 standard (LSF – Low Smoke Fume).

6.7. Components identification

Main components are identified by self-adhesive vinyl labels. In option, the Nuclear inverter offers the possibility to include specific component identification by engraved traffolyte labels.

6.8. Access to integrated subassemblies

All internal subassemblies are accessible for typical and most frequent maintenance from the front of the unit. Top access is available for replacement of cooling fans. Rear access is not required for installation or servicing. In any case and if side or rear access is required, the side and rear panels are removable.

6.9. Installation

The inverter is forkliftable from the front and equipped with lifting lugs to facilitate its installation on site. Chloride will issue calculation notes for fixing devices in order to meet on-site building requirements (e.g. Halfen rail, concrete anchors, bolts, etc…)

7 Environmental conditions

The Nuclear inverter is capable of withstanding any combination of the following environmental conditions. It operates without mechanical or electrical damage or degradation of operating characteristics.

7.1. Ambient temperature

The inverter is capable of operating permanently from 0° to 40°C.

7.2. Relative humidity

The inverter is capable of withstanding up to 90% humidity level (non-condensing) for an ambient temperature of 20°C.

7.3. Altitude

The maximum altitude without derating is 1000 metres above sea level.
Please consult us for operating the system above 1000 metres.

8 Technical data

Data common to the complete Nuclear inverter range

Inverter input

Nominal input voltage	(V)	See tables on the following pages
Input voltage tolerance	(%)	+18 / -20

Inverter output

Nominal output voltage		See tables on the following pages
Nominal output frequency		50 / 60 [factory setting selectable]
Overload at cos phi = 0.8	(%)	150 (10 min)
Short circuit capacity	(%)	300 (100 ms) / 160 (10 s) Option: 600 (100ms) / 320 (10 s)
Isolating transformer		Standard
Voltage stability (for 100% load variation):		
• Static	(%)	+/- 1% (+/-2% for paralleled systems)
• Dynamic	(%)	+/- 2% (+/-3% for paralleled systems)
Frequency response	(Hz/s)	1 (0.1 for inverters in parallel)
Frequency stability:		
• with own oscillator	(%)	+/- 0.05
• with reserve supply synchronisation	(%)	+/- 3 [adjustable]
Harmonic voltage distortion:		
• with 100% linear load	(%)	3
• with 100% non linear load	(%)	Complies with IEC 62040-1-2
Output crest factor admissible		3/1

Reserve supply input

Reserve input voltage	(V)	See tables on the following pages
Reserve input voltage tolerance	(%)	+/- 15 [adjustable from +/-5% to +/-20%]
Reserve input frequency	(Hz)	50 / 60 [factory setting selectable]
Reserve input frequency tolerance	(%)	+/- 3 [adjustable from +/-0.2% to +/-5%]

System data

External protection degree		IP 20
Internal protection degree		IP 20
Cable entry		Bottom
Access		Front
System design life	(years)	20 minimum, up to 60 with appropriate maintenance

Environmental data

Operating temperature	(°C)	0 to 40 (permanent operation)
Storage temperature	(°C)	0 to +70
Maximum relative humidity (non condensing)	(%)	<90
Operating altitude		1000 m (without system derating)

Data for 110 VDC (120 VDC) input systems

Input voltage: 110 VDC [120]

Output voltage: 110 VAC [115, 120] single phase

Ratings	(kVA)	**2.5**	**5**	**7.5**	**10**	**15**	**20**	**25**
Inverter input								
DC input voltage range	(V)	88 – 130						
DC current consumption(*)	(A)	22	44	65	87	128	171	214
Max DC current consumption(**)	(A)	27	55	81	108	160	214	267
Inverter output								
Nominal output current(*)	(A)	23	45	68	91	136	182	227
Reserve static switch								
Nominal input voltage AC	(V)	110 [115 / 120] – 1 phase + neutral						
Recommended type for reserve input protection		D curve (circuit breakers) or gL (fuses)						
System data								
Heat dissipation system(***)		F	F	F	F	F	F	F
Max System losses(**)	(W)	410	819	1143	1524	2118	2824	3529
Efficiency(*****)	(%)	83	83	84	84	85	85	85
System noise	(dBA)	60	61	62	62	63	68	68
Height	(mm)	1870	1870	1870	1870	1870	1870	1870
Width	(mm)	800	800	800	800	800	800	800
Depth	(mm)	800	800	800	800	800	800	800
Footprint	(m^2)	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Mass(****)	(kg)	290	310	330	340	360	480	530
Drawing code (see page 21)								
Code for general arrangement		BNi0	BNi0	BNi0	BNi0	BNi0	BNi0	BNi0

Ratings	(kVA)	**30**	**40**	**50**	**60**	**80**	**100**	**120**
Inverter input								
DC input voltage range	(V)	88 – 130						
DC current consumption(*)	(A)	257	342	423	504	677	846	1015
Max DC current consumption(**)	(A)	321	428	529	634	846	1057	1268
Inverter output								
Nominal output current(*)	(A)	273	364	455	545	727	909	1091
Reserve static switch								
Nominal input voltage AC	(V)	110 [115 / 120] – 1 phase + neutral						
Recommended type for reserve input protection		D curve (circuit breakers) or gL (fuses)						
System data								
Heat dissipation system(***)		F	F	F	F	F	F	F
Max System losses(**)	(W)	4235	5647	6512	7814	10419	13023	15628
Efficiency(*****)	(%)	85	85	86	86	86	86	86
System noise	(dBA)	68	70	71	71	74	75	75
Height	(mm)	1870	1870	1870	1870	1870	1870	1870
Width	(mm)	800	1200	1200	1200	2400	2800	3200
Depth	(mm)	800	800	800	800	800	800	800
Footprint	(m^2)	0.64	0.96	0.96	0.96	1.92	2.24	2.56
Mass(****)	(kg)	540	600	660	690	1090	1300	1380
Drawing code (see page 21)								
Code for general arrangement		BNi0	CNi0	CNi0	CNi0	on project	on project	on project

NOTA: *-(*) at full load (cos phi 0.8), at nominal 110 VDC input voltage, and at 110 VAC nominal output voltage*
-(**) at full load (cos phi 0.8) and low input voltage level
-(***) F: Fan cooling
-(****) For information only. Mass may vary according to configurations and options
-(*****) For tolerance, see IEC 60146-1-1

Data for 110 VDC (120 VDC) input systems

Input voltage: 110 VDC [120]

Output voltage: 230 [220 / 240] single phase

Ratings	(kVA)	**2.5**	**5**	**7.5**	**10**	**15**	**20**	**25**
Inverter input								
DC input voltage range	(V)	88 – 130						
DC current consumption(*)	(A)	22	44	65	87	128	171	214
Max DC current consumption(**)	(A)	27	55	81	108	160	214	267
Inverter output								
Nominal output current(*)	(A)	11	22	33	43	65	87	109
Reserve static switch								
Nominal input voltage AC	(V)	230 [220 / 240] – 1 phase + neutral						
Recommended type for reserve input protection		D curve (circuit breakers) or gL (fuses)						
System data								
Heat dissipation system(***)		F	F	F	F	F	F	F
Max System losses(**)	(W)	410	819	1143	1524	2118	2824	3529
Efficiency(*****)	(%)	83	83	84	84	85	85	85
System noise	(dBA)	60	61	62	62	63	68	68
Height	(mm)	1870	1870	1870	1870	1870	1870	1870
Width	(mm)	800	800	800	800	800	800	800
Depth	(mm)	800	800	800	800	800	800	800
Footprint	(m^2)	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Mass(****)	(kg)	290	310	320	340	360	470	520
Drawing code (see page 21)								
Code for general arrangement		BNi0	BNi0	BNi0	BNi0	BNi0	BNi0	BNi0

Ratings	(kVA)	**30**	**40**	**50**	**60**	**80**	**100**	**120**
Inverter input								
DC input voltage range	(V)	88 – 130						
DC current consumption(*)	(A)	257	342	423	507	677	846	1015
Max DC current consumption(**)	(A)	321	428	529	634	846	1057	1268
Inverter output								
Nominal output current(*)	(A)	130	174	217	261	348	435	522
Reserve static switch								
Nominal input voltage AC	(V)	230 [220 / 240] – 1 phase + neutral						
Recommended type for reserve input protection		D curve (circuit breakers) or gL (fuses)						
System data								
Heat dissipation system(***)		F	F	F	F	F	F	F
Max System losses(**)	(W)	4235	5647	6512	7814	10419	13023	15628
Efficiency(*****)	(%)	85	85	86	86	86	86	86
System noise	(dBA)	68	70	71	71	74	75	75
Height	(mm)	1870	1870	1870	1870	1870	1870	1870
Width	(mm)	800	1200	1200	1200	2200	2800	2800
Depth	(mm)	800	800	800	800	800	800	800
Footprint	(m^2)	0.64	0.96	0.96	0.96	1.76	2.24	2.24
Mass(****)	(kg)	530	600	650	680	1040	1230	1300
Drawing code (see page 21)								
Code for general arrangement		BNi0	CNi0	CNi0	CNi0	on project	on project	on project

NOTA: *-(*) at full load (cos phi 0.8), at nominal 110 VDC input voltage, and at 230 VAC nominal output voltage*
-(**) at full load (cos phi 0.8) and low input voltage level
-(***) F: Fan cooling
-(****) For information only. Mass may vary according to configurations and options
-(*****) For tolerance, see IEC 60146-1-1

Data for 220 VDC (240 VDC) input systems

Input voltage: 220 VDC [240]

Output voltage: 110 VAC [115, 120] single phase

Ratings	(kVA)	**10**	**15**	**20**	**25**	**30**	**40**
Inverter input							
DC input voltage range	(V)	176 – 260					
DC current consumption(*)	(A)	42	63	85	104	125	167
Max DC current consumption(**)	(A)	53	79	106	131	157	209
Inverter output							
Nominal output current(*)	(A)	91	136	182	227	273	364
Reserve static switch							
Nominal input voltage AC	(V)	110 [115 / 120] – 1 phase + neutral					
Recommended type for reserve input protection		D curve (circuit breakers) or gL (fuses)					
System data							
Heat dissipation system(***)		F	F	F	F	F	F
Max System losses(**)	(W)	1302	1953	2605	2989	3586	4782
Efficiency(*****)	(%)	86	86	86	87	87	87
System noise	(dBA)	62	63	64	65	65	68
Height	(mm)	1870	1870	1870	1870	1870	1870
Width	(mm)	800	800	800	800	800	800
Depth	(mm)	800	800	800	800	800	800
Footprint	(m^2)	0.64	0.64	0.64	0.64	0.64	0.64
Mass(****)	(kg)	340	360	430	490	500	550
Drawing code (see page 21)							
Code for general arrangement		BNi0	BNi0	BNi0	BNi0	BNi0	BNi0

Ratings	(kVA)	**50**	**60**	**80**	**100**	**120**
Inverter input						
DC input voltage range	(V)	176 – 260				
DC current consumption(*)	(A)	209	248	364	400	480
Max DC current consumption(**)	(A)	261	310	455	500	599
Inverter output						
Nominal output current(*)	(A)	455	545	818	909	1091
Reserve static switch						
Nominal input voltage AC	(V)	110 [115 / 120] – 1 phase + neutral				
Recommended type for reserve input protection		D curve (circuit breakers) or gL (fuses)				
System data						
Heat dissipation system(***)		F	F	F	F	F
Max System losses(**)	(W)	5977	6545	7111	7912	9495
Efficiency(*****)	(%)	87	88	90	91	91
System noise	(dBA)	68	68	71	73	73
Height	(mm)	1870	1870	1870	1870	1870
Width	(mm)	800	1200	1600	1600	1600
Depth	(mm)	800	800	800	800	1000
Footprint	(m^2)	0.64	0.96	0.96	1.28	1.60
Mass(****)	(kg)	580	600	740	810	900
Drawing code (see page 21)						
Code for general arrangement		BNi0	CNi0	ENi0	ENi0	FNi0

NOTA: *-(*) at full load (cos phi 0.8), at nominal 220 VDC input voltage, and at 110 VAC nominal output voltage*
-(**) at full load (cos phi 0.8) and low input voltage level
-(***) F: Fan cooling
-(****) For information only. Mass may vary according to configurations and options
-(*****) For tolerance, see IEC 60146-1-1

Data for 220 VDC (240 VDC) input systems

Input voltage: 220 VDC [240]

Output voltage: 230 [220 / 240] single phase

Ratings	(kVA)	**10**	**15**	**20**	**25**	**30**	**40**	**50**
Inverter input								
DC input voltage range	(V)	176 – 260						
DC current consumption(*)	(A)	42	63	85	104	125	167	209
Max DC current consumption(**)	(A)	53	79	106	131	157	209	261
Inverter output								
Nominal output current(*)	(A)	43	65	87	109	130	174	217
Reserve static switch								
Nominal input voltage AC	(V)	230 [220 / 240] – 1 phase + neutral						
Recommended type for reserve input protection		D curve (circuit breakers) or gL (fuses)						
System data								
Heat dissipation system(***)		F	F	F	F	F	F	F
Max System losses(**)	(W)	1302	1953	2605	2989	3586	4782	5977
Efficiency(*****)	(%)	86	86	86	87	87	87	87
System noise	(dBA)	62	63	64	65	65	68	68
Height	(mm)	1870	1870	1870	1870	1870	1870	1870
Width	(mm)	800	800	800	800	800	800	800
Depth	(mm)	800	800	800	800	800	800	800
Footprint	(m^2)	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Mass(****)	(kg)	330	360	430	480	490	540	560
Drawing code (see page 21)								
Code for general arrangement		BNi0	BNi0	BNi0	BNi0	BNi0	BNi0	BNi0

Ratings	(kVA)	**60**	**80**	**100**	**120**	**160**	**200**	**250**
Inverter input								
DC input voltage range	(V)	176 – 260						
DC current consumption(*)	(A)	248	323	400	480	639	799	999
Max DC current consumption(**)	(A)	310	404	500	599	799	999	1249
Inverter output								
Nominal output current(*)	(A)	261	348	435	522	696	870	1087
Reserve static switch								
Nominal input voltage AC	(V)	230 [220 / 240] – 1 phase + neutral						
Recommended type for reserve input protection		D curve (circuit breakers) or gL (fuses)						
System data								
Heat dissipation system(***)		F	F	F	F	F	F	F
Max System losses(**)	(W)	6545	7111	7912	9495	12659	15824	19780
Efficiency(*****)	(%)	88	90	91	91	91	91	91
System noise	(dBA)	68	71	71	72	74	75	75
Height	(mm)	1870	1870	1870	1870	1870	1870	1870
Width	(mm)	800	1200	1200	1200	2800	2800	3200
Depth	(mm)	800	800	800	1000	800	800	1000
Footprint	(m^2)	0.64	0.96	0.96	1.20	2.24	2.24	3.26
Mass(****)	(kg)	590	720	780	860	1290	1530	1700
Drawing code (see page 21)								
Code for general arrangement		BNi0	CNi0	CNi0	DNi0	on project	on project	on project

NOTA: -(*) at full load (cos phi 0.8), at nominal 220 VDC input voltage, and at 230 VAC nominal output voltage
-(**) at full load (cos phi 0.8) and low input voltage level
-(***) F: Fan cooling
-(****) For information only. Mass may vary according to configurations and options

9 Parallel operation

-(*****) For tolerance, see IEC 60146-1-1

The Nuclear inverter systems have the capability to be connected in parallel for dual configurations between units of the same rating. The parallel connection of Nuclear inverters increases reliability for the AC load.

9.1. System description

The Nuclear inverter range is capable of operating in dual parallel configuration as shown on Figure 9.

The dual inverter system is supplied with the parallel operation printed circuit board COPS, which delivers the main synchronisation signal for both inverters.

9.2. Operating principle

In this configuration, the two inverters are connected in parallel so that they continuously share the load. If one of the inverters fails, the remaining inverter keeps supplying the load.

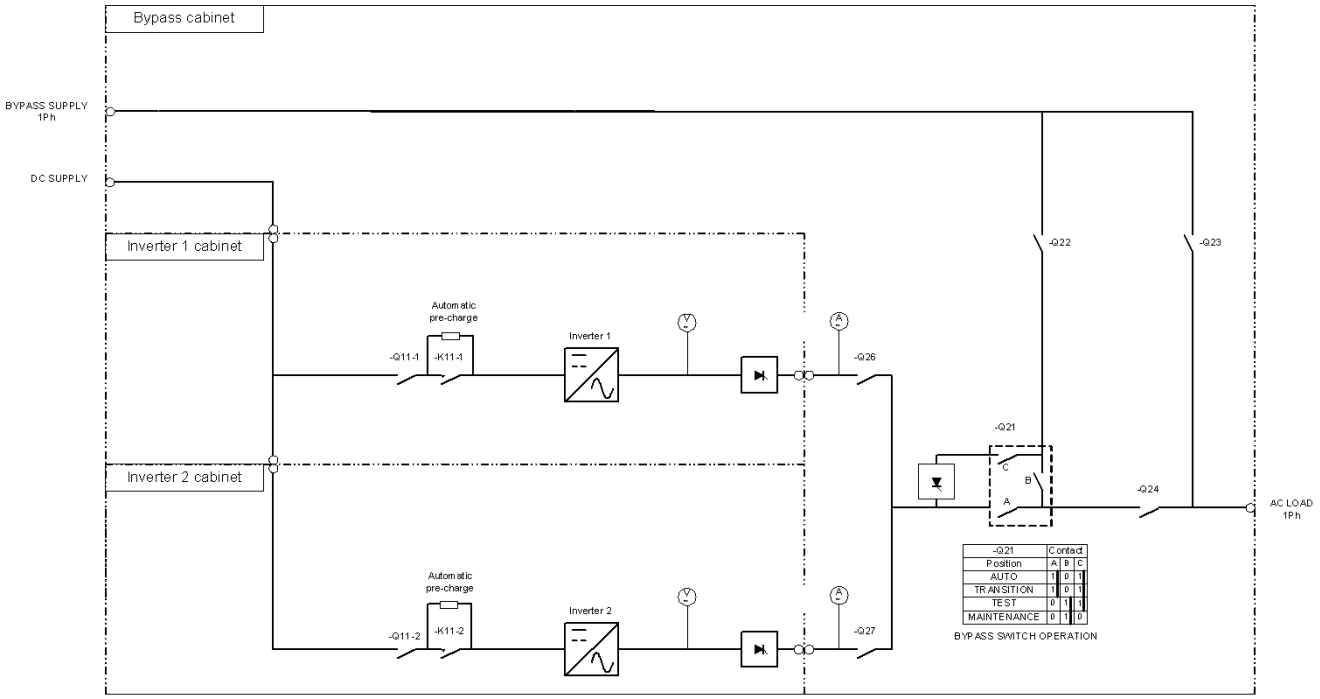


Figure 9: Nuclear inverters in parallel configuration

10 Options

10.1. Main electrical options

The list of options described in this section is non-exhaustive. Please consult us for any other requirement.

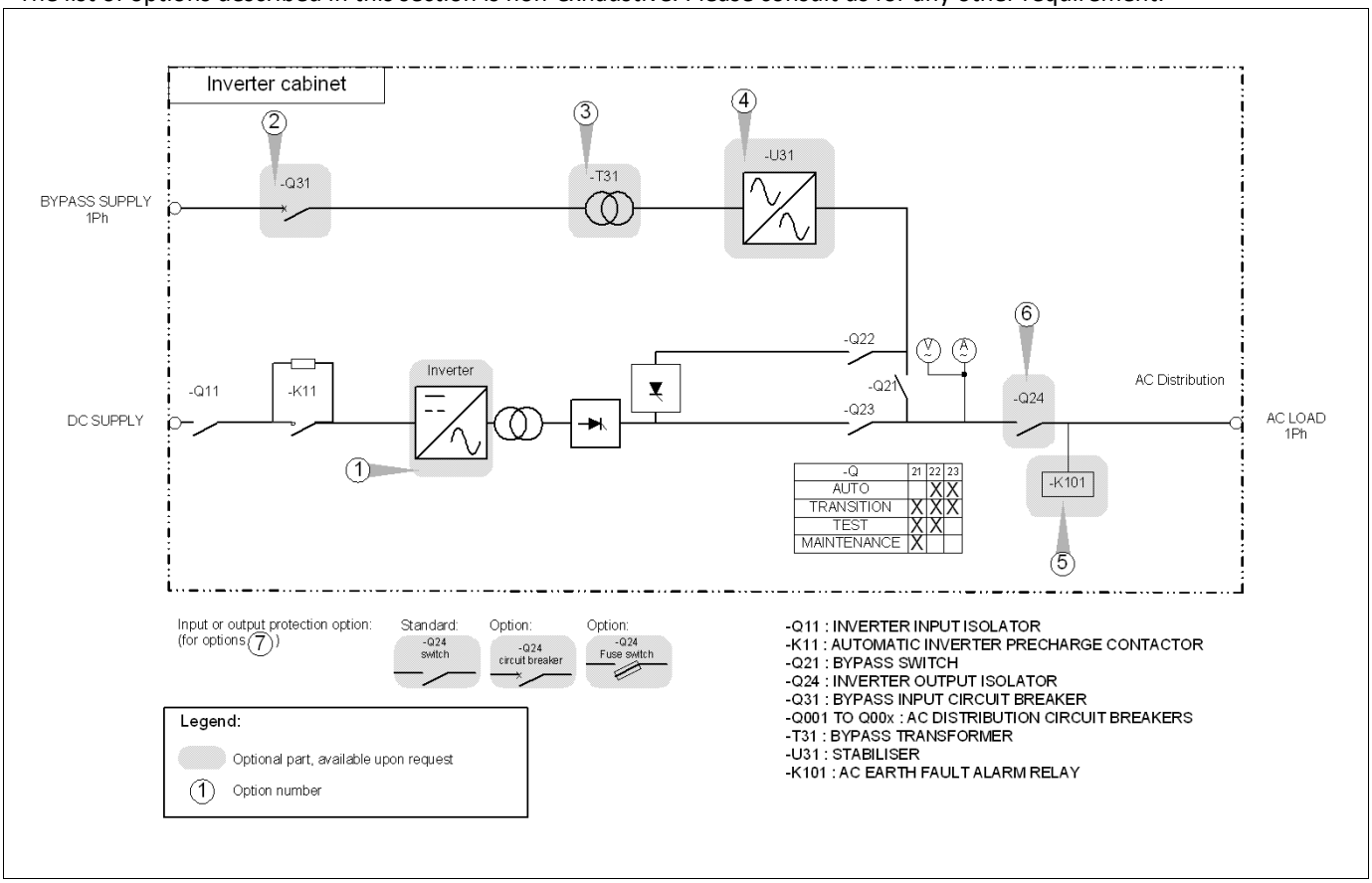


Figure 10: Nuclear inverter – overview of electrical options

Option No.	Option name	Function / description
①	Inverter short-circuit capability	Double size the short-circuit capacity of the inverter to reach 600%. The inverter bridge is oversized in order to ensure the short-circuit requirements of some nuclear plants. Please note this option may affect the overall dimensions of the equipment.
②	Reserve supply circuit breaker	Protect the reserve supply input by a double-pole circuit breaker.
③	Reserve supply transformer	Provide full galvanic isolation between the input and the output of the inverter. This transformer is of the type 1-phase input / 1-phase output. We recommend you not to use 3-phase input / 1-phase output transformer to avoid unbalanced currents on the phases. *This option may affect the overall dimensions of the system.*
④	Reserve supply stabiliser	Adjust the reserve supply voltage. The reserve supply voltage adjustment ensures the output voltage is within the tolerance accepted by the connected AC load. The stabiliser can be of the electronic type or electro-mechanical type. *This option may affect the overall dimensions of the system.*
⑤	AC earth fault alarm	Monitor the insulation resistance on the AC output circuit. Used in conjunction with the isolation transformer, this option is made of an electronic circuit CIC (or equivalent). It is fitted into the inverter cubicle and delivers remote indication by a changeover voltage-free contact. Local indication (inside the cabinet) by two LED's is available on the PCB (or moulded device) to indicate the polarity on fault. A local test push-button is also available on the device to simulate fault conditions.
⑥	Output protection	Isolate the output of the system. 3 types of protections are made available: – Switch: the standard configuration includes a fully rated switch with auxiliary contact for the monitoring of its operating status. – Fuse switch: fully rated fuse switch with auxiliary contact for the monitoring of its operating status. – Circuit breaker: fully rated circuit breaker and an additional auxiliary contact for the monitoring of its position.

10.2. Environment-related options

10.2.1. External cubicle protection

According to IEC 60529 (Degrees of protection provided by enclosures-IP Code), it is possible to protect the inverter cubicle from solid or liquid intrusion. The protection levels available are:

- IP 21
- IP 22
- IP 40
- IP 41
- IP 42

In all cases, even for standard IP 20 level, the third number shall be 7, representing mechanical protection.

10.2.2. Special enclosure finishing

Standard finishing of the enclosure is RAL 7032 (grey) textured semi gloss. Any other type of painting specification is also achievable upon request, in compliance with AFNOR, RAL or BS standards.

10.2.3. Specific ambient operation conditions

- Specific temperature conditions: Upon request, the Nuclear inverter is able to operate above 40°C (and up to 55°C) or below 0°C.
- Special seismic design: Specific modifications of the system may be added to allow the UPS to operate in seismic risks areas. Please consult us.

In such extreme conditions, the customer must specify the required service conditions, as specified in IEC 60146-2, §5.

10.2.4. Anti-condensation heater

This option includes a heater which is fitted inside the cubicle, to prevent internal components from condensation, mainly when the UPS is stored for a long period.

10.2.5. Temperature monitoring

This option consists in a thermostat fitted inside the cubicle to indicate abnormal heating in the inverter. This device is adjustable below 90°C and includes a remote indication available on a normally open, voltage-free contact.

10.3. Other options

10.3.1. Top cable entry

The option allows power cable entry from the top of the inverter, by adding an external cabinet to drive the cables down to the bottom of the inverter.

NOTE
This option affects the overall dimensions of the system.

10.3.2. Internal lighting

Internal lighting is available upon request to improve internal visibility of the system.

10.3.3. Portable maintenance tool

This maintenance dedicated tool allows a quickly checking of operational settings and thresholds of our nuclear analogue controlled systems.

NOTE:
This option must be stated at the project order stage in order to have the necessary components built-in the equipment for easy connection.

10.4. Monitoring options

10.4.1. Customer interface relays

It is possible to increase the number of outputs described in paragraph 5 by providing additional output relays. These outputs can be used to monitor several parameters specified by the user.

10.4.2. LCD Touch screen

Figure 11: Touch screen panel screenshot

The LCD touch screen solution is available to locally and remotely monitor the Nuclear inverter range. This microprocessor-based device is fully independent from the inverter control system, thus keeping the AC load safe from soft-computing mistakes.

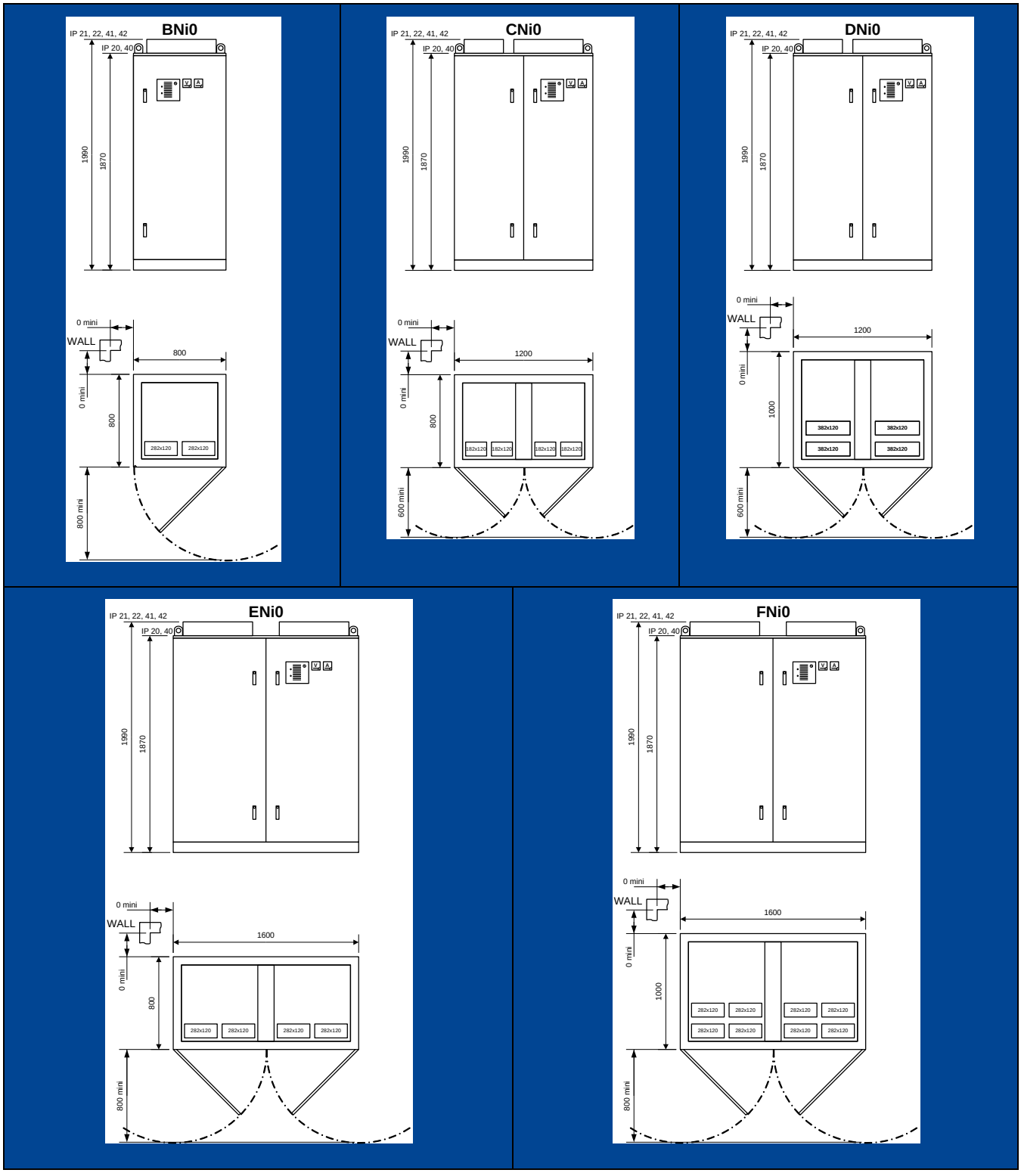
NOTE:
This fully independent device does not require any qualification for class IE equipment.

The Event dynamic display function allows real time visualisation of events related to the system.
It allows local and remote (via TCP) visualisation of the following information:

- Measured values
- Operating modes
- Alarms and warnings

The embedded Event Memory function allows recording of each system event (status, warning, and alarm).
The Measures recorder function allows permanent recording of selected measures from the inverter.
This touch screen panel offers an industry level of durability as it is designed to cope with industrial environmental conditions.

11 General arrangement drawings



Notes

Chloride™
Power to Protect

Chloride.com | Global & Europe, Chloride SAS

30, Avenue Montgolfier - BP 90 - 69684 Chassieu - France

T: +33 (0)4 78 40 13 56

Hello@Chloride.com

Chloride®-CP70 SMC-BR-EN-gl-rev1-0624