Features

- 150-1200Vdc input voltage range
- 200-600V output voltage (factory set)
- Up to 3000W output power
- High temperature 177°C
- +18-24V/1A auxiliary voltage output with protection switch
- 1500V voltage tolerant (survival)
- Input reverse voltage protection
- Programmable output soft start
- Compact and rugged aluminum housing
- CAN bus interface
- Input- and output short circuit protection
- High shock and vibration resistance

Product Description

The NSE 5002-27 HT DCDC is a rugged, high-performance, high-power DC/DC converter targeted downhole wireline applications and other high voltage DC transmission systems. The unit supports input voltage up to 1200V. It is also very well suited for other industrial and automotive applications.

The DC/DC converter has built-in support for NSE's downhole telemetry board (optional). In addition to the main high voltage output, the unit has also an auxiliary 18V output for external units. This may enable a simplified system architecture.

To operate reliably at high temperatures, the converter has been designed to have extremely high efficiency to reduce the loss to a minimum. Typically, the unit achieves above 99% efficiency at full load over the entire temperature range.

The PCB layout is designed with ruggedness in mind. A CNC machined aluminum chassis provides maximum mechanical support to allow the board to operate in an environment where very high shock and vibration may occur. The board is equipped with rugged high-temperature connectors.

The unit can be supplied in two different housings: A slim rectangular shaped housing, of 592 x 36 x 33mm (L x W x H) suitable for most customers to design into their system.

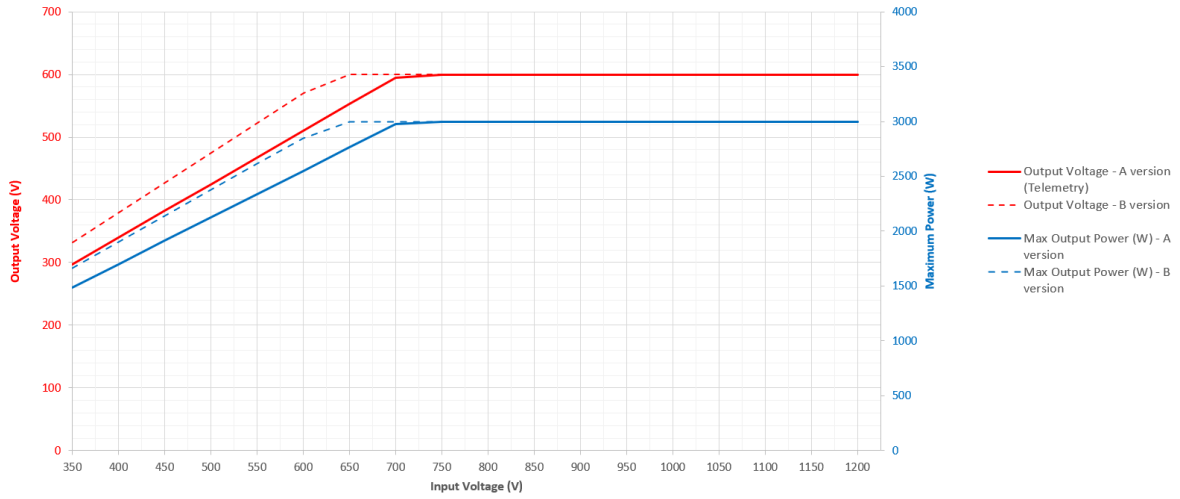
1 Product Specification

1.1 Electrical Specifications

Parameter	Conditions / Comments	Min	Typ	Max	Unit
Supply voltage					
Input High Voltage	*Operational*	150	>600	1200	Vdc
Input High Voltage	*Survival max 1 sec pulse*			1500	Vdc
High Voltage Output					
Output Voltage range	*Ref. output voltage graph.*				
	.. 600V version	585	600	615	Vdc
	.. 200V version	195	200	205	Vdc
Voltage Variation	*@600V - 100% dynamic load change / 1ms*			15	V
	Ref. output power graph				
Output Power	*@600V output*			3000	W
	@200V output			800	W
Low Voltage Output					
Output Voltage range	*Programmable*	18	18	24	Vdc
Voltage Variation	*100% dynamic load change / 1ms*			250	mV
Output Power				18	W
Efficiency	*Over temperature, at full load@600V output*	98.5	99		%
Load regulation Response					
Static load Voltage variation	*Voltage variation from min to max load*			6	V
Dynamic Step load response	*Transient voltage variation from Load step from no load to full loading or opposite*		+/-15	+/-25	V
Power Filters					
Input capacitance			3.0		*uF*
Output capacitance			6.0		*uF*
Additional Input capacitance					
Additional input cap.	*Product code -A-A & -A-C*		4.0		*uF*
Additional input cap.	*Product code -B-A & -B-C*		2.0		*uF*
Modem Interface					
Modem Power line filter	*Integrated*		Yes		
Switching and efficiency					
Switching frequency		120		250	*kHz*
Frequency stability		1			*%*
Power Loss				35	*W*

Protection					
Reverse Polarity Protection	*Continuous without degradation*			-600	*Vdc*
Overvoltage protection	*<1 second transient*			1500	*V*
Thermal shutdown			No		
CAN Bus Interface					
Baud rate		125	125	250	*kbits/s*
CANbus specification			CAN 2.0		
Noise filter			Yes		
CANBus termination	*136 Ohm differential* *Can be configured ON/OFF*		Yes		
Temperature Sensor					
Sensor range		0		190	*°C*
Accuracy		+/- 3			*°C*
MECHANICAL DIMENSIONS					
Chassis Length	*Rectangular housing*		592		*mm*
Chassis Width	*Rectangular housing*		36		*mm*
Chassis Height	*Rectangular housing*		33		*mm*
Chassis Length	*Circular housing*		581		*mm*
Chassis Outer Diameter	*Circular housing*		38		*mm*
OPERATIONAL LIFETIME					
Expected Lifetime	*< 125°C Ambient Temperature*	2000			*Hours*
	125 – 150°C (4 x acc. Factor)	500			*Hours*
	150- 177°C (8 x acc. Factor)	250			*Hours*
ENVIRONMENTAL AND THERMAL					
Ambient temperature	*Min and Max temperature on the surface of the outer housing.*	-20		177	*°C*
Thermal Resistance	*Surface of OUTER HOUSING to NSE UNIT* **Refer to the Section "Thermal properties" for further definition*			0.1	*°C/W*

1.2 Output voltage and power graphs (600Vdc output)



1.3 Thermal properties

The NSE-5002-27 DCDC is designed to operate in a 177°C environment.

In a typical assembly, the **NSE UNIT** is mounted to a **MOUNTING PROFILE** that is located inside an **OUTER HOUSING**.

The **OUTER HOUSING** surface temperature should not rise above the specified maximum ambient temperature, and the mechanical design and interface between the **OUTER HOUSING, MOUNTING PROFILE** and the **NSE UNIT** should be such that the thermal resistance specification is achieved.

1.4 Conformal Coating

This product is delivered without conformal coating.

1.5 Environmental requirements

NSE boards must be installed in dry air at atmospheric pressure (1atm). Avoid humid atmosphere or under / overpressure. Refer to general NSE installation guidelines for more information.

2 Block diagram

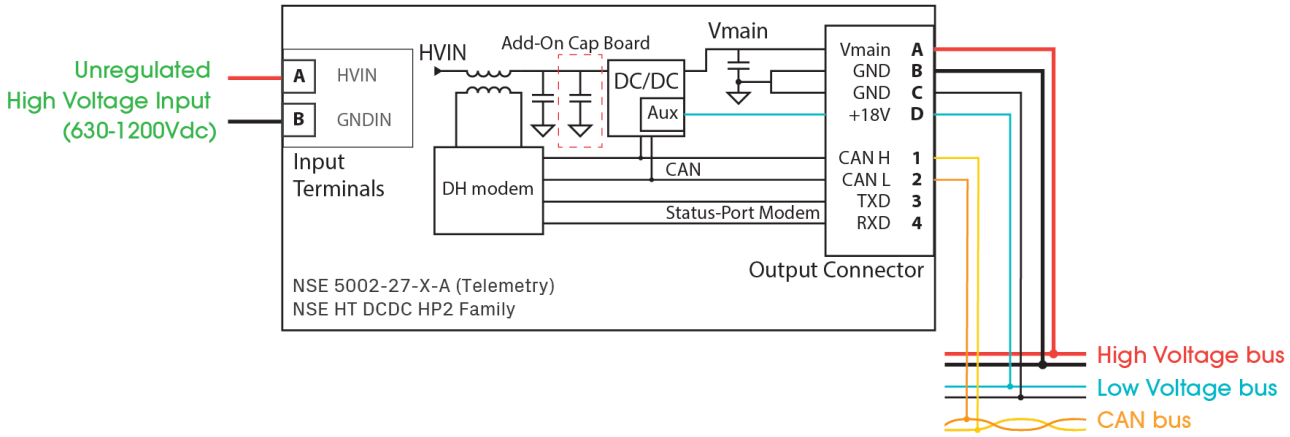


Figure 1 – Option-X-A - Integrated telemetry

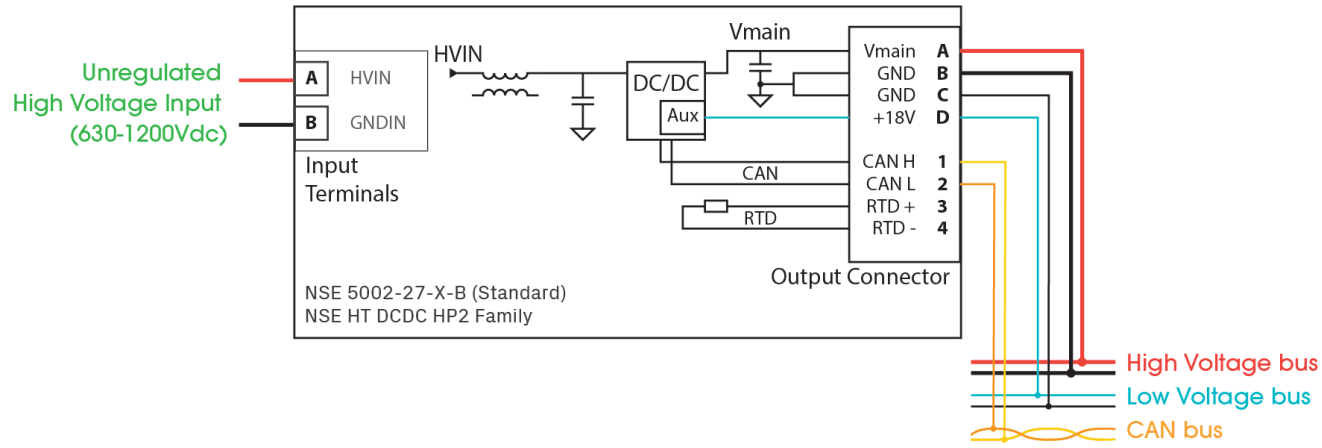


Figure 2 – Option -X-B -Standard version

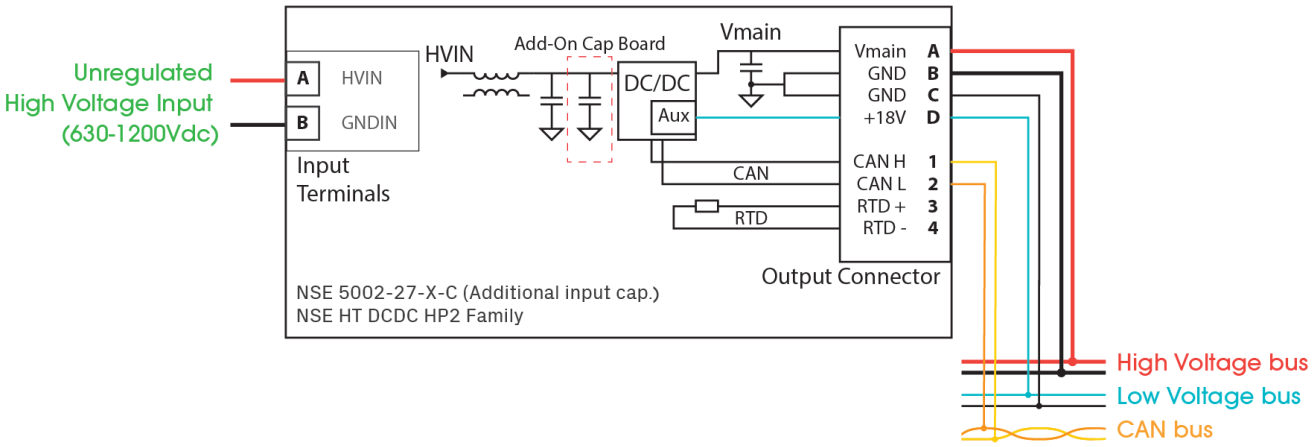


Figure 3 –Option -X-C -Additional input capacitance

2.1 Application Drawing

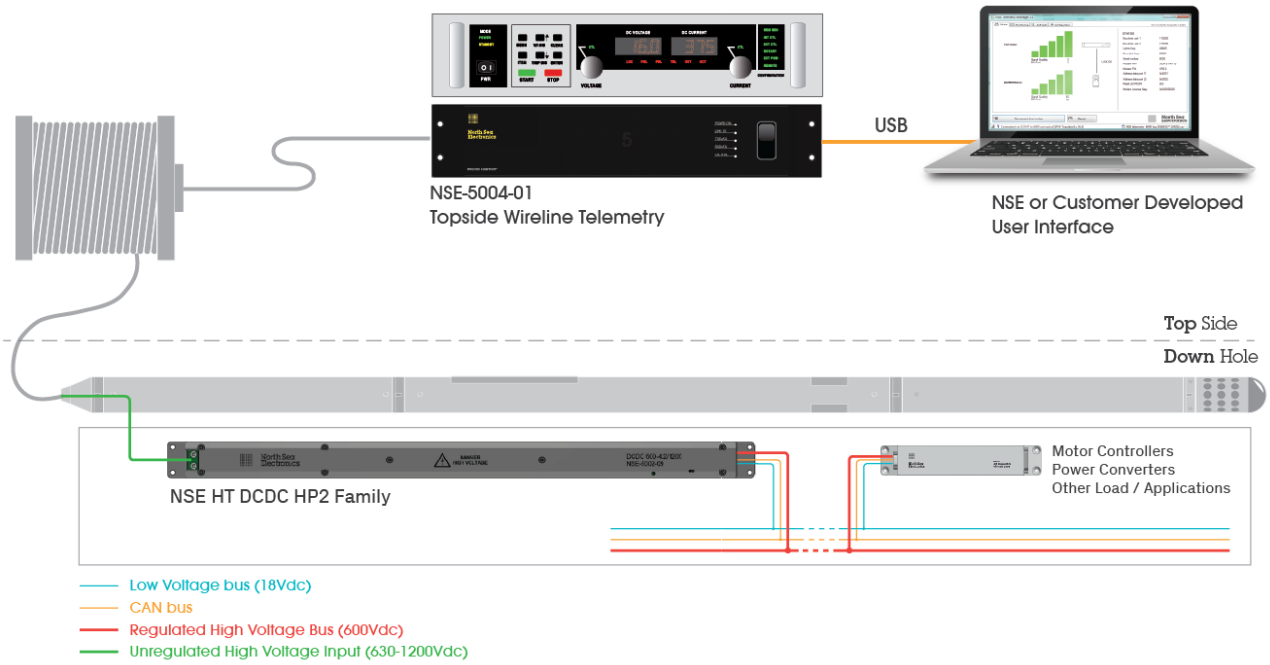
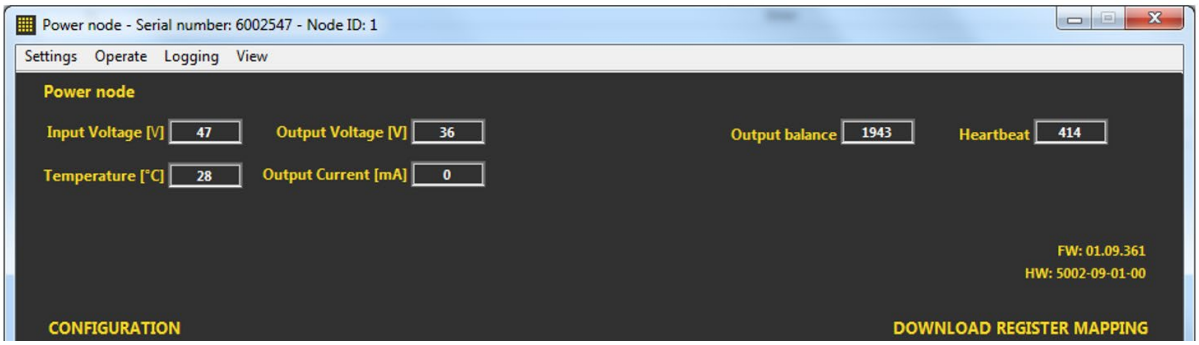


Figure 4. Typical application

2.2 NSE Node manager software

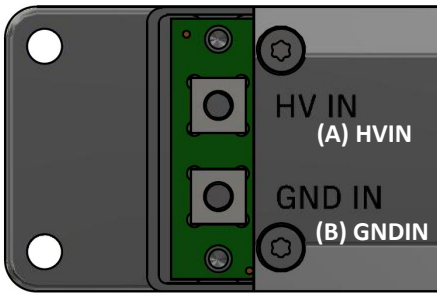
The DCDC is supported by the NSE Node manager software package.

The NSE node manager allow for monitoring and configuration of the unit.



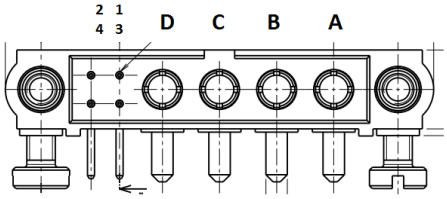
2.3 Input Connector

Input has 2 x screw terminals for GND and HV input.
A flat head, M4 x 6mm machine screw should be used to mount the input wires with ring terminal termination.
Suggested wire dimension for input wires is AWG20-AWG18.
PTFE isolated cables with an isolation voltage of >1200Vdc should be used.

Pin	Signal name	Description / Function (NSE Standard color)	Connector Pinout (Face View)
A	HVIN	HV Input Voltage (RED)	
B	GNDIN	HV Input ground (BLACK)	

2.4 Output connector

DCDC connector on PCBA: Harwin M80-5L10405M5-04-333-00-000 4+4 pin connector.
Mating connector: Harwin M80-4C10405F1-04-329-00-000

Pin	Signal name	Description / Function (NSE Standard color)	Connector Pinout (Face View)
A	VMAIN	Main Output Voltage (RED)	
B	GND	Main Ground wire (BLACK)	
C	GND	AUX Ground wire (BLACK)	
D	+18Vout	+18V auxiliary output (ORANGE)	
1	CANH	CAN Positive (YELLOW)	
2	CANL	CAN Negative (GREEN)	
3*	RTD+/	RTD terminals 1 (BROWN)	
	TXD	UART TXD modem Status port	
4*	RTD- /	RTD terminals 2 (VIOLET)	
	RXD	UART RXD modem Status port	

**When telemetry is installed, pin 3 & 4 will have the telemetry status interface. When the telemetry is not installed, an RTD is accessible and can be used to monitor the inner PCB temperature. Modem UART status port has 3.3V level*

3 Features

Feature	Description
Output voltage	The unit has a fixed regulated output voltage, nominally set to 600Vdc. The unit can be delivered with other output voltage settings. Consult NSE for non-standard output voltage.
Output Voltage switches	The unit has output voltage control switches both on the HV output and the +18V auxiliary output. These switches are used for startup voltage control and protection.
Input Filter/Capacitor bank	The unit has on-board input high voltage filter supporting typical power applications. For the telemetry option, extra capacitance is added to the system by installing additional capacitance boards inside the chassis. The C-Version has the add-on capacitor board only. The additional capacitor board is not required for normal operation but can add stability and damping of voltage transients in some applications.
Output filter	The output filter is included to reduce the output ripple and improve noise immunity from external units, such as high power motor drives.
Voltage and current sensing	The unit monitors: • Input voltage • Output voltage • Output current
Temperature sensing	The unit has embedded temperature sensors. The internal temperature can be read from CAN. Besides, there is an RTD connected to the output plug pin 3-4 for monitoring the temperature from an external controller. The RTD is a PT1000 element.
Soft Start	The HV output voltage is controlled by an control circuit. This enables the output voltage to be ramped up at the desired rate. The default setting is 1V/ms. This setting can be modified by NSE.
Pass through mode	When the input voltage is below the regulated voltage, the unit enters pass-through mode. In this mode, the output voltage is regulated to ~95% of the input voltage (~85% when telemetry is included).
Firmware	The unit has a bootloader installed, enabling FW upgrades via CANbus without the need for opening the system. The Unit has an internal EEPROM to store calibration data and custom settings. The EEPROM data is not affected by FW upgrades.
Bootloader	The controller is provided with a bootloader that allows for easy updates of the firmware. NSE is constantly making improvements and adding features to its firmware-base and the bootloader allows the customer to upgrade firmware if desired.

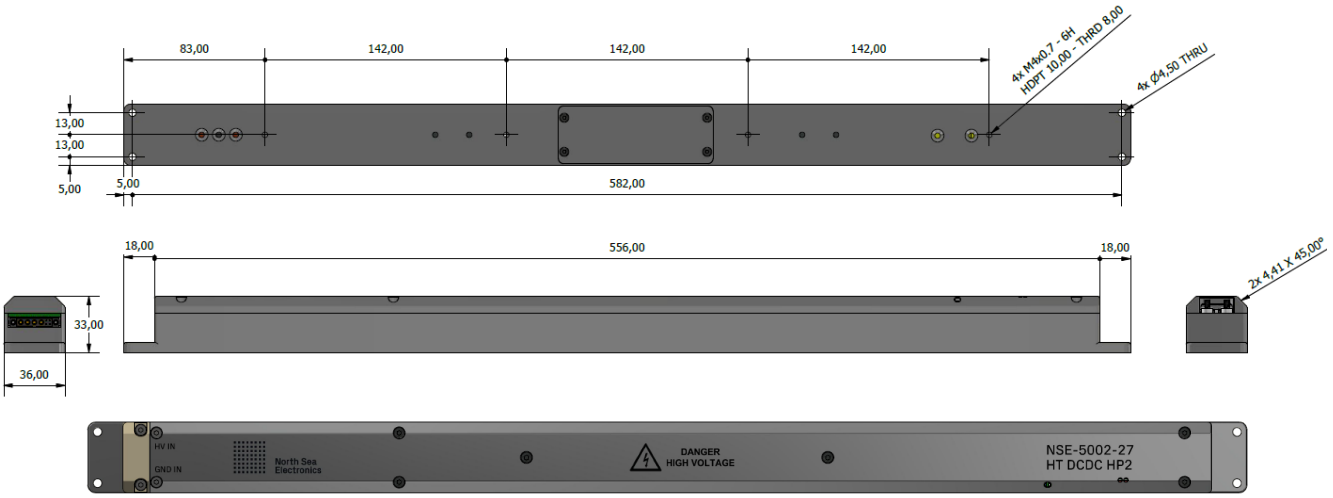
Feature	Description
Overvoltage Protection	The unit has two-stage protection circuits for input voltage For overvoltage protection, the unit turns off the output voltage when the input voltage reading is above approximately 1250V. Resume from this condition is at around 1200V. These settings are programmed limits.

	The second stage in protection shuts down all internal circuitry and enables the overvoltage protection circuit to survive at least 1500V conditions without damage. Resume from this condition is around 1000V. These settings are HW controlled and not adjustable.
Over-current protection	The unit monitors the output current. When over-voltage exceeds the maximum current, the output shuts down. The unit will try to resume after about 1 second. The overcurrent protection allows short bursts of current exceeding the current limit without interruption.
Short circuit protection	In short circuit protection mode, the unit detects the output voltage dropping below a minimum setting. When this occurs the unit quickly reacts and shuts down. The unit tolerates 0-ohm short circuit at startup, and 2 ohms “short circuit” after full voltage (600Vdc) is reached. After the short circuit is detected, the unit performs a full reset before re-attempting to start up. The unit will resume as soon as the short circuit situation is resolved.
Under-voltage protection	The units’ default programmed setting is to start up the HV output when the voltage reaches 330V. When the voltage drops below 300V, the unit turns off the output. The auxiliary voltage output (18Vdc) has a separate control setting. The default input voltage is 100V for startup and 80V for shutdown. These values can be tailored for different needs by NSE and can be useful for firmware updating the unit without applying a high voltage to the secondary systems.
Reverse voltage protection	The reverse voltage protection is designed by a high voltage transistor circuit, enabling low leakage in reverse voltage mode and low losses in forward operation mode. The circuit tolerates reverse voltage up to 600V.
CAN Bus Termination	The CAN bus termination is user-configurable as either “not terminated” or “terminated by 136 Ohm resistance differential”. The setting is stored in non-volatile memory.
Internal RTD temperature sensing	The unit has an internal RTD temperature sensor that can be used by external boards to sense the temperature inside the DCDC.

4 Mechanical Dimensions

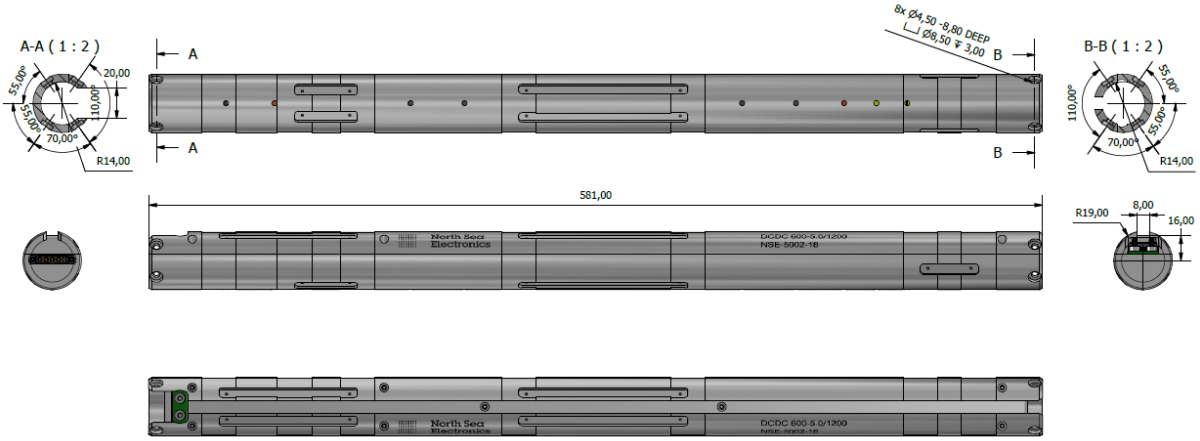
4.1 Rectangular housing – chassis option A

Fits inside an ID of 48mm.



4.2 Circular housing – chassis option B

Fits inside an ID of 38mm.



5 Datasheet Revision History

REV	DATE	DESCRIPTION	PREP	APPR
A	16.01.2025	Initial revision – based on HP1 datasheet	RFY	TKK
B	02.09.2025	Corrected typo in option codes	GLK	VVR

6 Related documents

Document number	Description
NSE-500209-501	CONNECTOR KIT SPECIFICATION

7 Product Code

		Product code:	**NSE-5002**	**-27**	***-YYYV***	**-X1**	**-X2**
Category	NSE-5002	= NSE DC/DC converter					
Model	- 27	= HT-DCDC-HP1 Family					
Output Voltage	YYY	= Output voltage (200-600V)					
Option 1	- A - B - C	= Telemetry option = Standard (without telemetry) = Standard with additional input capacitor board					
Option 2 (Chassis)	- A - B	= Rectangular chassis (fits inside Ø48mm) = Circular chassis (fits inside Ø38mm)					

8 Where to buy

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