

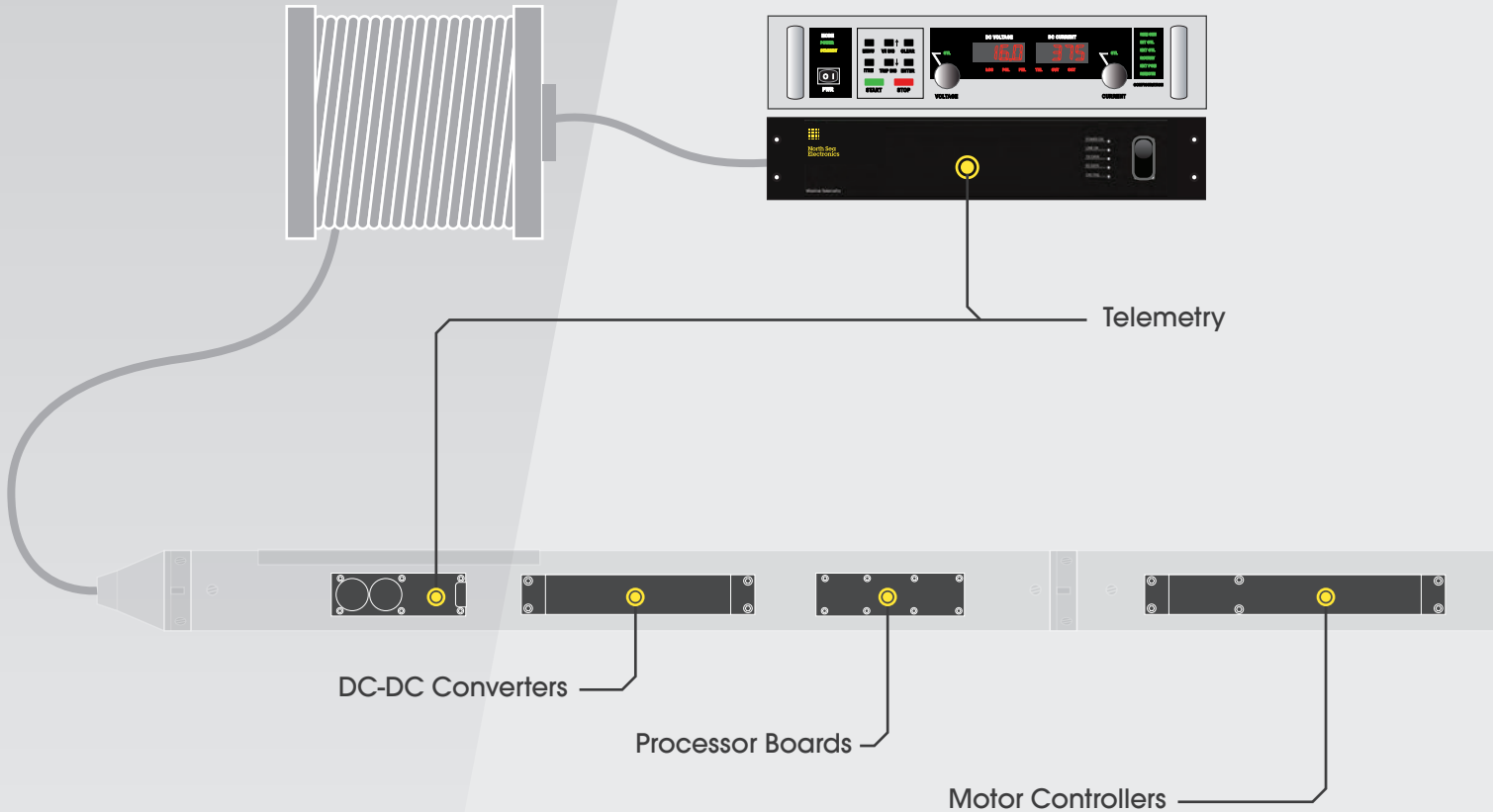


**North Sea
Electronics**

High Temperature Electronics

PRODUCT PORTFOLIO 2019 / 2020 - Rev B



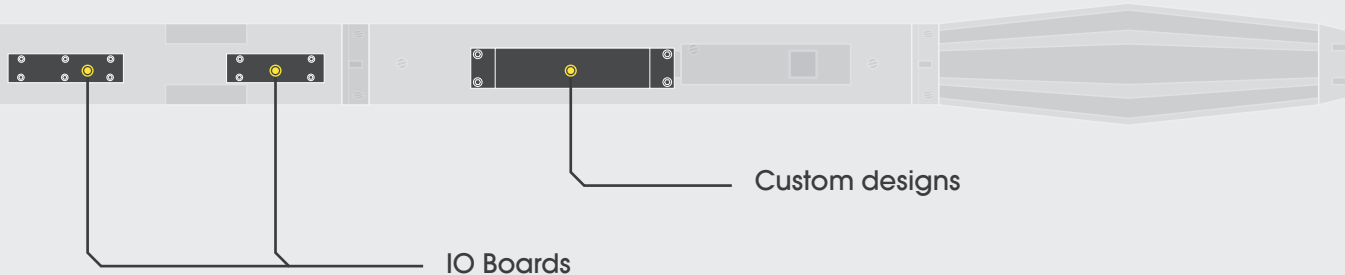


Configure Your Tool

NSE has a broad portfolio of **modular high temperature electronics**. By utilizing this modularity, almost any downhole tool can be set up with standard NSE off-the-shelf products. This means **significant cuts in development time and risk**, and allows the customer to focus on the most important thing; to **get into operation!**

At NSE we put our honor in making the electronics easy to implement and use. As an NSE customer you will benefit from getting products with extensive in-house testing, thousands of hours in real-life operations, and continuous improvement based on feedback from our customers.

By using NSE products you can save precious space, minimize risks and reduce the number of high cost bulkhead connectors and wiring work. All NSE boards have an open protocol for control and feedback, making it easy to configure the boards. The NSE protocols are well documented and provided with examples and references on how to use and implement the product in the most optimum way for your application.



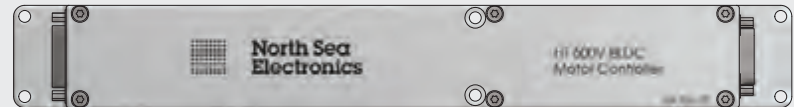
NSE Motor Controllers

NSE provides a free motor controller software that allows for easy configuration and tuning of the motor controller to the motor and application.

Parameters like motor pole pairs, resolver settings and PID regulation loops are configured in the GUI (amongst other settings). Once the desired configuration has been achieved, the controller registry settings can be stored to a configuration file.

By uploading different configuration files, the same motor controller can run completely different motors and/or applications. For the customer this implies simpler logistics as the same controller can serve many tools or applications.

IMAGINE HAVING ONE CONTROLLER...



The NSE Motor Controller GUI allow easy up- and download of configuration settings to the motor controller.

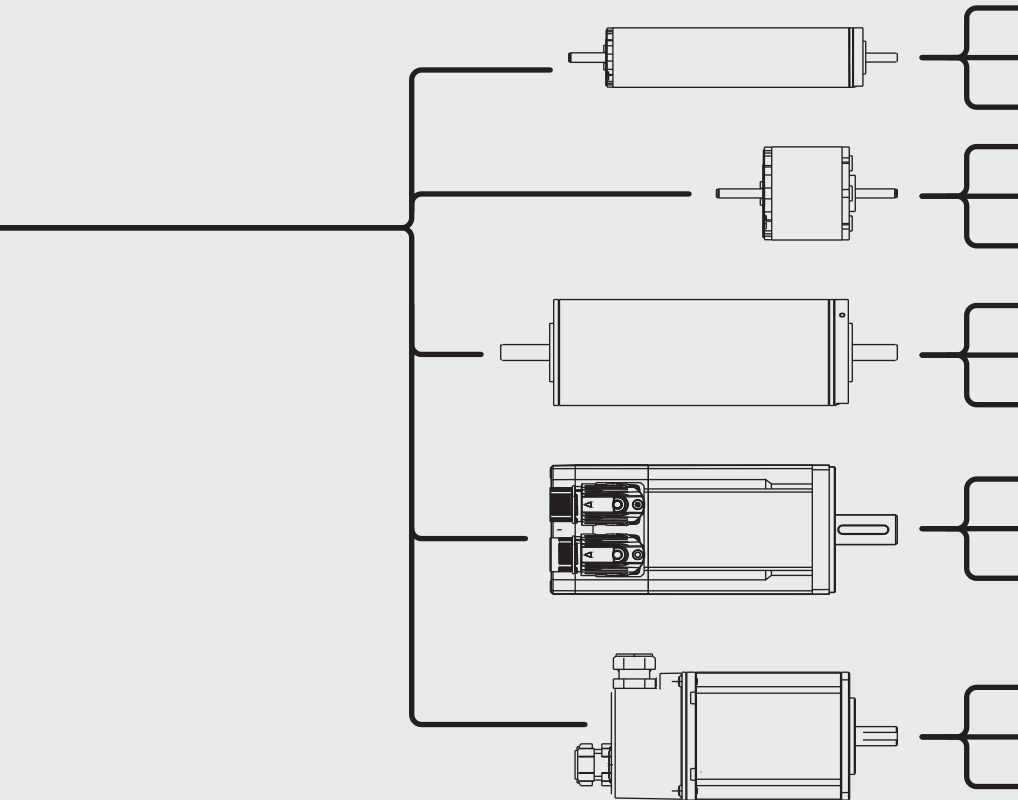


Configure and store the motor- and application characteristics using the NSE Motor Controller GUI



...FOR ALL YOUR MOTORS...

...AND APPLICATIONS



electro-hydraulic pumps

- wheel / belt drive systems
- torque screws

drilling

- positioning systems

cooling pumps

- release tools
- transducer head positioning

stroker

- valve control
- isolation barrier tools
- propulsion systems

- generator control

tractoring

- linear displacement

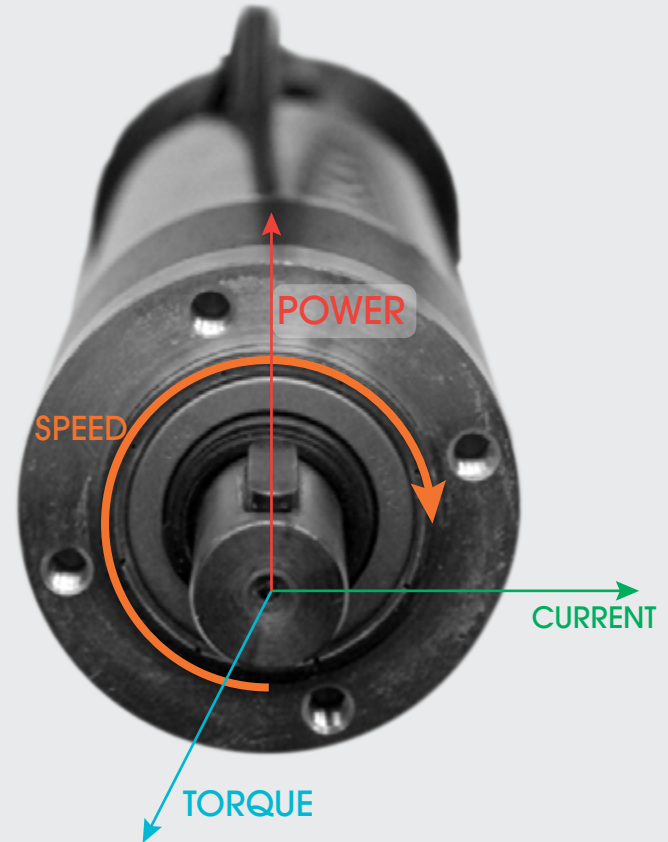
NSE Motor Controllers

NSE has through several years of dedication to high temperature electronics, developed a family of high efficient - state of the art motor controllers.

NSE controllers support hall encoders, Resolver feedback and sensorless running. The controllers are set up to run Field Oriented Control (FOC), in order to have maximum control of torque, speed and power.

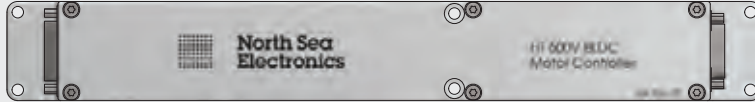
NSE are continuously developing the motor controller platform. Firmware updates are made available to our customers for free, and upgrading can easily be done through the bootloader system.

NSE Controllers give you full control of your motor



BLDC Motor controllers

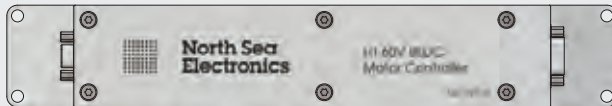
NSE 5001-05



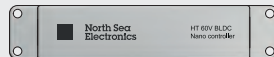
NSE 5001-07



NSE 5001-12



NSE 5001-11



HT 600V BLDC Controller

Dimensions	281.5 x 37 x 29.1mm
Input Drive Voltage	50 - 600Vdc
Output Power	Up to 3kW
Feedback	Resolver / Hall / S.Less

HT 60V BLDC Controller / Ø22mm

Dimensions	285mm x Ø22.2mm
Input Voltage	18 - 60Vdc
Output Power	Up to 240W
Feedback	Resolver / Hall / S.Less

HT 60V BLDC Controller

Dimensions	228 x 38 x 17mm
Input Voltage	18 - 60Vdc
Output Power	Up to 240W
Feedback	Resolver / Hall / S.Less

HT NANO BLDC Controller

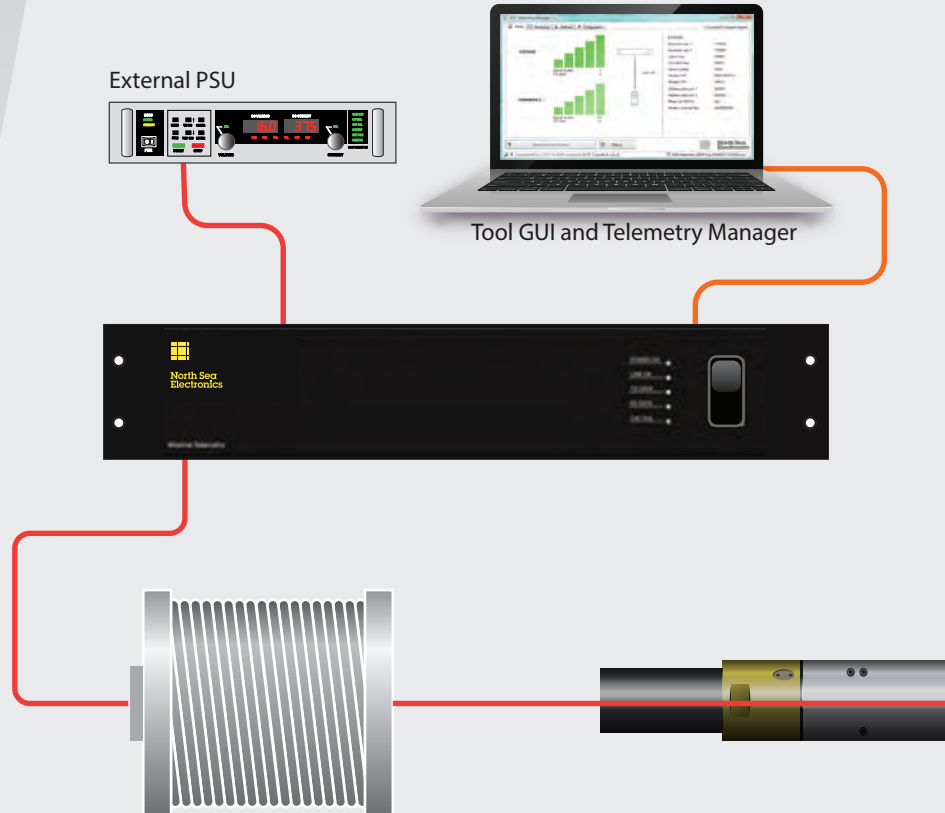
Dimensions	100 x 20 x 11mm
Input Voltage	18 - 50Vdc
Output Power	Up to 60W
Feedback	Hall / S.Less

NSE Telemetry

The NSE Telemetry is designed to handle both high power loads and at the same time deliver fast datarates. This allow users to use the same telemetry for both power- and logging tools. The high datarates allow more real time data and better control of any tool connected.

The telemetry system is in operation worldwide and NSE are continously working with our customers to deliver the best possible product. The telemetry system comes with a free telemetry manager software that gives full control of setup and link quality. This software also allows upload of all modem parameters directly to NSE in case there is need for support.

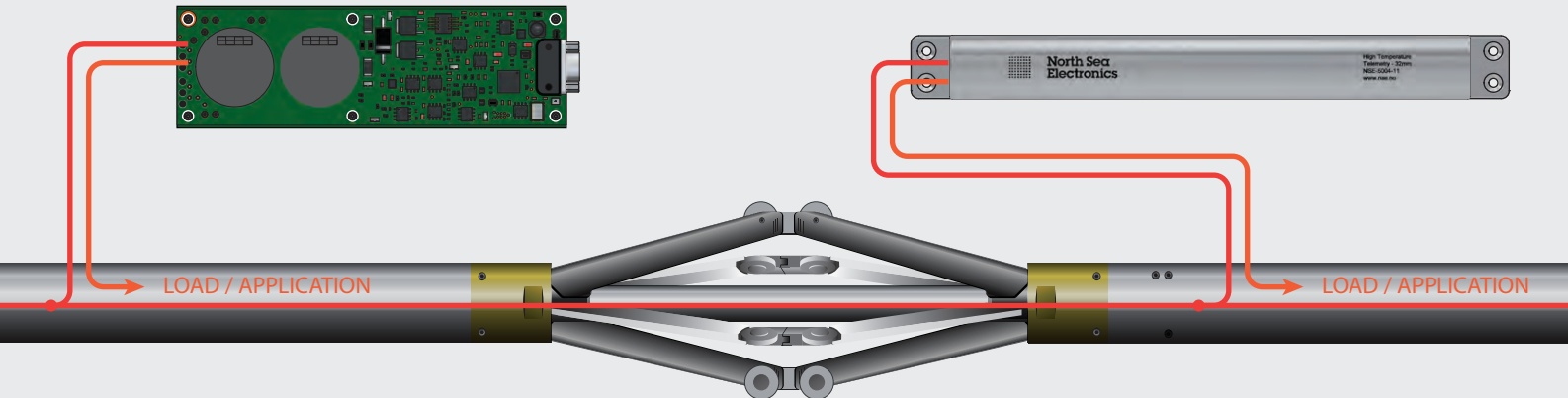
Power Capacity and High Datarates



Addressable and adaptable

The downhole modems are addressable which makes it possible to have multiple modems connected on the tool string. Each modem is simply given an address in the string, and then one can choose which modem to communicate with from the topside panel. This feature makes it easier to design individual tool sections and also to combine different tools in a string.

The modems have advanced algorithms in order to adapt to its environments such as cable characteristics, noise and temperature. In a matter of seconds the telemetry will recognise the cable and adjust its digital filter to match the characteristics. The modem is also continuously monitoring the link status and will adjust its datarates depending on the quality.



NSE Telemetry

The NSE Telemetry is the most versatile telemetry system for downhole (wireline, coiled tubing, hepta cables) and subsea use. It has proven to work with the majority of downhole tools in the market and will provide a reliable data link even on the most demanding cables and conditions in the industry.

Topside Wireline Telemetry

Dimensions	2U x 330mm (depth)
Max Line Voltage	1200Vdc
Max Line Current	8Adc
Interface	USB / RS485

Topside Portable Unit (Eurocard)

Dimensions	160 x 100 x 25mm
Max Line Voltage	600Vdc
Max Line Current	2Adc
Interface	USB / RS422



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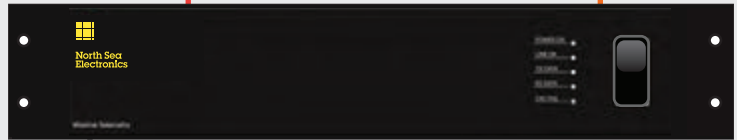
Topside Units

External PSU



Tool GUI and Telemetry Manager

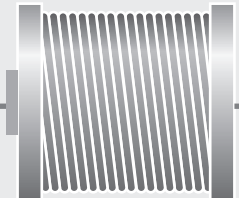
NSE 5004-03



NSE 5004-20



Topside Portable Unit -
Small topside modem for user equipment integration

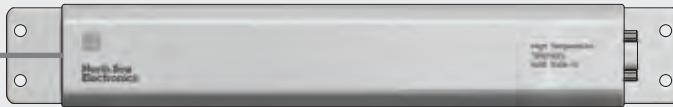


Downhole Units

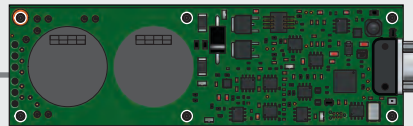
NSE 5004-11



NSE 5004-10



NSE 5004-04



HT DH Telemetry 32mm

Dimensions	304 x 32 x 16mm
Max Line Voltage	600Vdc
Max Line Current	2Adc
Uplink Data Rate	Up to 200kbps

HT DH Telemetry 38mm

Dimensions	243 x 37 x 22mm
Max Line Voltage	600Vdc
Max Line Current	4Adc
Uplink Data Rate	Up to 200kbps

HT DH Telemetry 55mm

Dimensions	147 x 46 x 27mm
Max Line Voltage	600Vdc
Max Line Current	8Adc
Uplink Data Rate	Up to 200kbps

NSE DCDC Converters

Having a reliable power source for your downhole tool is crucial in order to achieve success.

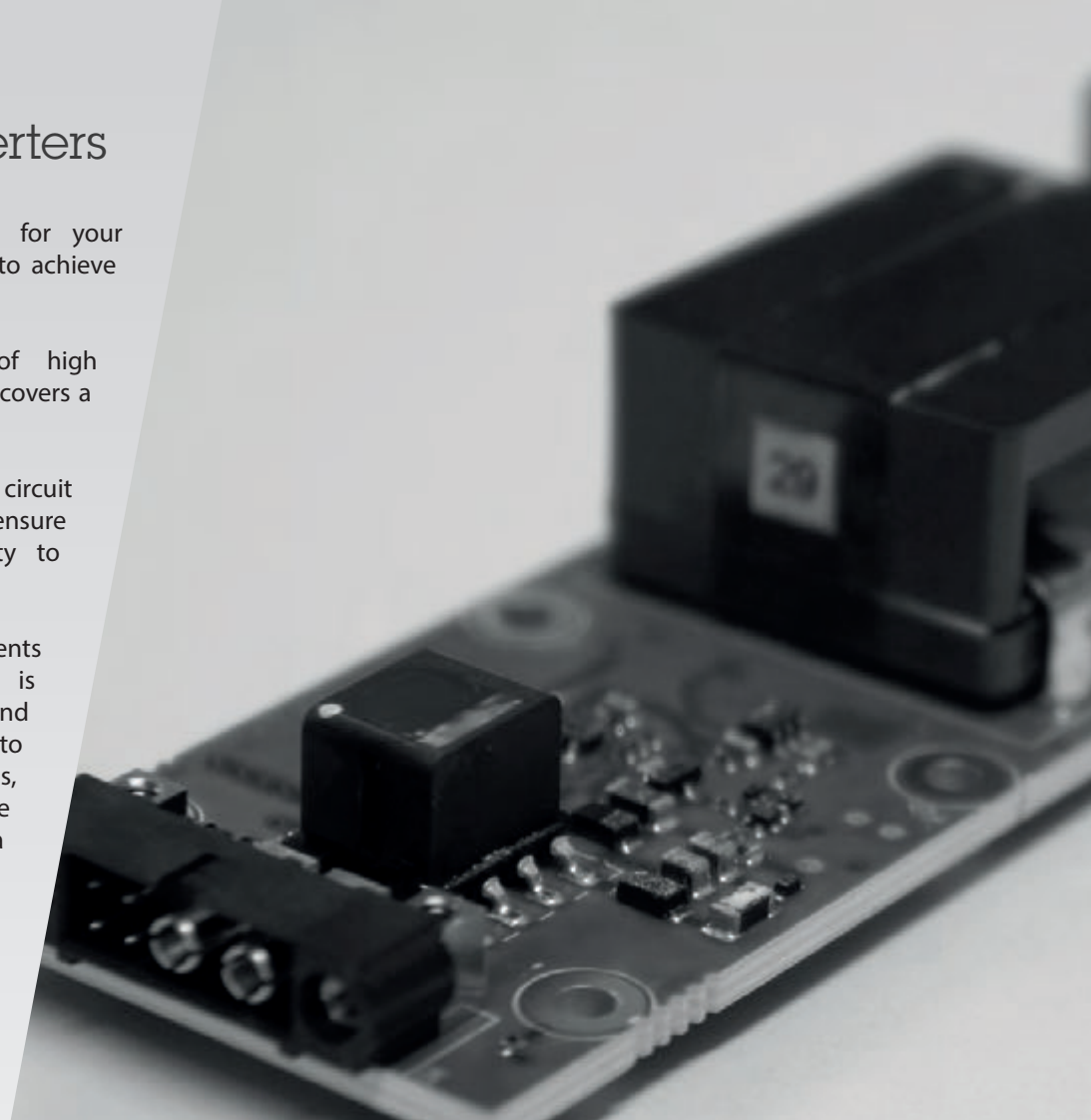
NSE has designed a series of high performance DCDC converters that covers a broad range of power levels.

All NSE DCDC converters have short circuit and overvoltage protection to ensure reliable operation and the ability to handle unforeseen situations.

Operating in harsh environments implies that the input voltage is fluctuating, and that voltage and current transients are very likely to occur. Even under these conditions, and with rapid load transients the NSE DCDC converters provide a stable output voltage.

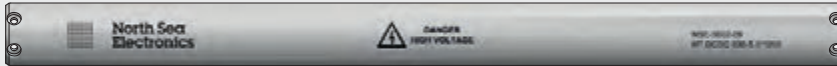


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DCDC Converters to cover all power requirements

NSE 5002-09



HT DCDC 600-4.2/1200-38mm

Dimensions	500mm x ø38mm
Input Voltage	600 - 1200Vdc
Output Voltage	600Vdc regulated
Output Power	2.5kW

NSE 5002-03 /-08 /-10



HT DCDC 24 | 48 | 60-4.2/600-42mm

Dimensions	366 x 35 x 23.5mm
Input Voltage	100 - 600Vdc
Output Voltage	24 / 48 / 60 Vdc
Output Power	100W / 200W / 250W

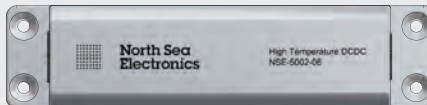
NSE 5002-05



HT DCDC 28-1.5/600-38mm

Dimensions	253 x 37 x 17mm
Input Voltage	200 - 600Vdc
Output Voltage	28Vdc regulated
Output Power	42W

NSE 5002-06



HT DCDC 30-0.83/600-37mm

Dimensions	153 x 37 x 17.1mm
Input Voltage	200 - 600Vdc
Output Voltage	30Vdc regulated
Output Power	25W

NSE Processor Boards

The NSE Processor boards are designed to operate in a harsh downhole or industrial environment and provides a flexible platform for control and monitoring.

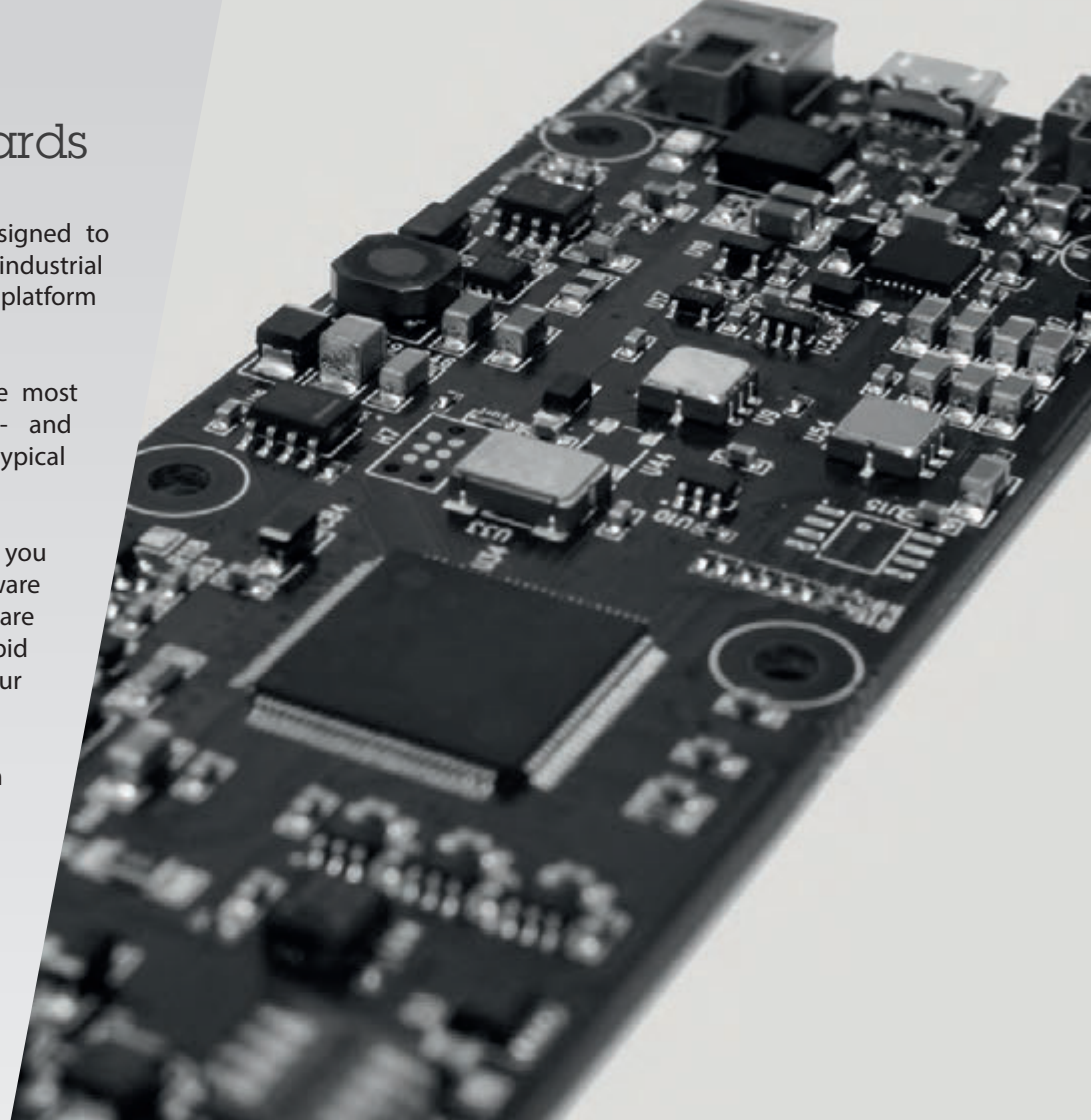
The boards are equipped with the most common sensor-, communication- and control interfaces required for typical downhole logging and drilling tools.

By choosing an NSE processor board, you get a proven and tested hardware platform, combined with firmware support that allows for rapid development and deployment of your tool.

NSE offer to develop custom firmware for the processor boards, or assist you with your own firmware development.

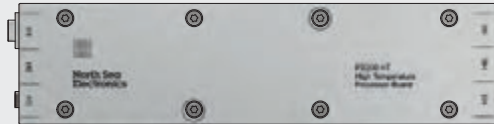


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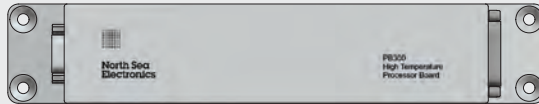


Processor Boards for demanding tasks

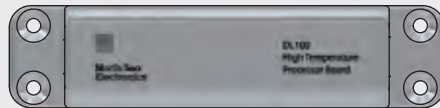
NSE 5003-02



NSE 5003-03



NSE 5003-04



PB200 Processor Board

Dimensions 177,5 x 45 x 11mm

- CAN / RS485
- User Programmable DSP
- 4 x Push-Pull out
- 4 x Bridge sensor inputs
- 7 x GPIO pins
- EEPROM Memory
- Accelerometer
- IEPE Interface

PB300 Processor Board

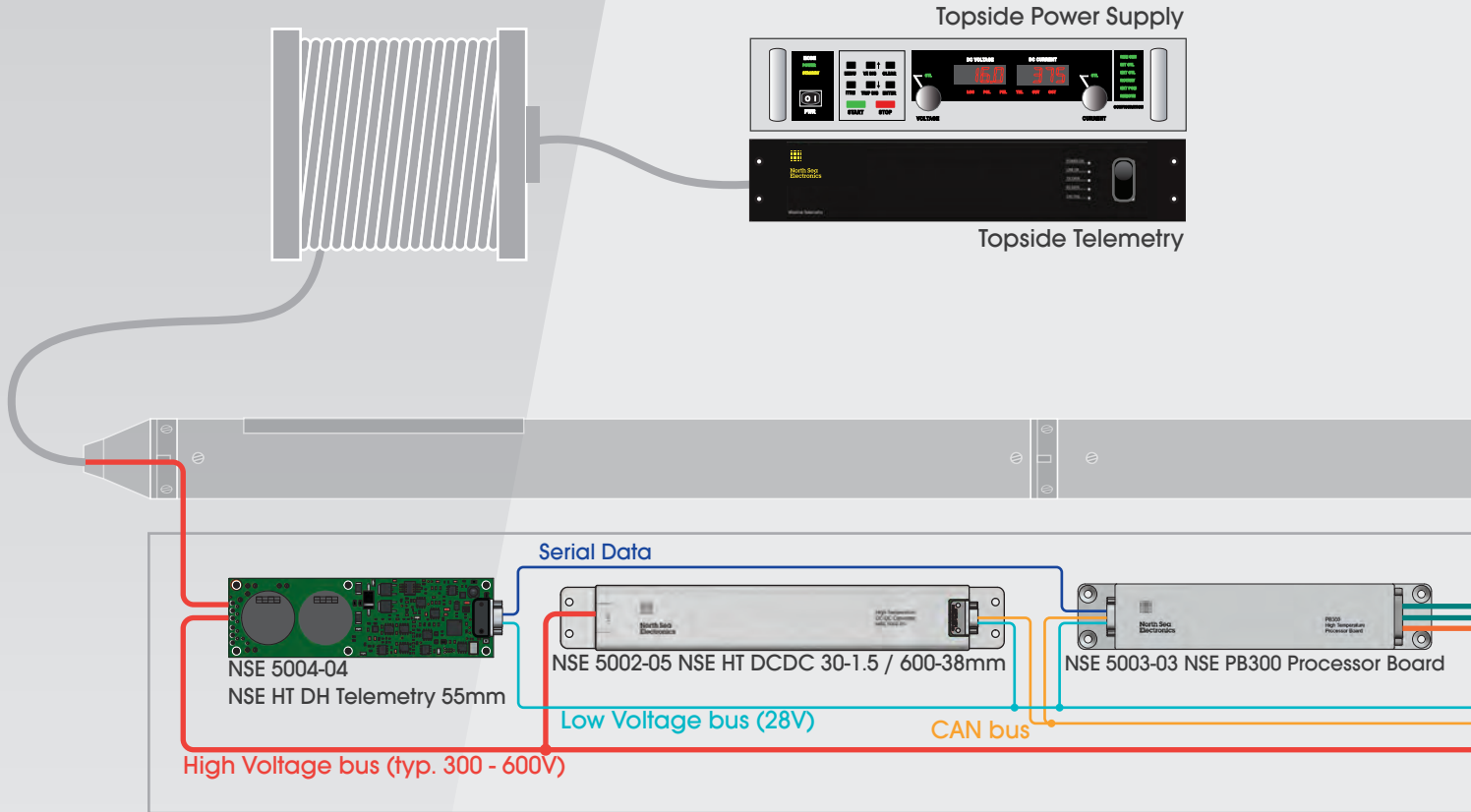
Dimensions 200 x 37 x 14mm

- CAN / RS485
- User Programmable DSP
- 2 x Open Drain
- 2 x Bridge sensor inputs
- 4 x GPIO pins
- EEPROM Memory
- Accelerometer
- Flash memory (Optional)

DL100 Data Logger

Dimensions 98 x 23 x 12mm

- CAN interface
- DSP processor
- 18 - 60V input
- 2 x Bridge sensor inputs
- 1 x RTD interface
- Flash memory
- Accelerometer
- Low power consumption

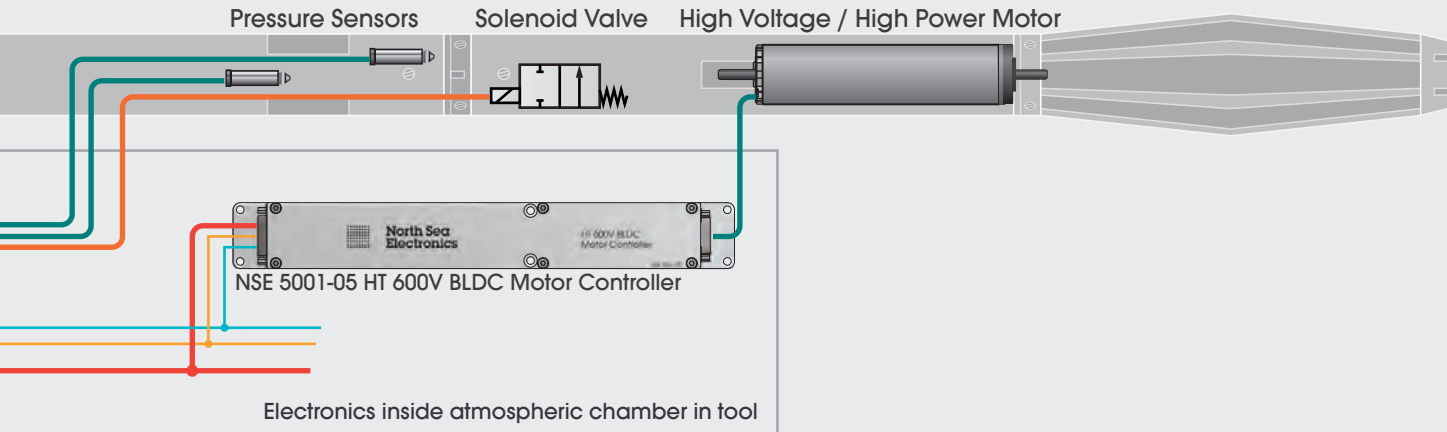


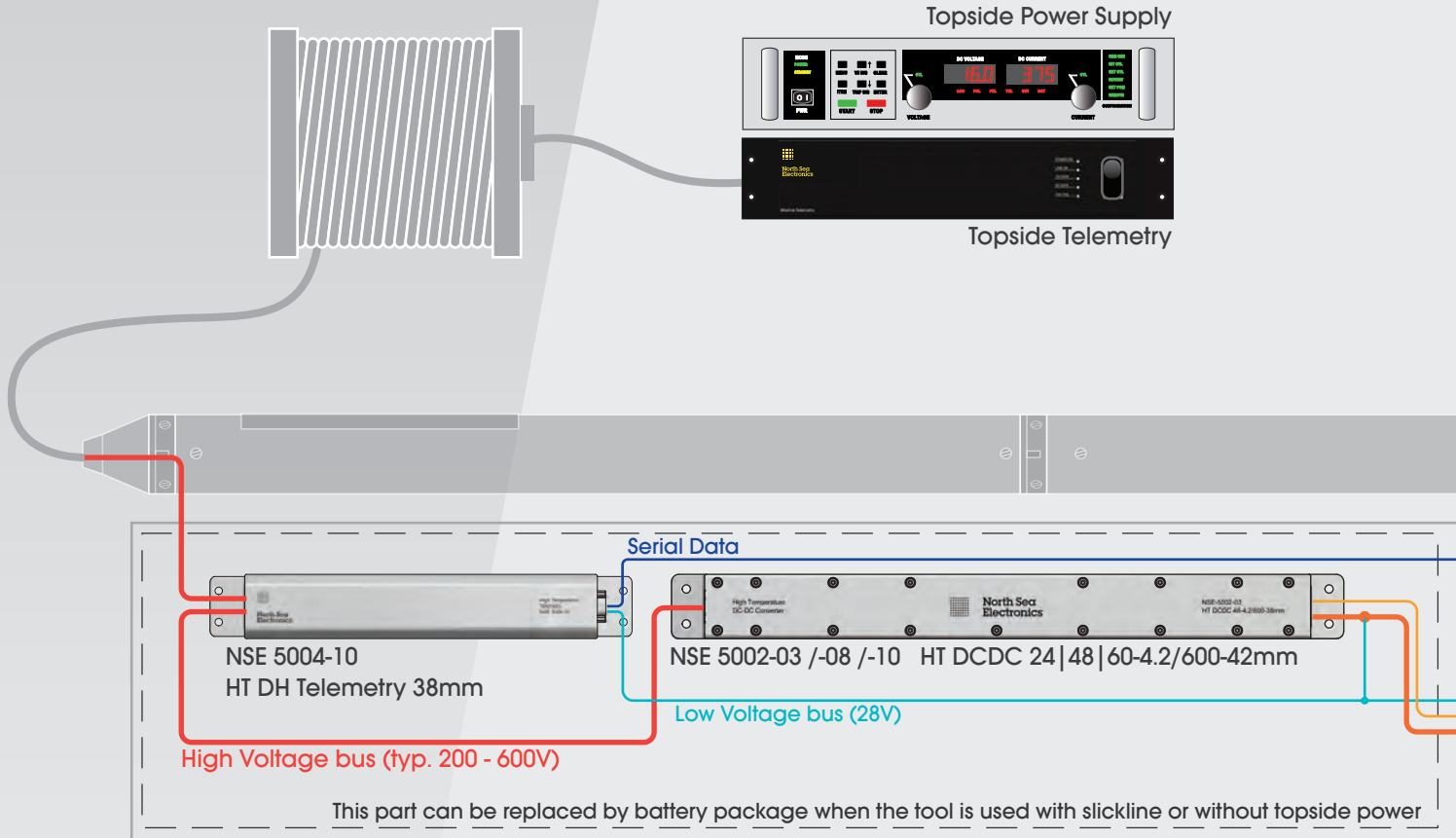
Reference design # 1 - High power tool

NSE electronics is well suited for typical power tool applications such as conveyor tools, strokers or high power electrohydraulic pumps.

Below is a typical reference design that shows how NSE electronics can be used to power and control a high power tool. It is assumed here that there will be used a high voltage, high power (>1kW) motor, and the electronics are chosen accordingly.

This reference design is shown with only one HT 600V BLDC Motor Controller, but several motor controllers and motors can be added if needed.

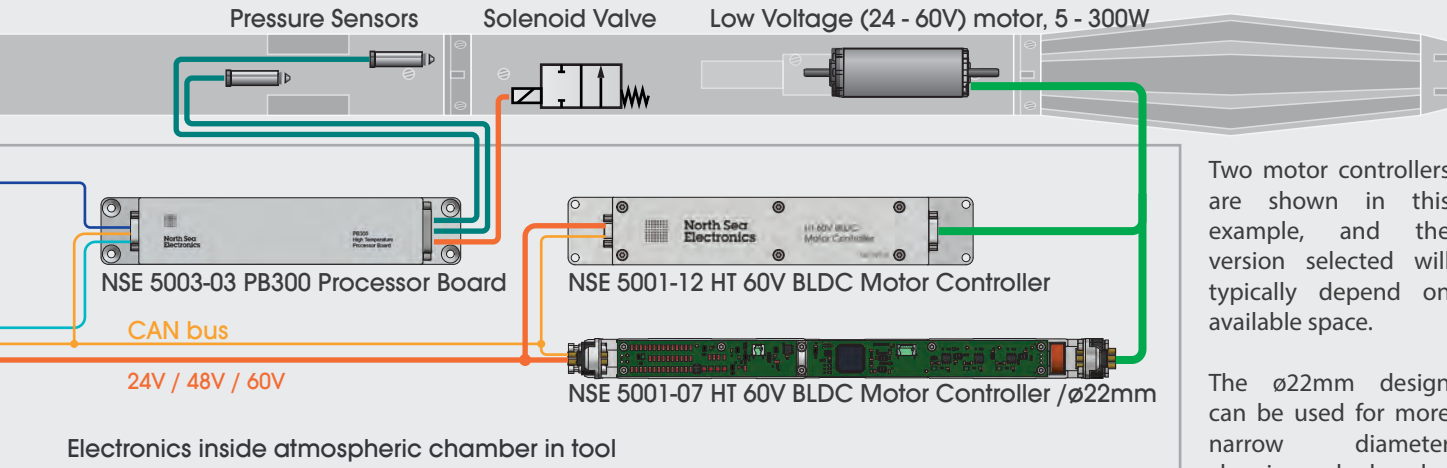




Reference design # 2 - Medium power tool

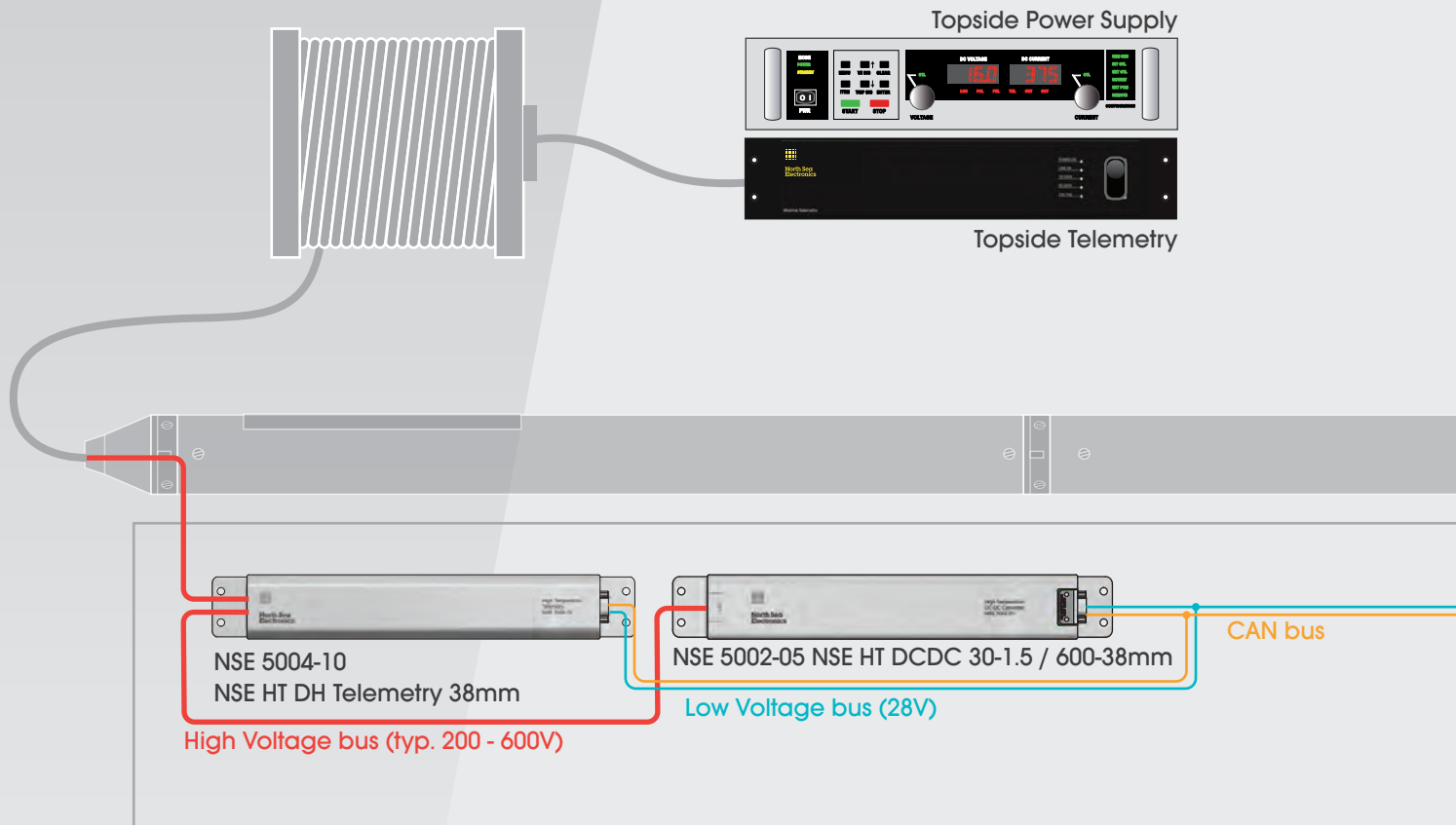
Below is a typical reference design that shows how NSE electronics can be used to power and control a medium power (20-250W) tool. Typically, this can be a small stroker or manipulation tool that uses a low voltage (18-60V) motor. Low voltage motors are more available and the prices are usually lower.

By selecting either of NSE 5002-03 /-08 or /-10, the system will have a power supply with high voltage (100-600Vdc) input and 4.2A output at either 24, 48 or 60Vdc. This makes it ideal as power source for low voltage motors.



Two motor controllers are shown in this example, and the version selected will typically depend on available space.

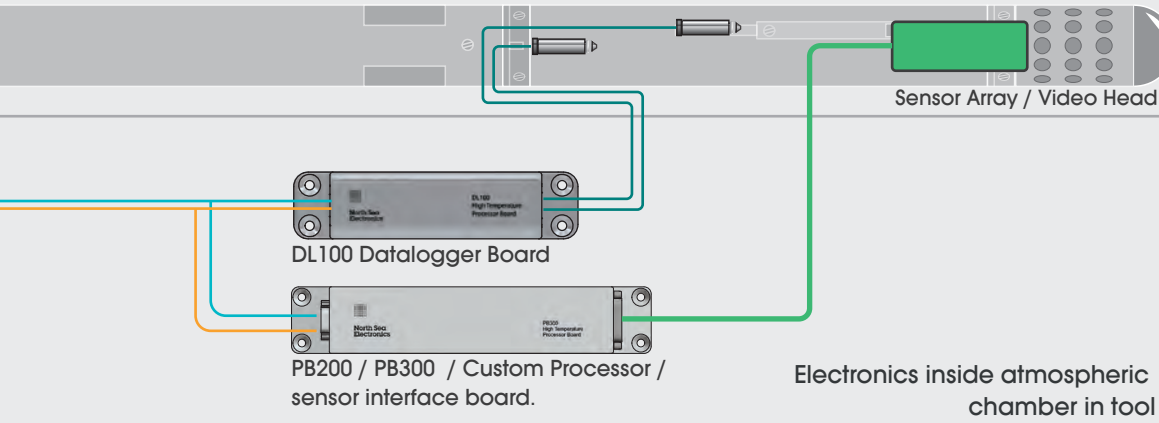
The ø22mm design can be used for more narrow diameter chassis and do also support resolver interfaces.



Reference design # 3 - Logging / Camera tool

Below is a typical reference design that shows how NSE electronics can be used to power and control a logging or camera tool. The unsurpassed NSE Telemetry provides a reliable and stable communication link with data rates up to over 200kbps, and a proven performance on even the longest and most difficult cables.

By adding an NSE DCDC Converter that works with a broad input voltage range, and outputs a reliable voltage with an available power of 40-240W (depending on model), the system should have enough power to cover most available and future data acquisition systems.



Logging- and high data rate acquisition boards are typically custom designs. NSE work tightly with our customers in order to provide the best possible integration of a system. If required, NSE will offer design support and can develop sensor interface boards. We have a very good experience in design of low noise / high sampling rate data acquisition boards.

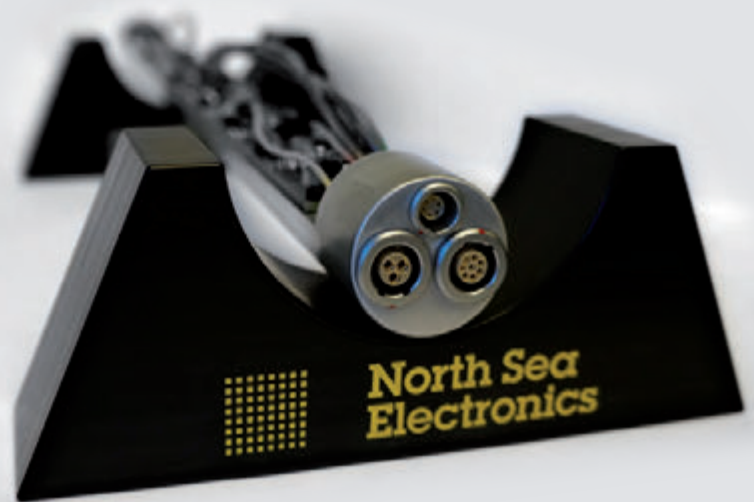
CUSTOM Designs

Advanced custom solutions

NSE work with a variety of customers in different industries such as oil and gas, marine, renewable energy and automotive.

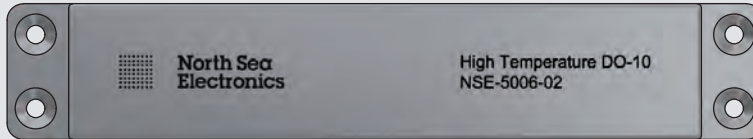
In addition to the “off-the-shelf” portfolio, NSE offer custom designs. This can be complete solutions specified by the customer, firmware features, or minor changes to existing products.

NSE has a dedicated staff of highly skilled engineers with an extensive knowledge in design of electronics for harsh environments. Together with our production partners, NSE can offer development and production that meet the highest standards.



Node IO Boards

NSE 5006-02



The NSE 5006-02 is a 10 channel Digital Output (Open Drain / Sinking current) board. The board is conformed coated and rated for operation in an ambient atmosphere up to 177deg / 15.000Psi. This allows flexible installation close to the actual solenoids / valves that are to be operated.

NSE 5005-02



The NSE 5005-05 is a versatile analog input node board, designed to interface RTD thermocouplers, strain gauges, pressure sensors or other bridge type sensors.

The board is conformed coated and rated for operation in up to 177deg / 15.000Psi ambient pressure environments, allowing flexible installation close to the sensors. This reduces cabling, increases accuracy and reduces the noise influence.

DO-10 Digital Output Module

Dimensions Housing	184 x 33 x 13.9mm
Max. Current / Ch.	1Adc
Max. Total Current	5Adc
Open Drain Channels	10
GPIO Channels	2
Communication	CANBus
Input Voltage Range	18-36Vdc
Temp / Pressure rating	177°C / 15.000Psi

AI-200 Analog Input Module

Dimensions	T.B.D
Bridge Channels	4
RTD Channels	6
0-5V analog Input	2
GPIO Channels	2
Communication	CANBus
Input Voltage Range	18-36Vdc
Temp / Pressure rating	177°C / 15.000Psi

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