North Sea Electronics

NSE Topside Telemetry 19'' 2U

NSE-5004-01

Features

- Very compact design
- Up to 1200Vdc input voltage
- Up to 8.3A input current
- Up to 200kbps data rates
- USB / RS485
- Easy integration into 3rd party systems
- High noise redundancy
- Adaptive modulation

Product Description

The NSE Wireline Telemetry System is used for communication via wireline or powerline. The system consists of two main components: a topside unit and one or more downhole modems.

The NSE Wireline Telemetry System operates as a transparent link between the topside user interface/applications and the electronics located in the downhole tool. Serial commands sent from a computer to the topside modem are modulated and superimposed on the power cable. This signal is demodulated and converted back to conventional serial commands (TTL or CANBus) in the downhole modem.

The TS Telemetry QPSK is designed to be used in a 19inch rack mount system. The units is only 2U high and 346mm deep (excl. connectors), making it easy to transport and handle. Connections to power supply and wireline are made by rugged Harting connectors.

NSE Wireline Telemetry Systems are deployed worldwide and cover all applications from power tools, such as tractor and strokers, to low power sensors and data acquisition tools. The reliability of the link allows data transfer in very noisy conditions over difficult cables and the system will optimize data rates for the given setup.

The system requires very little user interaction. In most cases, the modems will autotune to the correct gain and frequency settings for a cable. During operation, the system is continuously adapting to the conditions on the line to optimize the signal to noise ratio.

The system is addressable so several downhole modems can communicate with one topside modem and has a broad input voltage range.

1 Table of NSE Topside Modems

Product Number / Name	Size	Max. Input DC Voltage	Max. Wireline Current	Noise immun.	USB / RS485 ports	Ethernet Option
NSE-5004-01 NSE Topside Telemetry 19inch Rack	**19'' 2U x 346mm (excl. con.)**	**1200V**	**8A**	**High**	**2 / 1**	**NO**
NSE-5004-20 NSE Topside Telemetry – Portable Unit	**314 x 113 x 71.5mm**	**600V**	**2A**	**Medium**	**3 / 0**	**YES**
NSE-5004-21 NSE Topside Telemetry – Eurocard Board	**100x 160mm Eurocard**	**600V**	**2A**	**Medium**	**3 / 1**	**YES**

2 Product Specification

2.1 Electrical Specifications

Parameter	Conditions / Comments	Min	Typ	Max	Unit
SUPPLY VOLTAGE					
Input Voltage AC supply		110		230	*Vac*
Input Power				30	*W*
WIRELINE / POWER INTERFACE					
Input High Voltage	*Continuous DC Voltage*	0		1200	*Vdc*
Current	*Continuous DC Voltage*	0		8.3	*Adc*
COMMUNICATION INTERFACES					
USB Port 1	*Virtual Serial Port – Data 1*	9.600		375.000	*bps*
USB Port 2	*Virtual Serial Port – Data 2*	9.600		375.000	*bps*
USB Port 3	*Virtual Serial Port – Status*	9.600		375.000	*bps*
RS-422/485	*Not Mounted*	-		-	
*Ethernet**	*Alternative communication port *Not implemented – Consult NSE for information*	-		-	
INTEGRATED SENSORS					
Temperature sensor	*Measurement range*	-20		85	*degC*
ENVIRONMENTAL					
Operating temp. range	*Min and Max temperature of the ambient atmosphere*	-10		50	*degC*

TRANSMISSION PARAMETERS				
Uplink frequency range	*Centre frequency*	20	45	*kHz*
Uplink data rate	*Payload data available to user*		200	*kbit/sec*
Downlink freq. range	*Centre frequency*	24	30	*kHz*
Downlink data rate	*Payload data available to user*		16	*kbit/sec*
Adaptive Filter Tuning	*Continuous - to optimize SNR*		YES	
Adaptive Modulation	*Uplink – to optimize data rates*		YES	
Automatic gain control	*Uplink and downlink*		YES	
Data redundancy check	*8 bit*		YES	
Automatic retransmit	*Modems will retransmit if CRC fails*		YES	
CONNECTORS				
AC Inlet Supply Power	*AC supply to power the modem*		IEC Inlet	
High Voltage DC OUT	*HV DC Output to wireline / cable*		Harting	
High Voltage DC IN	*HV DC Input from external PSU*		Harting	
2 x USB			USB B	
RS-422			9 PIN D-SUB	
PHYSICAL SIZE				
Width	*Standard rack mount*		19"	
Height	*Standard rack mount*		2U	
Depth	*Excluding connectors*		346	mm

2.2 Conformal Coating

This product is delivered with no conformal coating.

2.3 Environmental requirements

This unit does not have any weather or ingress protection. The unit is designed for indoor use within the specified temperature range.

2.4 Cable types supported

The NSE Telemetry system is developed to work on wireline cables, but has proven to provide reliable links on a variety of cable and setups such as:

- Wireline, Monoconductor cables
- Wireline, Hepta cables
- Coiled tubing with electrical lines
- Coiled tubing with hybrid (electro and fiber) cables
- TEC Downhole Cables
- Various Subsea cables
- Twisted pair

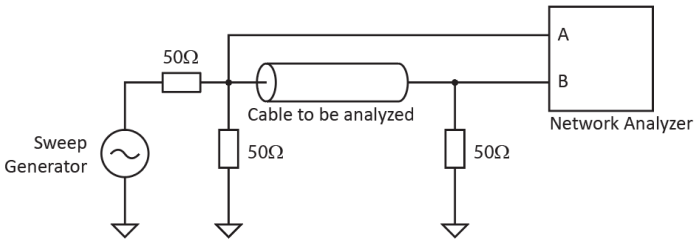
The versatility and adaptive algorithms of the telemetry mean that it will work on a very broad range of cable. Contact NSE if you have questions about specific cable types or setup.

2.5 Telemetry range

The maximum supported cable length of the modem depends on several factors:

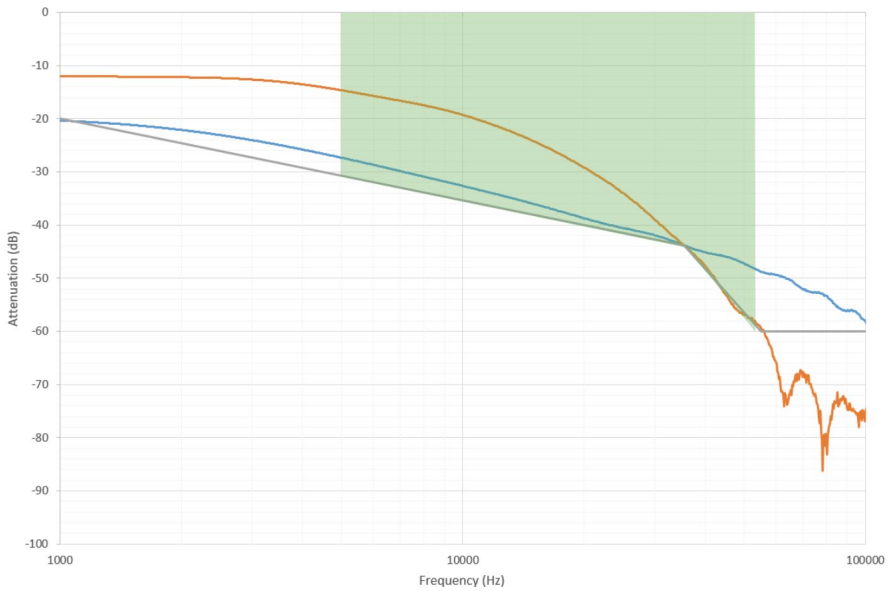
- Cable type and characteristics
- Connections from the topside modem to the cable head/winch
- Connections and grounding in the tool itself
- Ground loops and ground induced noise
- Sources of noise downhole such as - motor controller, power converters, and sensors
- Sources of noise topside such as - power supplies, electrical winches, hydraulic power packs, and generators

To provide a reference for the telemetry we use two cable characteristics as the maximum limit for the range of the standard modem setup. Note that in most cases, the telemetry will operate fine on even longer cables than these references, but they serve as a guideline. Long-range modems will support cables setups with higher attenuation.



Measurement circuit for cable references

The graph below shows the attenuation plot of the reference cables with the overlay of a green area ranging between 5 to 55kHz. In this area, the attenuation of the cable should not be below the limit indicated. As can be seen, both the reference cables are within the green area for the frequency range of interest.

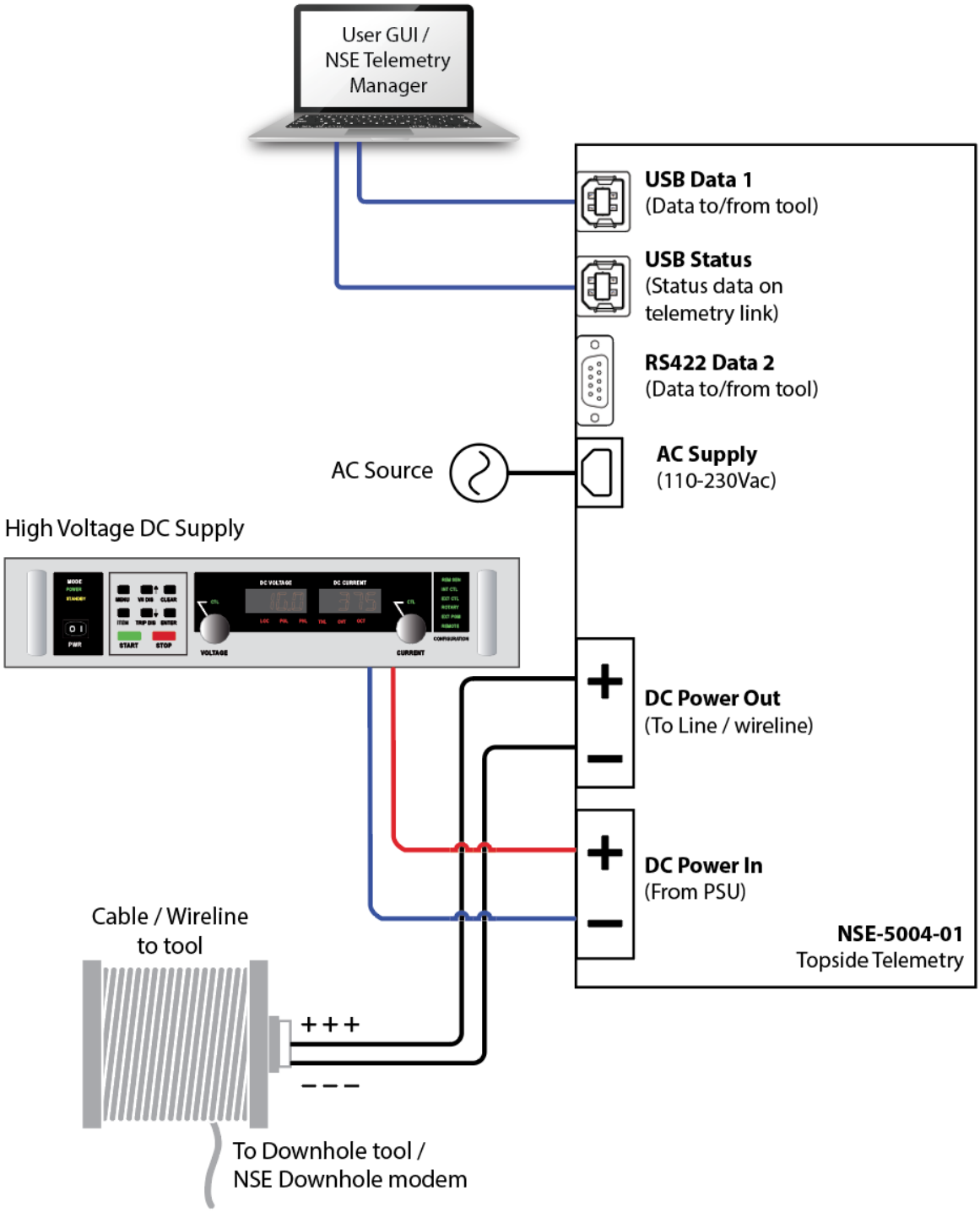


Reference Cable 1
Length 9.1km / 30kft
Camesa 5/16
1N32WTZ
(Corrosion resistant)

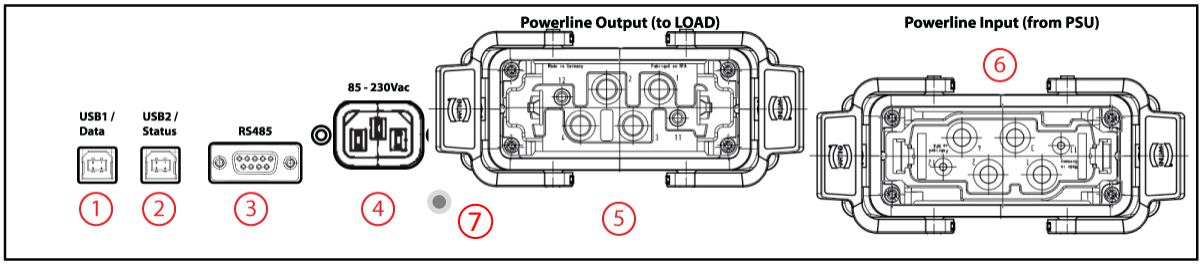
Reference Cable 2
Length 9.1km / 30kft
Camesa 5/16
1N32PTZ

3 Connections

3.1 Overview



3.2 Rear Panel Connectors



Connector	Name	Function
1	USB1 / Data	USB dataport. This is the input port for the data traffic
2	USB2 / Status	USB statusport. This is the USB port for monitoring the modem status data, and writing configuration registers
3	RS422/RS485	Alternative dataport. Can be used for data traffic.
4	110 – 230Vac IEC inlet	AC Mains power to the modem.
5	Powerline output (to load)	DC Output voltage and telemetry signals
6	Powerline input (from HV PSU)	DC Input Voltage
7	Ground Lug	Chassis ground connection

3.2.1 IEC Power Inlet

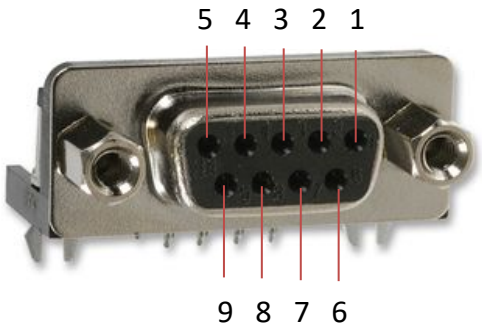
Modem connector:	**BULGIN - PX0580/PC - INLET, IEC**

3.2.2 USB1 / USB2 Connectors

Modem connector:	**USB Type B, Receptable**
USB interface chip:	**FTDI FT232R USB to serial UART interface**

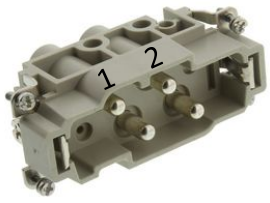
3.2.3 RS422/RS485 Connector

Modem connector:	**D Sub Connector, DB9, Standard, Receptacle**
RS422 / RS485 interface chip:	**MAX1486CUB+**

Pin	Signal name	Description / Function	Connector Pinout (Face View)
1	GND	Ground	
2	N.C	Not connected	
3	N.C	Not connected	
4	Y	Noninverting Driver Output	
5	Z	Inverting Driver Output	
6	N.C	Not connected	
7	N.C	Not connected	
8	A	Noninverting Receiver Input	
9	B	Inverting Receiver Input	

3.2.1 Powerline Input (from HV PSU)

Modem connector:	**Han Com Series, Insert, 4 Contacts, 16B, Plug, Screw Pin**
	Harting product no. 0938 006 2611
Modem connector base:	**Low Profile, Base, Bulkhead Mount, Aluminium Body, 2 Lever, 16B**
	Harting product no. 0930 016 0301
Suggested mating connector:	**Han Com Series, Insert, 4 Contacts, 16B, Receptacle, Screw Socket**
	Harting product no. 0938 006 2711

Pin	Signal name	Description / Function	Modem Connector Photo
1	HV+	High Voltage DC Positive	
2	HV-	High Voltage DC Return	
3	N.C	Not connected	
4	N.C	Not connected	

3.2.1 Powerline Output (to wire/powerline)

Modem connector:	Han Com Series, Insert, 4 Contacts, 16B, Receptacle, Screw Socket Harting product no. 0938 006 2711
Modem connector base:	Low Profile, Base, Bulkhead Mount, Aluminium Body, 2 Lever, 16B Harting product no. 0930 016 0301
Suggested mating connector:	Han Com Series, Insert, 4 Contacts, 16B, Plug, Screw Pin Harting product no. 0938 006 2611

Pin	Signal name	Description / Function	Connector Drawing
1	HV+	High Voltage DC Positive	
2	HV-	High Voltage DC Return	
3	N.C	Not connected	
4	N.C	Not connected	

3.3 LED Indicators

The board has 4 LED indicators to indicate activity.

Name	Colour	Description
Power	Green	Illuminates when power is applied to the modem
Link OK	Green	Illuminated when topside and downhole modem has power and contact with each other
RX Data	Green	Blinks when receiving data
TX Data	Green	Blinks when transmitting data
CRC	Red	Blinks when detecting a CRC Fault

4 Features

The NSE Telemetry is continuously being updated and updates are provided for free to our customers. Below is a list of the main (but not all) features of the telemetry system. Consult NSE for further questions or inquiries about the features and advantages of the NSE Telemetry system.

Feature	Description
Transparent data port	The data being sent and received on the data port are the same bytes as you receive and send on the topside modem. No framing or encryption is necessary. The purpose of the modem is to be a transparent datalink from your topside user interface to the tool. Note that a topside and a downhole modem can have different baud rates and that the latency on the data can have some variation as the modem will buffer data and send it over the line in packages.
High Power Wireline Filter	The modem has a high power / high voltage wireline filter design to separate the communication signal from the DC power being fed to the modem. The high power filter will handle the currents (within specifications) and voltages normally being seen on a wireline and will help to improve the signal to noise ratio of the system.
Automatic Link Tuning	The first time the modems are powered up on a new cable, the topside and downhole modems will analyze the cable and work out the best settings for modulation, gains, and frequencies. No user interaction is required here, and this feature ensures optimum data rates and signal quality for a given cable. The feature can be disabled if the user wants to set the parameters themselves.
Adaptive filter tuning	Once the link has been established the modems will continuously work to adapt to the cable by updating the digital filter coefficients. The updates are being done several times per second and ensure that the link will maintain the highest possible signal to noise ratio even when conditions such as spooling out the cable, temperature and load, changes.
Adaptive modulation	The adaptive modulation will increase the modulation rate in steps (hence the available data rates) when the signal to noise ratio is better than defined thresholds. In this way, the user will always have the best possible data rate for the actual condition (cable and noise) at the same time as the modem will ensure to lower the data rates if noise levels increase. It is possible to set the modems to a "safe" mode where the system will optimize frequency and modulation for noisy conditions rather than "performance" mode where the modem will optimize for the highest possible data rates.

CRC and automatic retransmissions	All data being sent over the wireline are being CRC (Cyclic Redundancy Check) checked when received and if the modems detect a failed CRC it will request that the data are being retransmitted (up to 4 times). All CRC events, retransmissions, and package loss (if resending a package 4 times fail, the package is dropped) are being tracked and the count of these events can be read out over the status port.
Addressable	The downhole modems are addressable and several downhole modems can be connected in parallel. On a topside modem, one chooses which modem to talk to by selecting a destination address.
Data buffering	When data is being fed to the modems on the serial port, the data are being buffered until they are transmitted over the wireline. Both the topside modems and the downhole modems have defined buffer space to temporarily store bytes that are not immediately sent. The status of the serial buffers can be monitored through the status port to optimize the data flow into the modems and to prevent overflowing the serial buffers. A flow control mechanism can also be enabled if required.

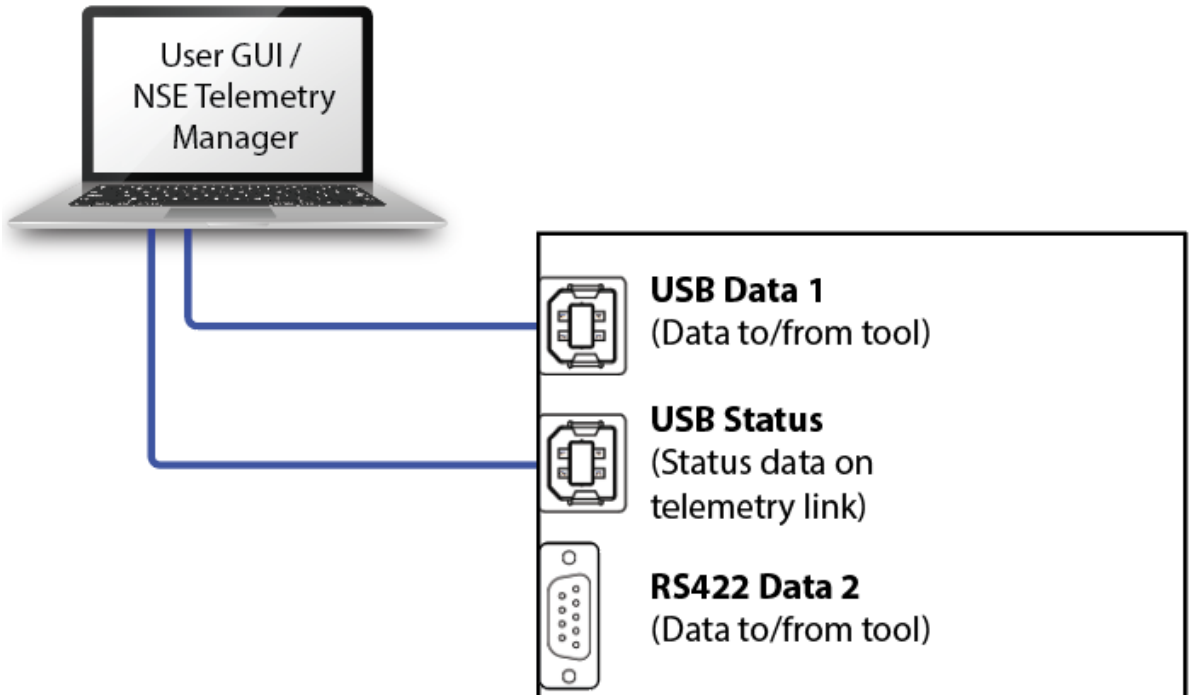
4.1 Bootloader

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, and the bootloader allows the customer to upgrade a controller if desired.

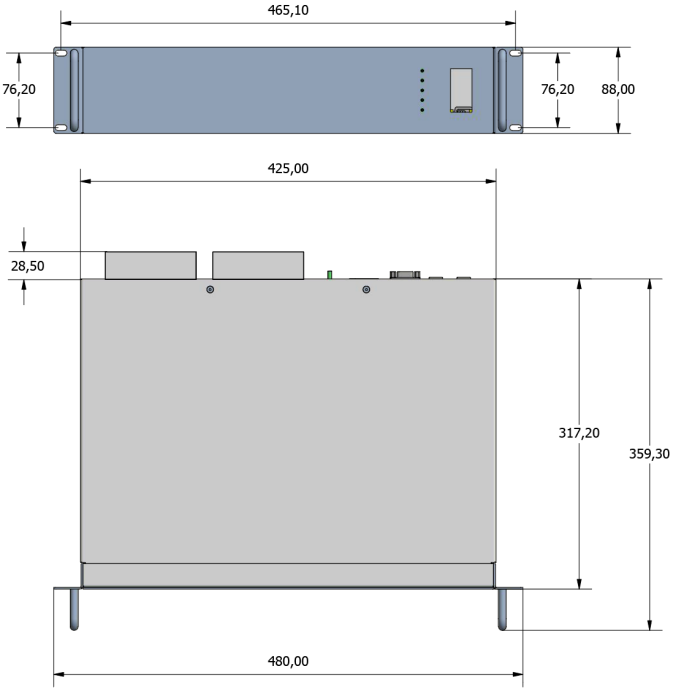
5 Graphical User Interface

The "NSE Telemetry Manager" software (graphical user interface) is free of charge software that can be used to set up and monitor the telemetry system. The software uses the **status port** (USB Status) to communicate with the modem.

The "NSE Telemetry Manager" will display all relevant data from the telemetry and can trend- and download all parameters. Data from a test can be uploaded directly to NSE servers to ease support and faultfinding.



6 Mechanical Dimensions



7 Datasheet Revision History

REV	DATE	DESCRIPTION	PREP	APPR
A	18.11.2020	Initial release of datasheet on new template. Superseeds earlier versions of datasheets and user manuals.	RFY	GLK

8 Product code

		Product code:	**NSE-5004**	**-01**	**-X**
Category	NSE-5004	= NSE Telemetry			
Model	-01	= Topside Telemetry QPSK – rack mount			
Version	-X	= Leave blank (Custom option suffix)			

8.1 Where to buy

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