



Features

- Active CCL sensor
- Detection of collars even at zero speed
- Available with or without telemetry
- High temperature – 177°C
- CANbus Interface with active termination resistor
- Highly sensitive sensor design
- Can be made with a center flow passage
- Feasible for wireline and coiled tubing
- Coil versions available for OD 60, 48, 36 & 24mm



Product Description

The NSE CCL is an active Casing Collar Locator for downhole applications. The CCL features a sophisticated measuring principle that allows for high-resolution locator data at both high and low speeds. The sensor can detect changes in both the casing material properties and geometry. Due to its unique sensitivity it reacts to both electric and magnetic properties of the materials.

The CCL detects geometrical variations in:

- Non-magnetic, conductive materials (Austenitic stainless-steel, Aluminum, etc.)
- Conductive magnetic materials (Iron, Steel, nickel)
- Non-conductive magnetic materials (Ferrite, Magnetic powder cores, etc.)

The NSE CCL can be directly integrated into the customer's tool or used as a stand-alone unit. The CCL can stream data through the NSE telemetry system or provide data on CANbus to any third-party system with CANbus interface. Both solutions are easy to integrate into new or existing systems. The sensor may have a flow path through its center which makes it very suitable for coiled tubing applications in addition to all e-line/wireline applications. The mechanical design is compact and cost efficient.

The CCL is rated for temperatures up to 177°C (350°F) with a ruggedized design which allows for use in extremely harsh environments.

1 Product overview

The NSE CCL is available in two different board variants and several different coil dimensions.

The two different board variants are:

Board variant #1 is NSE-5007-80 (MK1)

Board variant #2 is NSE-5007-81 (MK2)

The main difference between the two board variants is the size and output power capability.

The MK2 is smaller and can be configured for higher output level.

The coil variants are designed for 24mm 48mm and 60mm housing ID.

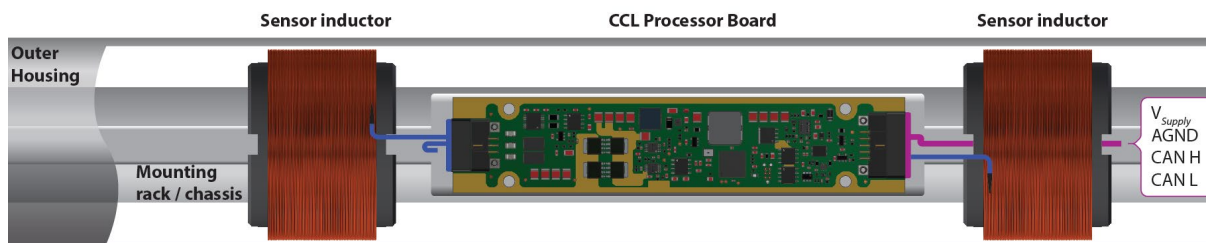
Larger coils gives better sensitivity for larger casing ID.

1.1 CCL for tool-integration (CANbus output)

This version of the CCL is made for direct integration. The design guidelines for the CCL and step models of the processor board and inductors makes design of the CCL section easy and allow for the customer to integrate a high-performance CCL directly in their tool.

The Version B CCL consist of the following components:

Item	Description	Supplier
1	1 x CCL Processor Board	NSE
2	2 x Sensor Inductors	NSE
4	Chassis/rack for mounting	Customer design
5	Outer housing	Customer design



2 Product Specification

Parameter	Conditions / Comments	Min	Typ	Max	Unit
SUPPLY VOLTAGE Input Voltage Range Power consumption	<i>CCL for integration (CANbus)</i> <i>Specified operational range</i> <i>18 – 30Vdc Input voltage</i>	18	24 1	48 3	Vdc W
CCL Data <i>Sensing Method</i> <i>Response time Min -> Max</i> <i>Response time Max -> Min</i>	 <i>10-90% Full Scale output change</i> <i>90-10% Full Scale output change</i>	INDUCTIVE			 <i>ms</i> <i>ms</i>
SAMPLE RATE Output Data rate	<i>Through CANbus</i>		50	100	Sps
CANBUS INTERFACE* Bit Rate		83.3	125	250	kbits/s
ENVIRONMENTAL AND THERMAL Ambient temperature	<i>Min and Max Temperature on the surface of outer housing</i>	-10		177	°C
OPERATIONAL LIFETIME <i>Expected Lifetime</i>	<i>< 125°C Ambient Temperature</i> <i>125 - 150°C (4 x acc. factor)</i> <i>150- 177°C (8 x acc. factor)</i>	2000	500	250	Hours Hours Hours

* Note – Bit rate is configurable.

3 Thermal properties

The NSE High-Temperature Casing Collar Locator 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 have a low thermal resistance.



3.1 Conformal Coating

This product is delivered without conformal coating of the electronics. However, this can be provided on request.

3.2 Environmental requirements

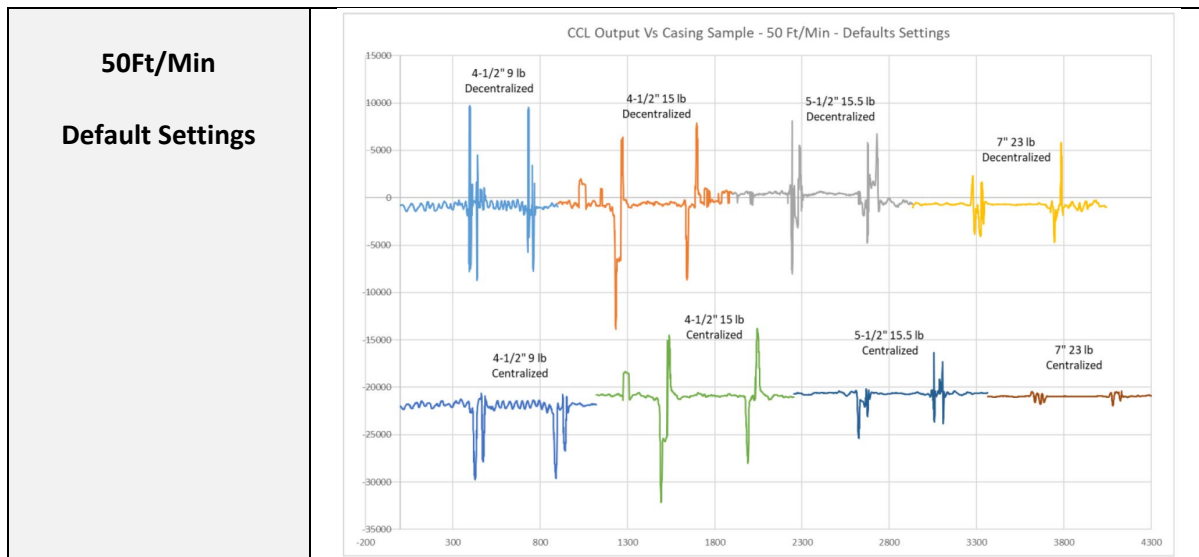
NSE boards must be installed in atmospheric pressure (1atm) with dry air. Avoid any humid atmosphere or under- /overpressure. Refer to general NSE installation guidelines for more information.

4 Performance

The NSE CCL can detect even very tiny geometrical changes on a casing. Setting the CCL in different modes allow for optimized performance in different scenarios and conditions (various casing diameters, materials and how the CCL is run in the hole).

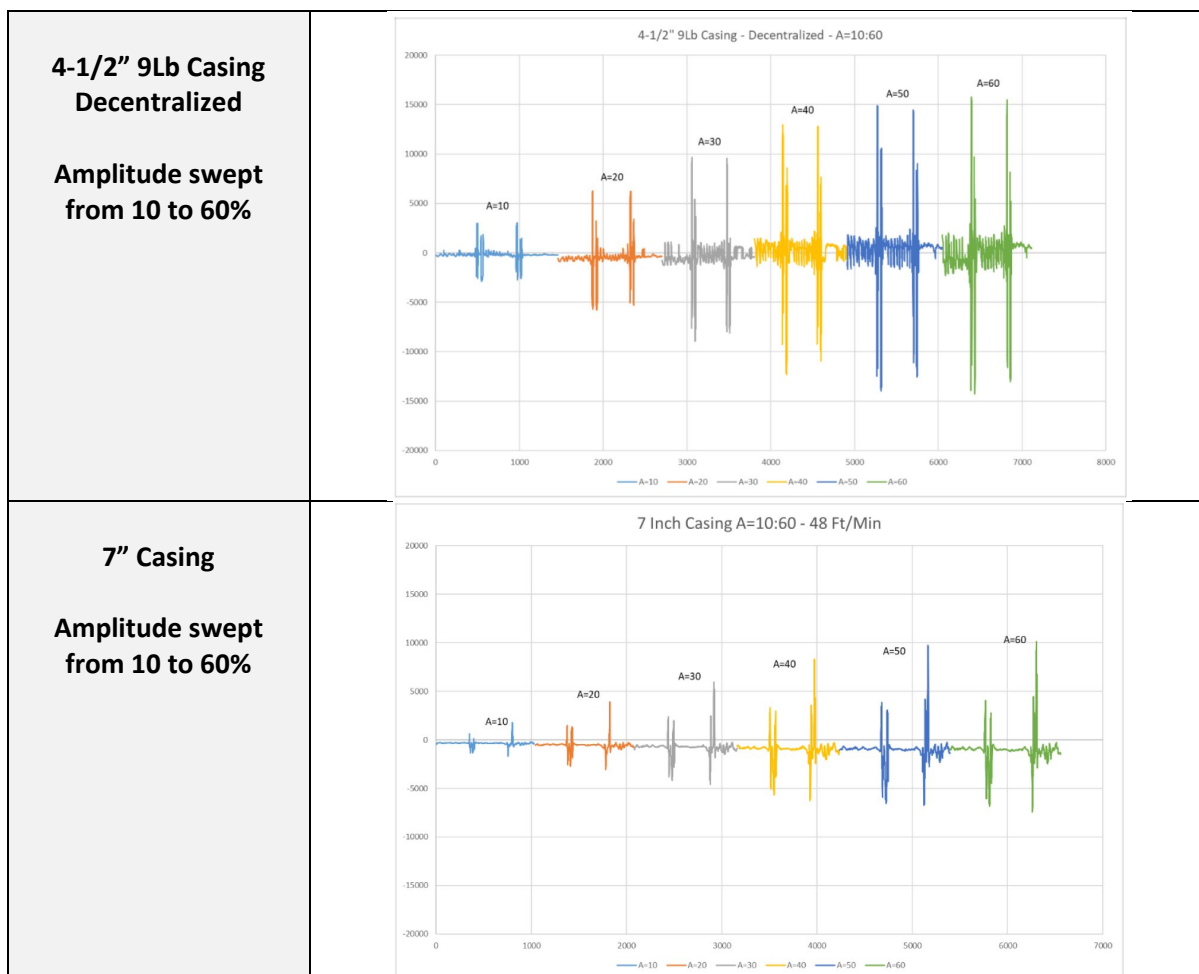
For most scenarios, the CCL will perform excellent with the standard settings / mode.

4.1 Output for different casings



4.2 Output for different amplitude settings

The Amplitude setting of the CCL determines how powerful excitation signal the CCL will have. Usually a higher gain setting will result in a higher detection signal. The signal however can saturate (usually around 40%) and a higher amplitude gain will also result in higher power consumption.



5 Connector and pin-outs

Note that the two board variants has different connector pinouts.

Board variant #1 is NSE-5007-80 (MK1)

Board variant #2 is NSE-5007-81 (MK2)

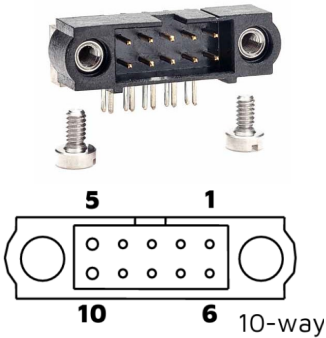
Descriptions of these are given below.

5.1 Power and communication NSE-5007-01/02

This describes the connector interface to board type NSE-5007-80 (MK1)

CCL PCBA Connector: M80-5401042

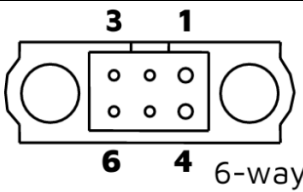
Mating connector: M80-4611042

Pin	Signal name	Description / Function	Connector Pinout
1	V_Supply	Input Power	
2	AGND	Ground	
3	N.C	Not Connected	
4	CAN H	CAN High	
5	CAN L	CAN Low	
6	TEST 1	Test pin – Not to be connected	
7	N.C	Not Connected	
8	N.C	Not Connected	
9	CAN H	CAN High	
10	CAN L	CAN Low	

5.2 Sensor (inductors) NSE-5007-01/02

CCL PCBA Connector: M80-5400642

Mating connector: M80-4610642

Pin	Signal name	Description / Function	Connector Pinout
1	SIG-	Inductor 1 Driver	
2	SIG+	Inductor 2 Driver	
3	COM+	Inductor 2 Common	
4	COM-	Inductor 1 Common	
5	GND	GND	
6	TEST2	Diagnose (Not to be connected)	

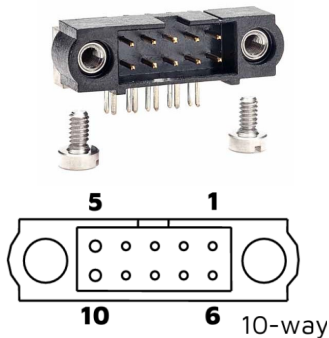
Use 0.5Nm torque on the connector securing screws.

5.3 Power, communication & sensor NSE-5007-03/04/05/06

This describes the connector interface to board type NSE-5007-81 (MK2)

The NSE-5007-03 has only one PCBA plug interface. The same signals are supported on this interface as on the NSE-5007-01/02 version, except some duplicated signals are removed.

CCL PCBA Connector: M80-5401042
 Mating connector: M80-4611042

Pin	Signal name	Description / Function	Connector Pinout
1	V_Supply	Input Power	
2	AGND	Ground	
3	SIG-	Inductor 1 Driver	
4	SIG+	Inductor 2 Driver	
5	COM-	Inductor 1 Common	
6	COM+	Inductor 2 Common	
7	TEST 1	Test pin – Not to be connected	
8	N.C	Not Connected	
9	CAN H	CAN High	
10	CAN L	CAN Low	

6 Features

Feature	Description
Communication Interface	<p>The CCL is delivered with either NSE DH Telemetry or with CANbus communication interface.</p> <p>The unit has CANbus termination that can be enabled or disabled in firmware.</p>
Wide input voltage range	<p>When used as a stand-alone unit (not integrated with customer tool, the unit will accept 100-600Vdc input.</p> <p>When used together with a customer tool, the CCL can be fed from a low voltage toolbus (typ. 18-48Vdc).</p>
High sensitivity	The CCL uses a proprietary measurement principle that enables high sensitivity and detection of collars at even if the unit is not moving.
High output data rates	The CCL can stream output data at up to 100samples per seconds – allowing for precision measurements even if the unit is traveling at high speeds.
Variable gain and sensitivity	Gain and sensitivity can be changed by sending commands to the unit to optimize performance for various scenarios and casing diameters.
Temperature sensing	<p>There is an embedded temperature sensor on the board.</p> <p>Temperature can be read out through the CAN communication interface.</p>

7 Firmware

The embedded firmware features all the necessary functions to set up and run the CCL. Basic setup will cover the most common use of the CCL, but changing parameters such as amplitude gain and frequency is easy and can be done on the fly if required.

Setup of the controller is stored in a non-volatile memory that can also easily be down- and uploaded to a computer to save and restore defined configurations.

7.1 Control parameters

Parameter(s)	Setting(s)
Mode setting	Different mode setting allows for different behavior of the CCL. The parameters below (Gain, offset, frequency and thresholds) are set to pre-defined levels depending on desired behavior. Manual control of the parameter is also possible if required.
Amplitude gain	Changing the amplitude gain of the CCL.
Amplitude offset	Changing the offset can be used to cancel out effects of the mechanical design on the CCL.
Frequency	The CCL excitation frequency can be changed in order to tune its performance for different scenarios. Consult NSE for use of this parameter.
Communication	Bit rate, node ID
Squelch Threshold	Noise attenuation level
Other Parameters	Other control and configuration parameters. Refer to register description for a full overview of parameters

7.2 Feedback parameters

Parameter(s)	Readout
Signed Amplitude	CCL detection signal
Temperatures	Internal board temperatures
Other Parameters	Other feedback parameters. Refer to register description for a full overview of parameters

7.3 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 a controller if desired.

8 Graphical User Interface

The “NSE Node Manager” software (graphical user interface) is a free of charge software that can be used to set up and run the sensor. This software uses the standard NSE protocol to communicate with the casing collar locator and allows the user to set up and run the system within minutes.

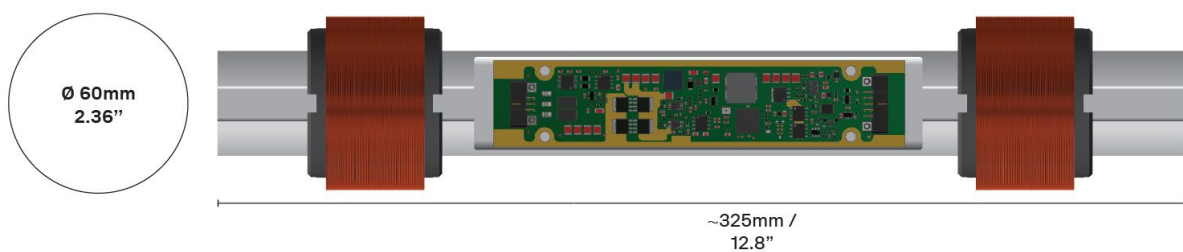
A USB to CANbus adapter is required to communicate between “NSE Node Manager” software and CCL sensor.

9 Mechanical Design

See document “**NSE-500701-904 – NSE CCL - Mechanical Design Guidelines**” for information about the mechanical design of chassis and housing.

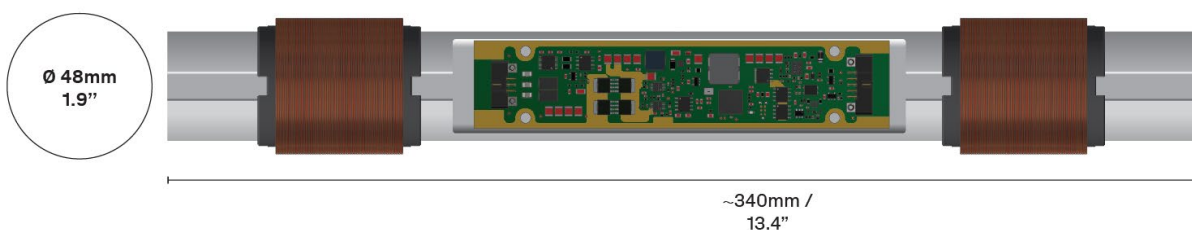
9.1 Dimensions Model -01, OD=60mm (Analog PCBA - MK1)

Note – final dimensions depend on customer design and layout. The drawing below can serve as a reference for typical dimensions.



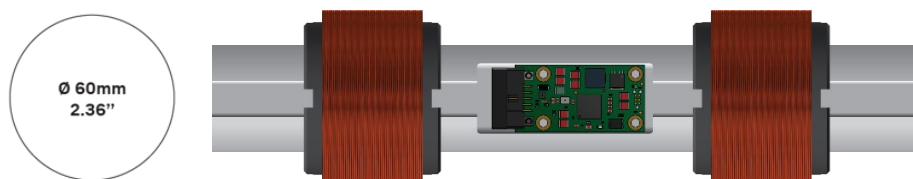
9.2 Dimensions Model -02, OD=48mm (Analog PCBA - MK1)

Note – final dimensions depend on customer design and layout. The drawing below can serve as a reference for typical dimensions.



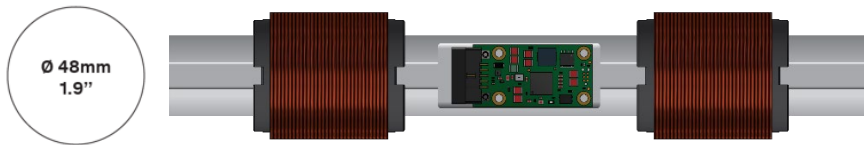
9.3 Dimensions Model -03, OD=60mm (Digital PCBA - MK2)

Note – final dimensions depend on customer design and layout. The drawing below can serve as a reference for typical dimensions.



9.4 Dimensions Model -04, OD=48mm (Digital PCBA - MK2)

Note – final dimensions depend on customer design and layout. The drawing below can serve as a reference for typical dimensions.



9.5 Dimensions Model -06, OD=24mm (Digital PCBA - MK2)

Note – final dimensions depend on customer design and layout. The drawing below can serve as a reference for typical dimensions.



10 Ordering

10.1 Order code

			Order code:	NSE-5007	-XX	-N	-N
Category	NSE-5007	= NSE CCL					
Model	-01	OD=60mm, Analog					
	-02	OD=48mm, Analog					
	-03	OD=60mm, Digital (MK2)					
	-04	OD=48mm, Digital (MK2)					
	-06	OD=24mm, Digital (MK2)					
Option 1	A	Without Telemetry – Canbus only					
	B	With downhole Telemetry (NSE-5004-16)					
Option 2	A-U	Chassis options – Customer specific					
	Z	No chassis. Inductor & PCBA kit.					

10.2 Where to buy

Email: sales@nse.no
 Web: www.nse.no
 Phone: +47 406 48 400

11 Appendix

11.1 CCL with integrated DH Telemetry and HV Power Supply

This implementation can be connected directly to the wireline and act as a stand-alone CCL.

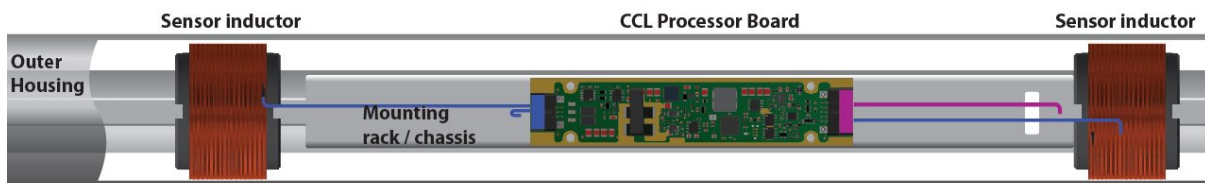
The NSE modem with integrated PSU will provide power to the CCL and transfer data back to the topside modem. An NSE topside modem is required to receive the data. The modem with the integrated power supply requires 100Vdc input voltage as a minimum and will work up to 600Vdc input.

The outer chassis is customer design/provided item but must follow the NSE guidelines for materials and layout.

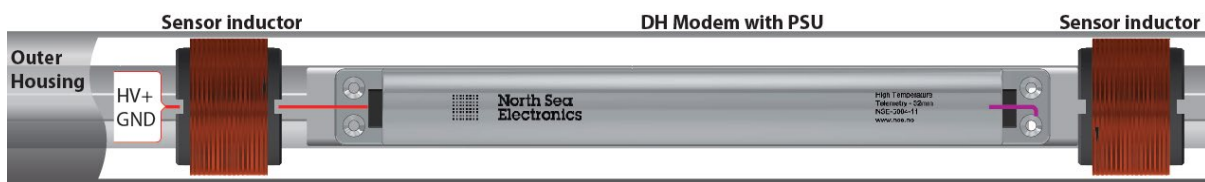
Refer to NSE-5004-16 (downhole modem) datasheet for information about voltage levels and data capacities.

Item	Description	Supplier
1	1 x CCL Processor Board	NSE
2	2 x Sensor Inductors	NSE
3	1 x NSE DH telemetry with PSU – NSE-5004-16	NSE
4	Chassis/rack for mounting PCBA and inductors	Customer design
5	Outer housing	Customer design

Topside of mounting rack / chassis:



Bottom side of mounting rack / chassis:



13 Datasheet revisions

Datasheet Revision History

REV	DATE	DESCRIPTION	PREP	APPR
A	19.03.2021	Initial release	RFY	GLK
B	29.06.2022	Changed mating connectors	EEN	RFY
C	04.07.2023	Updated with MK2 versions	AJA	GLK
D	19.09.2023	Including MK2 plug description. Various adjustments. Corrected document number.	TKK	GLK