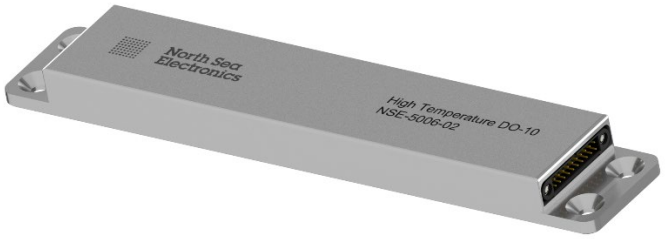
Features

- Highly versatile digital (output drain) output board
- 10 x Output Drain sinking outputs
- Up to 36V / 0.5A per channel
- Total input current rating of 5A
- Integrated temperature sensor
- CANBus Communication interface
- 18-36Vdc Input voltage range
- 2 digital 3.3V logic inputs
- Individual PWM Control of each channel
- Pressure rated board – 700bar
- CNC Machined aluminum housing



Product Description

The DO-10 is a High Temperature, High Pressure 10 channel sinking digital output board, made for downhole or other extreme environments.

The board can be used to control solenoid valves, relays or other functions that require on/off switching. Each channel can be individually PWM switched (or hard on/off) allowing for optimized power control to the device connected. There is also individual current sensing on each output channel to allow for monitoring and verification of correct action.

The board is conformal coated and rated for operation in up to 177deg / 700bar ambient pressure environments, allowing it to be located closed to the actual solenoids / valves that are to be operated. With only 4 input wires (power x 2 and CANbus x 2), wiring to the board is simple and flexible, and the number of feedthrough pins can be reduced significantly in a system.

Revision History

REV	DATE	DESCRIPTION	PREP	APPR
A	21.08.2019	Initial Revision	RFY	GLK

Content

1 Board Specifications

Parameter	Conditions / Comments	Min	Typ	Max	Unit
Supply voltage					
Input Voltage		18	24	36	Vdc
Input Current				6	A
Input Current meas. range	*10-bit resolution*			36	Vdc
Input Current meas. accuracy		*±5*			*% FS*
Input Voltage meas. range	*10-bit resolution*				
Input Voltage meas. accuracy		*±5*			*% FS*
Output					
Total number of channel(s)	*Open drain*		10		
- PWM channels			10		
Output current pr. Channel				1	A
Max total output			6		A
Output current meas. range	*10-bit resolution*	*0*		2	A
Output current meas. accuracy		*±10*			*% FS*
Output 3.3V			3,3		V
Logic Input					
Number of digital input	*Internal pull-up, 3.3V*		2		
Vih (input high voltage)		2.3			V
Vil (input low voltage)				0.6	V
CAN port	*Base/std frame format*				
Baud rate			50 (default)		kbits/s
	Extended frame format (default)		83.3 125 250		
Environment					
Op. Temperature Range*		-20		177	DegC
Op. Pressure Range**			700	1000	bar
Conformal coating			Yes		
Chassis dimension					
Height			13.9		mm
Width			33		mm
Length			184		mm

** Consult NSE for mounting guidance.*

*** Consult NSE for pressure ratings on this board.*

1.1 Thermal properties

The NSE High Temperature DO-10 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.

1.2 Sensors

On board sensor:	1 temperature sensor 1 Input voltage measurement 1 Input current 10 x Open drain current

1.3 Communication Interface

Communication interface:	CAN bus,
Protocol:	Doc: NSE-5000-013 - NSE Embedded Protocol Description
Register description DO-10:	Doc: NSE-500602-011 - Register Description DO-10

1.4 Connectors

Input Connector:	Nicomatic 221V06F26-0200-3400CMM
Mating Connector:	Nicomatic 222S06M16-0200-4310
Output Connector:	Nicomatic 221V20F26
Mating Connector:	Nicomatic 222S20M16

2 Functional Description

2.1 Block Diagram

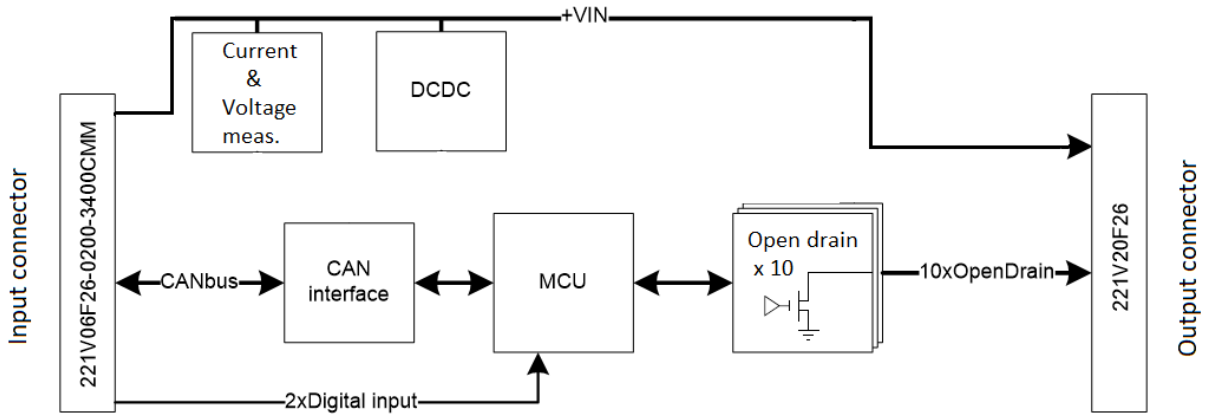


Figure 1 Block Diagram

2.2 Open drain

There are 10 open drain outputs that typically can be used for relay or solenoid switching. Refer to the "Board Specifications" for maximum current on the pin. The open drain output equals the supply input voltage of the DO-10. The current of each open drain output is measured individually.

2.3 Integrated Sensors

2.3.1 Temperature sensor

Temperature will be acquired and distributed on request.
The temperature sensor measurements shall be within ±3% of the ambient temperature (from 0 degC to 177 degC).

2.3.2 Voltage measurement

Board input voltage will be acquired and distributed on request.
The board input voltage measurements shall be within ±3% of full scale input voltage.

2.3.3 Input current measurement

Input current will be acquired and distributed on request.
The board input current measurements shall be within ±5% of full scale current measurements.

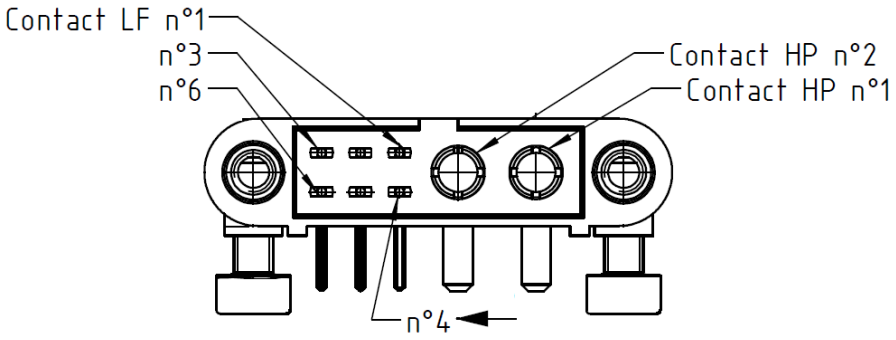
2.3.4 Open drain current measurement channel 0-9

Input current will be acquired and distributed on request.
The board open drain current measurements shall be within ±10% of full scale open drain current measurements.

3 Connector pin-out

3.1 Input connector H2

The input connector (H2) is a Nicomatic 221V06F26-0200-3400CMM.

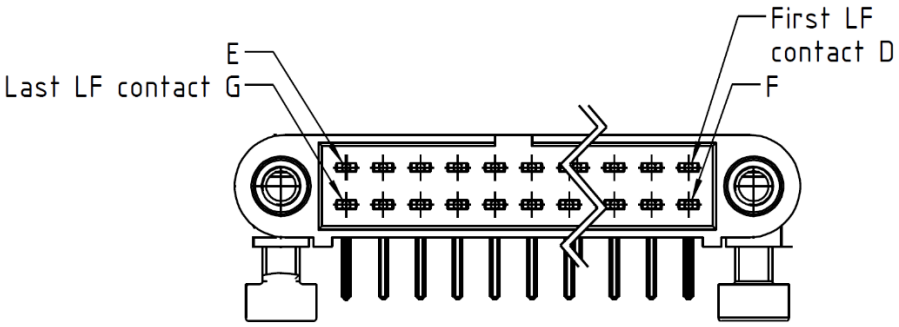


Board mounted connector – face view

Pin Number	Signal name	Description
HP1	+VIN	+18-36V
HP2	GND	Ground
LF1	CANH	CANBUS High
LF2	CANL	CANBUS Low
LF3	GPIO1	Digital Input 1
LF4	GPIO2	Digital Input 2
LF5	+3V3	+3.3V Output – Consult NSE for Current
LF6	GND	Ground

3.2 Output connector H1

The Output connector (H1) is a Nicomatic 221V20F26.



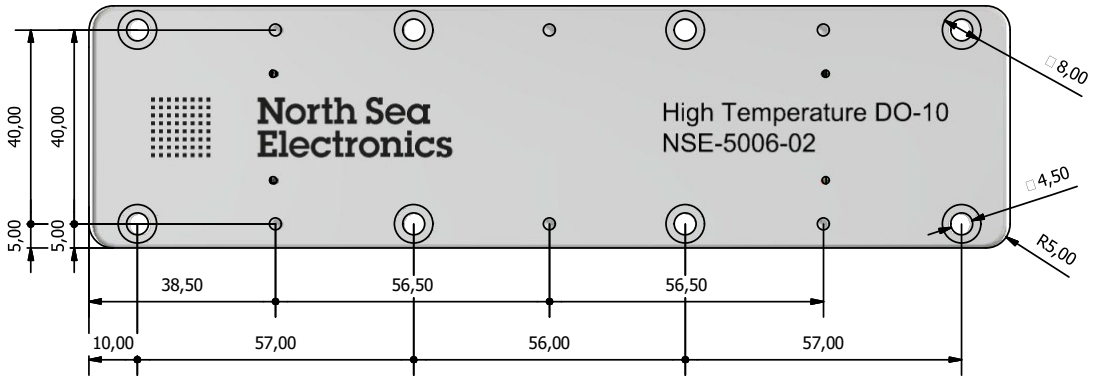
Board mounted connector – face view

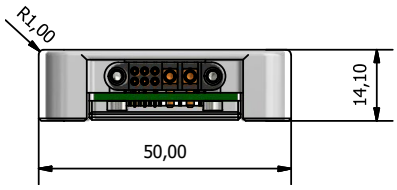
Pin Number	Signal name	Description
1 (LF)	CH0	Open drain channel 0
2	CH1	Open drain channel 1
3	CH2	Open drain channel 2
4	CH3	Open drain channel 3
5	CH4	Open drain channel 4
6	CH5	Open drain channel 5
7	CH6	Open drain channel 6
8	CH7	Open drain channel 7
9	CH8	Open drain channel 8
10 (E)	CH9	Open drain channel 9
11 (F)	VRELAY	Filtered Vin – 18-36V
12	VRELAY	Filtered Vin – 18-36V
13	VRELAY	Filtered Vin – 18-36V
14	VRELAY	Filtered Vin – 18-36V
15	VRELAY	Filtered Vin – 18-36V
16	VRELAY	Filtered Vin – 18-36V
17	VRELAY	Filtered Vin – 18-36V
18	VRELAY	Filtered Vin – 18-36V
19	VRELAY	Filtered Vin – 18-36V
20 (G)	VRELAY	Filtered Vin – 18-36V

4 Mechanical Dimensions

Unit can be delivered in two different types of housing; wide or narrow version.

4.1 NSE-5006-02-A (Wide chassis version)





4.2 NSE-5006-02-B (Narrow chassis version)