CANlink 4003: Control Module

PRECISE, CONFIGURABLE CONTROL

HED's CL-4003 provides steady, precise current control for Vocational vehicles and Construction equipment. It is a highly programmable mid-size controller offering high speed processing, large memory capacity, and configurable I/O.

PRECISION CONTROL

The Plus and Flex modules feature 2-wire current control outputs for improved control of hydraulic valves that will not fluctuate over temp and voltage - critical for boom, drum speed and track speed control and other similar applications.

PROGRAMMABLE + CONFIGURABLE

Configurable I/O allows outputs to be programmed as inputs and inputs to be configured as multiple input types through software configurability - giving you the ultimate flexibility.

RUGGED RELIABILITY

Made for severe-duty mobile applications, these controllers are IP67 and IP6K9K sealed and are resistant to shock and vibration - ensuring performance regardless of the operating environment.

EXPAND WITH EASE

HED's 4000 series I/O controllers share a common architecture and wire pinouts allowing for quicker and lower cost development if expanded I/O is needed in the future.

READY TO GET STARTED?

Connect with our team of experts to discuss your project and discover how HED can provide tailored control solutions for your vehicles.

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HED®
Intelligent Vehicle Controls

CL-4003 CONTROL MODULE | Preliminary Product Specifications

HARDWARE	
Overview	Arm™ Cortex-M7 Microcontroller running at 240 MHz
MCU	S32K328
Flash	8MB
RAM	1152KB
INTERFACES	
CAN	3x CAN-FD ports
Bluetooth™	Bluethooth™ 5.1 Compliant - *optional*
Accelerometer	3-axis (2g to 16g selectable range)- *optional*
MECHANICAL	
Housing Material	Nylon 6/6 15% glass filled
Installation	Panel mount
Connectors	2x Deutsch 18-pin DT
Dimensions	133.35 x 158.50 x 38.10 mm 5.25 x 6.24 x 1.50 in
Weight	TBD
Contacts	16-18 AWG: 0462-201-16141 14-16 AWG: 0462-209-16141
Plugs	Non-locking: 114017 Locking: 0413-217-1605
Wire Size	14-16 AWG or 16-18 AWG
Mounting & Torque	1/4-20" or M6 Fastener 50-55 in-lbs
Indicators	1x Blue Power 2x RGB Indicators (user configured)
OPERATING SYSTEM	
Operating System	FreeRTOS
Bootup Time	150msec (approximate)
SOFTWARE FRAMEWORK & TOOLS	
Development	NXP Design Studio
Programming	C / C++
CAN Protocol	J1939 and CANopen networks [1]

[1] Capable of interfacing with J1939 devices but HED does not currently offer a standard J1939 Client.

ELECTRICAL	
Operating Voltage	8-32VDC
Key Switch	Standard for Start/Shutdown
Max Total I/O Available	25
Inputs	up to 25
Outputs	up to 22
Current Draw (No I/O active)	115mA (13.8VDC) (typ) 95mA (28VDC) (typ)
Total Maximum Output Current	15A per +Battery Pin feeding bank of outputs (see pinout)
Standby Current	<0.6mA (12VDC), <1.7mA (24VDC)
Suspend Mode Current	contact us for details
PRODUCT RATINGS	
IP Class	IP67 and IP6K9K
EU/CE Compliance	CE 2014/30/EU
Vibrations	ISO 16750-3, ISO 19014-3
Shock	ISO 16750-3, ISO 19014-3
Solar	ISO 16750-4
Salt Fog	ISO 16750-4, ISO 19014-3
Chemical	ISO 16750-5, ISO 19014-3
Electrostatic Discharge	ISO 10605, ISO 13766-1, ISO 14982
Conducted Transient Immunity	ISO 13766-1, ISO 7637-2, ISO 14982
Starting Profile	ISO 16750-2
Reverse Polarity	ISO 16750-2
EMC	ISO 13766-1, ISO 14982, CISPR 25
Temperature Range	Operating:-40C to +85C (Output current limits may require moderate derating for temperatures above +70C) Storage:-40C to +85C
FCC / ISED Compliance	FCC Part 15 (b) and ISED Canada

Part Number Details

CL-4003-HHH-FF-IIOODD-CCCNNN	(HHH)	Firmware Options (FF)		(II)	(00)	Daughterboard(DD)		Custom Suffix (CCCNNN)[3]	
	Hardware Configuration[1]	**CANopen Client**	**BSP Master**	**# of Inputs[2]**	**# of Sourcing Outputs**	**None**	**Optional**	**Customer**	**Number**
CL-4003-105-FF-0122DD-CCCNNN	105	50	B0	01	22	00	01	CCC	NNN
CL-4003-106-FF-071600-CCCNNN	106	50	B0	07	16	00	n/a	CCC	NNN
CL-4003-107-B0-131200-CCCNNN	107	50	B0	13	12	00	n/a	CCC	NNN

[1] See PINOUT configurations starting on page 30 for additional details.
[2] Output pins can be configurable in software to a variety of input types, so total number of inputs can exceed input number listed.
[3] Custom Suffix added if customer requests HED to pre-program their application into controller prior to shipment.

Standard Part Numbers Available

	CANopen Client Part Numbers	BSP Master Part Numbers
Plus Model – Full Feature	CL-4003-105-50-012200	CL-4003-105-B0-012200
Plus Model – With Daughterboard	n/a	CL-4003-105-B0-012201
Base Model – Limited Outputs	CL-4003-106-50-071600	CL-4003-106-B0-071600
Flex Model – Limited Outputs	CL-4003-107-50-131200	CL-4003-107-B0-131200

Daughterboard Details

Daughterboard Code	Features Included
01	Bluetooth, Accelerometer, RTC

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CL-4003 STANDARD CONFIGURATIONS AVAILABLE

Configuration	Model Name	CAN Ports	QSPI Flash	Suspend	Daughterboard Connectors	LEDs
CL-4003-105	Plus	3x	yes	yes	yes	1x Blue Power LED, 2x RGB LED User Configured
CL-4003-106	Base	3x	yes	yes	yes	1x Blue Power LED, 2x RGB LED User Configured
CL-4003-107	Flex	2x	no	no	no	1x Blue Power LED, 2x RGB LED User Configured

Configuration	Total Inputs	Digital Inputs	Analog Inputs	Frequency Inputs	RTD Inputs	20mA Inputs	Total Outputs	Sourcing Outputs	Sinking Outputs	Analog Outputs
CL-4003-105	23x	23x	15x	4x	4x	4x	22x	16x	6x	2x
CL-4003-106	23x	23x	9x	4x	0x	0x	16x	16x	0x	0x
CL-4003-107	25x	22x	9x	2x	0x	0x	12x	8x	4x	0x

18 PIN DEUTSCH - A-KEY PINOUT CONFIGURATIONS DETAILS

PIN	CL-4003-105 Configuration (Plus)	CL-4003-106 Configuration (Base)	CL-4003-107 Configuration (Flex)
Pin 1	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG/TRI/VTD1 / Output DOUT/PWM(-) (2A) (Bank 1)	Output DOUT/PWM/ECC(+)(5A) / Input STB/ STG/TRI/VTD1 (Bank 1)	Input VTD1
Pin 2	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG/TRI/VTD1 / Output DOUT/PWM(-) (2A) (Bank 1)	Output DOUT/PWM/ECC(+)(5A) / Input STB/ STG/TRI/VTD1 (Bank 1)	Input VTD1
Pin 3	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG/TRI/VTD1/VTD2/FREQ/20mA/RTD1 (BanK 1)	Output DOUT/PWM/ECC(+)(5A) / Input STB/ STG/TRI/FREQ (Bank 1)	Input STG/FREQ
Pin 4	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG/TRI/VTD1/VTD2/FREQ/20mA/RTD1 (Bank 1)	Output DOUT/PWM/ECC(+)(5A) / Input STB/ STG/TRI/FREQ (Bank 1)	Input STG/FREQ
Pin 5	Battery (-)	Battery (-)	Battery (-)
Pin 6	Battery (+) CPU- Unswitched and Output Pins 1-4 (Max 15A) with VTD2	Battery (+) CPU- Unswitched and Output Pins 1-4 (Max 15A) with VTD2	Battery (+) CPU- Unswitched with VTD2
Pin 7	CAN1-L / Wake-up from Suspend	CAN1-L / Wake-up from Suspend	CAN1-L
Pin 8	CAN1-H / Wake-up from Suspend	CAN1-H / Wake-up from Suspend	CAN1-H
Pin 9	CAN2-L / Wake-up from Suspend	CAN2-L / Wake-up from Suspend	CAN2-L
Pin 10	CAN2-H / Wake-up from Suspend	CAN2-H / Wake-up from Suspend	CAN2-H
Pin 11	Key Switch STB with VTD2 / Controlled Shutdown	Key Switch STB with VTD2 / Controlled Shutdown	Key Switch STB with VTD2 / Controlled Shutdown
Pin 12	Battery (+) Outputs Pins 15-18 (Max 15A) with VTD2	Battery (+) Outputs Pins 15-18 (Max 15A) with VTD2	Input STB
Pin 13	Input STB/STG/TRI/VTD1/VTD2/FREQ/20mA/RTD2 / 5V Sensor Supply / Output Analog (0-10V)	Input STB/STG/TRI/VTD1/VTD2/FREQ	Input STB/VTD1
Pin 14	Input STB/STG/TRI/VTD1/VTD2/FREQ/20mA/RTD2 / 5V Sensor Ground / Output Analog (0-10V)	Input STB/STG/TRI/VTD1/VTD2/FREQ	5V Sensor Ground
Pin 15	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG/TRI/VTD1 (Bank 2)	Output DOUT/PWM/ECC(+)(5A) / Input STB/ STG/TRI (Bank 2)	Input VTD1
Pin 16	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG/TRI/VTD1 (Bank 2)	Output DOUT/PWM/ECC(+)(5A) / Input STB/ STG/TRI (Bank 2)	Input STB/VTD1
Pin 17	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG/TRI/VTD1 (Bank 2)	Output DOUT/PWM/ECC(+)(5A) / Input STB/ STG/TRI (Bank 2)	Input STB/STG
Pin 18	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG/TRI/VTD1 (Bank 2)	Output DOUT/PWM/ECC(+)(5A) / Input STB/ STG/TRI (Bank 2)	Input STB/STG
Bank 1	Each pin within bank can be independently configured as Output or any Input type.		
Bank 2	Each pin within bank can be independently configured as Output or any Input type.		

*Exact Pin locations may be adjusted prior to final product release. Please verify with your sales rep.

VTD1 = 0-5.5VDC
VTD2 = 0-35VDC
RTD1 = 0-500ohms
RTD2 = 0-2Kohms

CL-4003 CONTROL MODULE | Preliminary Product Specifications

18 PIN DEUTSCH - B-KEY PINOUT CONFIGURATIONS DETAILS

PIN	CL-4003-105 Configuration (Plus)	CL-4003-106 Configuration (Base)	CL-4003-107 Configuration (Flex)
Pin 1	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 3)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 3)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 3)
Pin 2	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 3)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 3)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 3)
Pin 3	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 3)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 3)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 3)
Pin 4	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 3)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 3)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 3)
Pin 5	Input STB/STG/TRI/VTD1/VTD2 (Wake-Up Digital STB or STG Input)	Input STB/VTD1/VTD2 (Wake-Up Digital STB)	Input STB
Pin 6	BAT(+) Outputs Pins 1-4 (Max 15A) with STB	BAT(+) Outputs Pins 1-4 (Max 15A) with STB	BAT(+) Outputs Pins 1-4 (Max 15A) with STB
Pin 7	Battery (-) for FET Flyback (with STG Diagnostic)	Battery (-) for FET Flyback (with STG Diagnostic)	Battery (-) for FET Flyback (with STG Diagnostic)
Pin 8	Return(-) for 2-Wire CC / DOUT/PWM(-)(2A) / Input STB/STG/TRI/VTD1 (Note 1)	Input STB/VTD1	Return(-) for 2-Wire CC / DOUT/PWM(-)(2A) / Input STB/STG/TRI/VTD1 (Note 1)
Pin 9	Return(-) for 2-Wire CC / DOUT/PWM(-)(2A) / Input STB/STG/TRI/VTD1 (Note 1)	Input STB/VTD1	Return(-) for 2-Wire CC / DOUT/PWM(-)(2A) / Input STB/STG/TRI/VTD1 (Note 1)
Pin 10	CAN3-L / Wake-up from Suspend	CAN3-L / Wake-up from Suspend	Input STB
Pin 11	CAN3-H / Wake-up from Suspend	CAN3-H / Wake-up from Suspend	Input STB
Pin 12	BAT(+) Outputs Pins 15-18 (Max 15A) with STB	BAT(+) Outputs Pins 15-18 (Max 15A) with STB	BAT(+) Outputs Pins 15-18 (Max 15A) with STB
Pin 13	Return(-) for 2-Wire CC / DOUT/PWM(-)(2A) / Input STB/STG/TRI/VTD1 (Note 1)	Input STB/VTD1	Return(-) for 2-Wire CC / DOUT/PWM(-)(2A) / Input STB/STG/TRI/VTD1 (Note 1)
Pin 14	Return(-) for 2-Wire CC / DOUT/PWM(-)(2A) / Input STB/STG/TRI/VTD1 (Note 1)	Input STB/VTD1	Return(-) for 2-Wire CC / DOUT/PWM(-)(2A) / Input STB/STG/TRI/VTD1 (Note 1)
Pin 15	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 4)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 4)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 4)
Pin 16	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 4)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 4)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 4)
Pin 17	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 4)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 4)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 4)
Pin 18	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 4)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 4)	Output DOUT/PWM/ECC(+)(5A) / Input STB/STG (Bank 4)
Bank 3	All 4x pins must be configured as Inputs or Outputs. When configured as Inputs, each pin can independently be STB or STG.		
Bank 4	All 4x pins must be configured as Inputs or Outputs. When configured as Inputs, each pin can independently be STB or STG.		
Note 1	Return(-) pins must be paired with Sourcing Output on same connector as Return(-) pin.		

*Exact Pin locations may be adjusted prior to final product release. Please verify with your sales rep.

VTD1 = 0-5.5VDC
VTD2 = 0-35VDC
RTD1 = 0-500ohms
RTD2 = 0-2Kohms