

FEATURES

- 3 galvanically isolated passive current outputs
- Isolation voltage between channels – 600 V (DC)
- 16-bit D/A conversion
- Check for current loop integrity
- Defined value of output upon power supply switch on and off

DESCRIPTION

The CB003 modules are intended for usage in DV459 boards. The module consists of 3 galvanically isolated passive current outputs 0 ÷ 25 mA with check and signaling of insufficient level of power supply in current loop. When power supply is switched off, in inclination or decline the module output is in opened status.

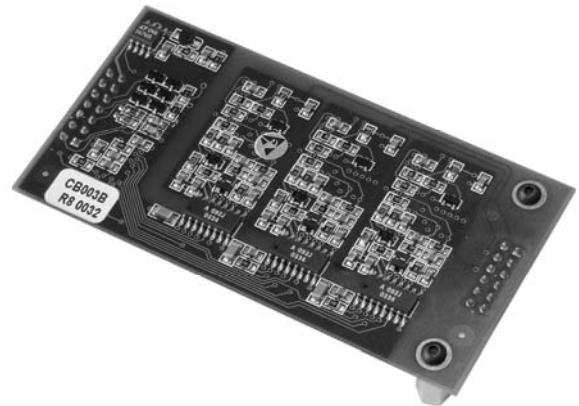
The input values stored in DV459 board from superior CPU are periodically transferred to module controller via its serial interface. The module controller then ensures the periodical transfer of data to output D/A converters, whereas it inspects their validity. In case the output data are older than approved limit, the controller interrupts their sending to D/A converter and thus invokes the disconnection of pertinent output. This mechanism ensures only the setup of zero value, for example in case of permanent error in communication between the module and board. The output value stored in board is normally transferred to board output up to its final overwrite with another value or to its reset or software reconfiguration of the board.

Signal connection

After the module is installed in one of external slots of DV459 board, the channels no.1, 2 and 3 of module are connected to channels no. 1, 2 and 3 of this slot.

ELECTROSTATIC SENSITIVE COMPONENT

Upon handling, installation and storage of module, it is necessary to observe all regulations regarding to handling of electrostatic sensitive devices.



To connect the analogue channels of DV459 board, the standardized cable can be used with free end K102, or K602.

The connection modules MD412, MD413 and MD415 offer the option of structured connection of technology signals, which further contain the galvanically isolated power supplies, which can be used to supply the current loops and supplemental overvoltage protections against surges with amplitude higher than 200 V. The output power supplies of these modules are limited in output current with visual signaling of limiting status and are resistant to permanent short-circuit of output.

Power supply modules MD414 and MD416 contain only 9 galvanically isolated power supply of current loops and are suitable mainly in cases with very limited space.

Output protection

Using the output switch, the disconnection of current loop is ensured in cases, where the proper value of output cannot be detected.

The opening of switch is ensured in such cases:

- If the module is without power supply or during drop of power supply

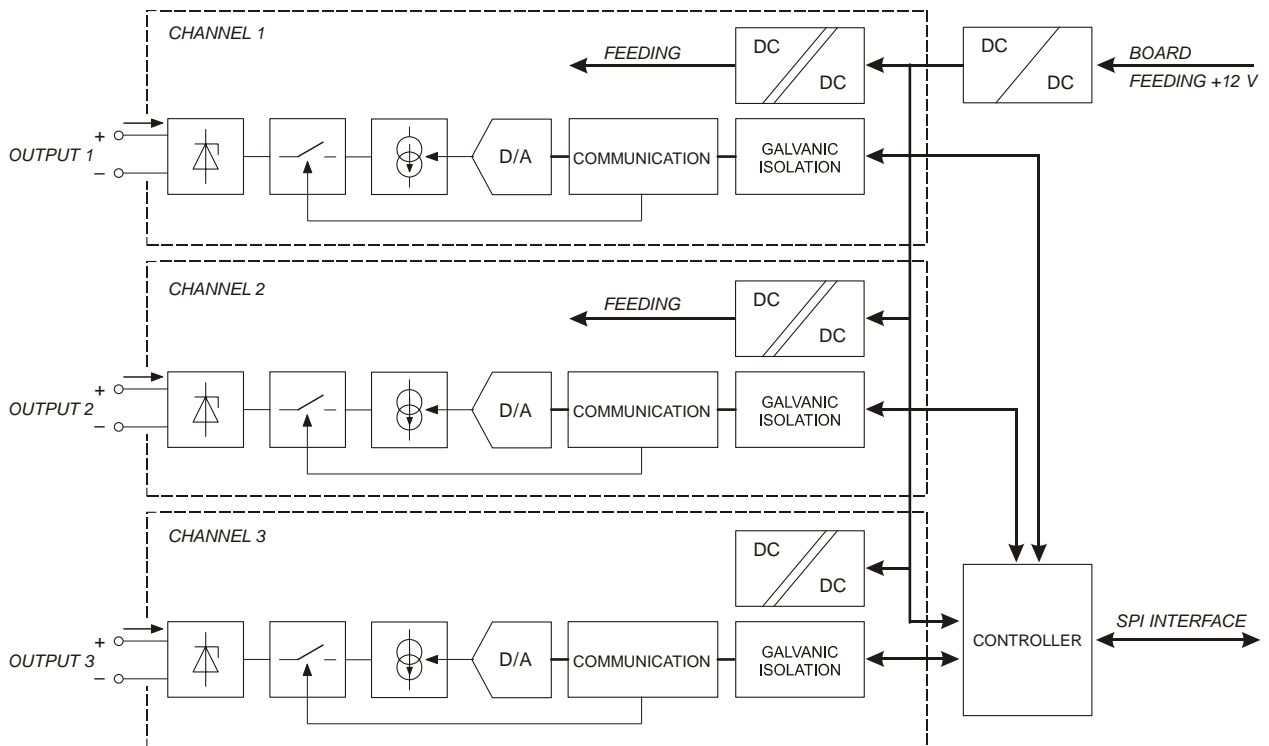


Figure 1: Flow chart of CB003 module

- Upon and after power supply is switched on, output remains opened up to the moment of first write of channel value to the module controller and then to D/A converter (after software configuration of DV459 board)
- Until 100 ms since the moment of last update of output channel value in module controller from DV459 board (e.g. in case of board error or system reset)
- Until 20 ms since interruption of communication between module controller and D/A converter of channel

Signalling of errors of specific modules

The insufficient level of power supply of output channel current loop is signalled by setup of attribute in program interface of the DV459 board.

The error in communication with D/A converter of module channel is signalled by setup of attribute in specific part of DV459 board program interface and since it is a specific hardware error of module, it also causes the setup of SPC_ERR in

information about the slot and signalling of HW error on board panel.

15	14	13	12	11	10	9	8
-	-	COM3 ERR	DRV3 ERR	COM2 ERR	DRV2 ERR	COM1 ERR	DRV1 ERR

7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	-

Part of program interface DV459 specific for module ¹⁾

The information with meaning specific to module type, installed in slot of DV459, is contained in „ModInputs“ structure of this slot (see also catalogue sheet of DV459 board).

¹⁾ Access to these items is ensured by higher layers of control system

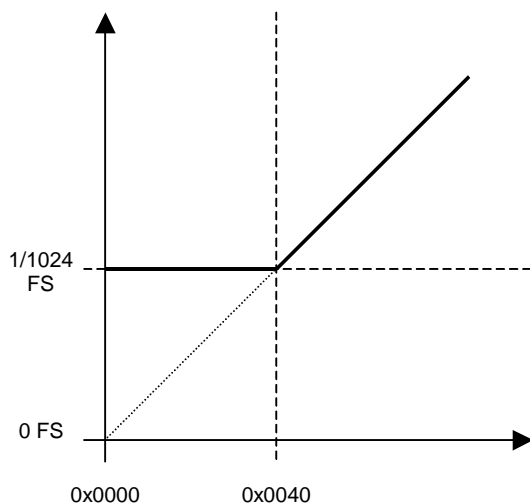
In case of output modules CB003, only section Inf has significance from this structure, since it contains the error attributes of module:

The communication error at channel corresponds to setup of COM#ERR attribute, whereas the insufficient level of current loop power supply corresponds to setup of DRV#ERR attribute.

Data format of output values, conversions characteristics of outputs

The value of output is encoded in 16-bit binary code. The minimum value of current flowing thru output is set in calibration to 1/1024 of maximum value of range. This non-zero current enables testing of conductivity of current loop also upon setup of zero output value.

The output has zero value only in cases, when it is disconnected by output switch.



Module calibration

The conversion characteristics are software calibrated in point of 0x0040 by shifting the linear portion and in point of 0xCCCC by adjustment of steepness. The calibration data are permanently stored in module memory, including the date of calibration. The information on calibration date can be read from DV459 communication interface.

Module support in DV459

The DV459 boards support the CB003 modules since firmware version of FW 1.01. Versions lower than 2.00 do not enable the auto detection of this module type and therefore it is necessary to

use fixed mode of slot configuration. From version 2.00, their full support is ensured.

Output numerical value	Analogue value of output [mA]
0x0000	0,024
0x0040	0,024
0x0A3D	1,000
0x28F6	4,000
0x6666	10,000
0xCCCC	20,000
0xF5C2	24,000
0xFFFF	25,000

Module signature

The module memory holds permanently its serial number, which can be read from communication interface of DV459 board.

Supply voltage of current loops

DV459 boards can integrate up to 9 current outputs, whereas each output releases the thermal output corresponding to voltage drop at output and regulated current. However, such drop cannot go under any circumstances under the limit ensuring the safe regulation of output current.

The given heat can be limited by setup of supply voltage of current loop, according to maximum decrement on controlled circuit. The usage of connection modules of MD412 to MD416 series may implement in the form of selection of full or reduced output voltage of power supply.

The corresponding voltage values in current loop are given in figure 2, the drop in controlled circuit can reach 18 V, with the reserve of 1,2 V.

In cases, where given controlled circuit ensures under normal conditions and under maximum current of output 20 mA the voltage in this circuit will not exceed value of 10 V, the reduced voltage can be safely used to power supply the loop, otherwise full voltage must be used.

Example with decrease in controlled circuit within range 2 - 10 V and 20 mA. Feeding from MD412 is reduced by 8 V, sum of underlined parts gives maximum voltage at DV459 output, totally 19.3 V.						
MD412 0.7 V	<u>DV459</u> <u>U_{min}=4.1 V</u>	<u>Reserve</u> <u>1.2 V</u>	Ctrl.cir. min. 2 V	<u>Ctrl.cir. 2-10V</u> <u>8 V</u>	Volt. red. in feeder 8 V	<u>MD412</u> <u>dU_{cc} max=6V</u>
Feeding from MD412 U _{max} = 30 V.						
MD412 0.7 V	DV459 U _{min} =4.1 V	Controlled circuit 19.2 V				Feeding from MD412 dU max=6V
		Reserve 1.2 V	Ctrl.cir. min. 2 V	Ctrl.cir. 2-10V 8 V	Ctrl.cir. 10-18V 8 V	
Example with decrease in controlled circuit within range 10 - 18 V and 20 mA. MD412 feeder gives full voltage. Sum of underlined parts gives maximum voltage at DV459 output, totally 19.3 V.						
MD412 0.7 V	<u>DV459</u> <u>U_{min}=4.1 V</u>	<u>Reserve</u> <u>1.2 V</u>	Controlled circuit min. 10 V		<u>Tech. 10-18V</u> <u>8 V</u>	<u>MD412</u> <u>dU_{cc} max=6V</u>

Figure 2: Power supply of current loop from MD412 at 20 mA current

Thermal balance

In CASE, where the controlled circuit ensures the voltage drop higher than 10 V at 20 mA, or on the contrary, $2 \div 10$ V, and reduced voltage is used, the voltage on DV459 output will not exceed the value of 19,3 V at this current. This corresponds to maximum thermal output of 390 mW released in DV459 boards from single current loop. The board may also release the heat of 72 mW at 20 mA at current inputs of board.

Should we consider for example DV459A2-B3B3B3 board with 18 current inputs and 9 outputs, the maximum value of thermal output released in board from current loops is 4,8 W, provided the above stated condition of output voltage limitation is met. The maximum drain of stated board from system is 4,8 W, so the total thermal output of board will not exceed the level of 9,6 W.

In some cases the drop on controlled circuit depend on other circumstances and therefore cannot be classified into any of groups with guaranteed drop under or over value of 10 V, therefore to power supply such circuit, it is necessary to select the full power supply voltage.

For given thermal losses and maximum temperature of system surrounding, it is necessary to ensure the corresponding cooling of system.

Assortment of CB003 modules

CB003 modules are delivered only in B class with dual-point calibration (see also catalogue sheet of DV459 board).

Valid order code

CB003B

Technical parameters of CB003 module

Parameter	Conditions	Min.	Type	Max.	Units
Power supply voltage (VME)			+12		V
Power consumption			48	56	mA
Module power drain			0,58	0,68	W
Specific dielectric strength output / system	1 min.		2150		V DC
Specific dielectric strength output / output	1 min.		600		V DC
Insulation resistance of input against system		100			MΩ
Output resistance			25		MΩ
Resolution		16			bit
Integral non-linearity				0,012	%
Error in zero value	$T_A = 25\text{ °C}$			0,1	%
Additional error of zero value due to temperature change				20	ppm / °C
Gain error	$T_A = 25\text{ °C}$			0,2	%
Additional error of gain due to temperature change				80	ppm / °C
Maximum error	$T_A = 0 \div 70\text{ °C}$			0,5	%
Conversion time				3	ms
Operating temperature range		-5		+70	°C
Weight			40		g
Dimension			1		module