C-DIAS Digital Output Module CTO 163

The module CTO 163 has 16 digital outputs +24V/ 2A (switching positive).

These outputs are protected against short-circuiting. The supply voltage of each channel group is checked on undervoltage.

Technical data

Digital outputs

Number of outputs	16
Protection against short circuiting	Yes
Maximum permissible constant current / channel	2A
Maximum total current (per 4 channels)	6A (100% operating time)
Maximum total current (whole module)	24A (100% operating time)
Maximum breaking energy of the output (inductive load)	With additional internal protective circuit (HW V2.0 or higher) Maximum 0,65 Joule / channel maximum 1,95 Joule / 4 channels
Voltage drop across the supply (output switched on)	≤1V
Residual current (output switched off)	≤12µA
Switch-on delay time	<200µs
Switch-off delay time	<200µs
Status display	Optional (LEDs: outputs yellow, voltage surveillance red)

Electrical requirements

Supply voltage +24V / 1-4	18 – 30V DC	
Supply voltage current consumption +24V / 1-4	Corresponds to the load on the digital outputs (max. 6A/ group of 4)	
Supply of the C-DIAS bus	+5V	
Current consumption on the C-DIAS bus (+5V supply)	Typically 5mA	Maximum 20mA

Voltage surveillance

Supply voltage +24V / 1-4	Supply voltage <18V (Error-LED illuminates red)

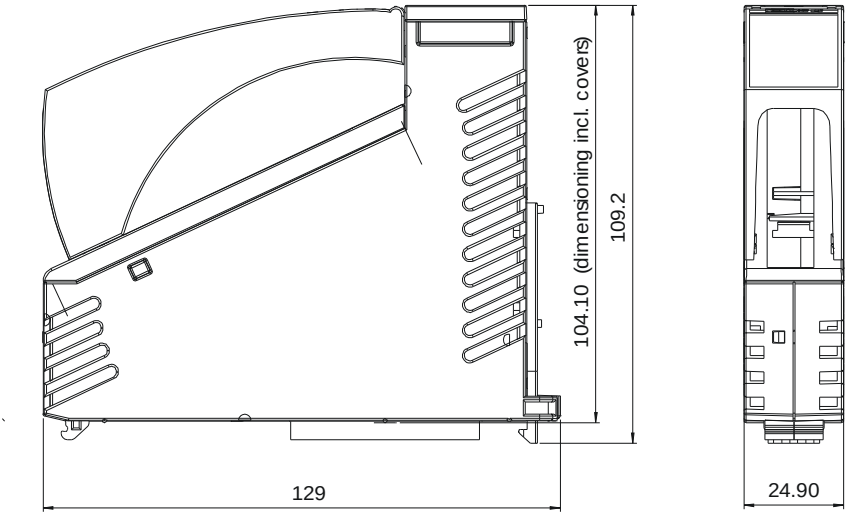
Miscellaneous

Article numbers	12-007-163 CTO163 with status display (LEDs yellow and red)
	12-007-163-O CTO163 without status display (no LEDs)
Hardware version	1.x – 2.x
Standardization	UL (E247993)

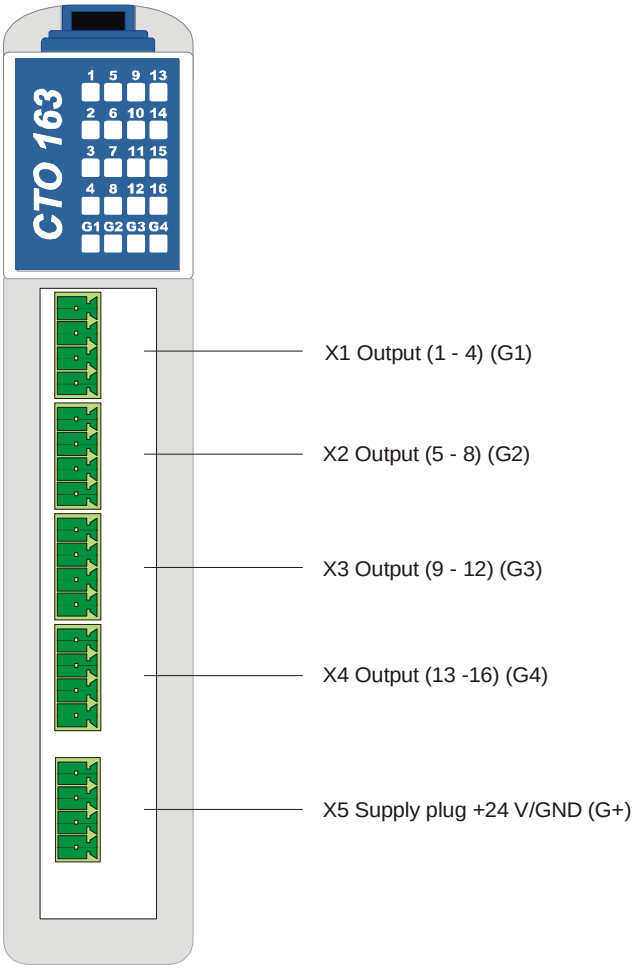
Environmental conditions

Storage temperature	-20 – +85℃	
Operating temperature	0 – +60℃	
Humidity	0 – 95%, without condensation	
EMV stability	In accordance with EN 61000-6-2 (industrial)	
Resistance to shocks	EN 60068-2-27	150m/s²
Protective system	EN 60529	IP20

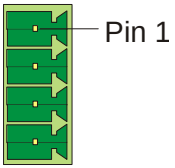
Mechanical dimensions



Connections

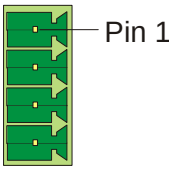


X1: Plug output 1 – 4 (G1)



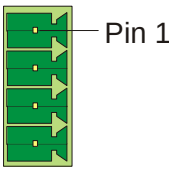
Pin	Function
1	Output 1
2	Output 2
3	Output 3
4	Output 4

X2: Plug output 5 – 8 (G2)



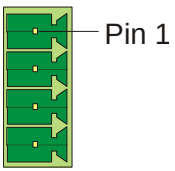
Pin	Function
1	Output 5
2	Output 6
3	Output 7
4	Output 8

X3: Plug output 9 – 12 (G3)



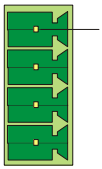
Pin	Function
1	Output 9
2	Output 10
3	Output 11
4	Output 12

X4: Plug output 13 – 16 (G4)



Pin	Function
1	Output 13
2	Output 14
3	Output 15
4	Output 16

X5: Plug supply (G+)



Pin	Function
1	+24V /1 (output 1 - 4)
2	+24V /2 (output 5 - 8)
3	+24V /3 (output 9 - 12)
4	+24V /4 (output 13 - 16)

Useable connectors

Connector with spring clamp:
Phoenix Contact: FK-MCP 1.5/ 4-ST-3.5

Connector with crew clamp technique:
Phoenix Contact: MC 1.5/ 4-ST-3.5

The complete C-DIAS plug set CKL 031 with spring clamp is available from Sigmatek with the article number 12-600-031.

General comments on digital outputs

4 outputs each are supplied from a common +24V connection.

The cable cross-section of both the +24V and the 0V supply has to be matched to the maximum output current being drawn from a group.

Caution!
If inductive loads are not protectively wired, when the load is disconnected high peak currents will flow through the 0V line, because the internal protective wiring directs the voltage peaks to 0V. With 0V cables, which are longer than permitted and too thin, this can lead to outputs on the module involved reacting in an undesired way.

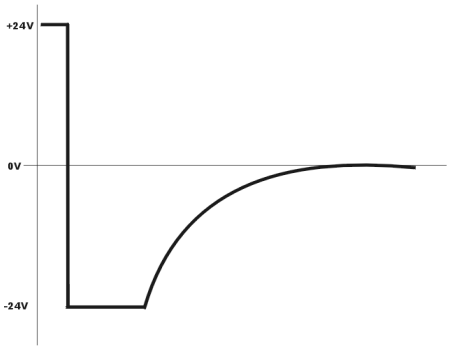
Attention!
Si des charges inductives ne sont pas équipées d'un circuit de protection, au moment de la déconnection de la charge de forts courants s'écoulent à travers la ligne de 0V, car le circuit de protection interne dirige les pointes de tension vers 0V. Avec câbles 0V, d'une section trop faible et d'une longueur au-delà des spécifications, le module peut générer des signaux de sortie indésirables.

The outputs may be disconnected as a group by disconnection of the +24V supply.

The application of a voltage to an output, which exceeds the supply voltage by more than 0.7V, is not permitted.

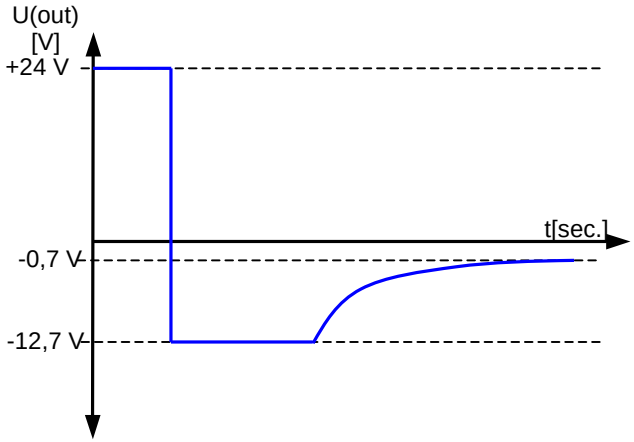
All outputs are protectively wired to +24V internally. The disconnection of inductive loads is, as depicted in the diagram, limited to -24V. However, additional protective wiring to inductive loads is recommended (recovery diode), so that system malfunctioning through voltage peaks (inductive disturbance in analogue circuits) can be avoided. This has, however, the consequence that the internal voltage limit is only effective up to -0.6V.

Disconnection of inductive loads



Additional protective circuit (HW V2.0 or higher)

Each of the 4 outputs are protected internally against 24V/1 to 24V/4. The disconnected inductive load shown in the diagram is limited to -12.7V. However, an addition protective circuit connected directly to the inductive load is recommended (freewheeling diode)in order to avoid system disruptions caused by voltage spikes (I.e. cross talk over analog lines). This results, however, in the internal voltage limiter being effective to only -0.7V.

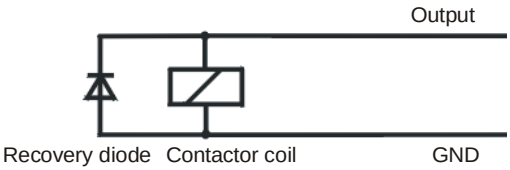


Wiring instructions

Please pay attention to the following guidelines:

- Avoid laying the input cables parallel to the load circuits
- Protective wiring of all contactor coils (RC-network or recovery diodes)
- Correct earthing

Connection of inductive loads



Status displays

LED no.	LED colour	Meaning
1 – 16	yellow	Outputs 1 – 16
G1 – G4	red	Error voltage surveillance

Addressing

Address	Access		Description
16#00	WRITE	WORD	Output 1..16
16#07	READ	BYTE	Bit 0 Surveillance +24V /1 Bit 1 Surveillance +24V /2 Bit 2 Surveillance +24V /3 Bit 3 Surveillance +24V /4 (0 = supply voltage <18V, 1 = supply voltage OK)

Data in EEPROM (organized byte-wise)

Address	Data	Description
$00	$xx	Check sum
$01	123	Identification
$02	2	Module group 2 = TO
$03	2	Variant 2 = CTO163
$04	16	Number of channels
$05	$1x	Hardware version $10 = HW-V1.0, $11 = HW-V1.1,…
$10		Serial number

Check sum calculation of the EEPROM

- The check sum is calculated byte-wise
- It is calculated from the address following the check sum to the last address of the data block (both inclusive)
- This means, the length of the data block of the check sum to be calculated = 5 BYTE fixed.
- Calculation algorithm:

1.	Load pointer with address of the comparison data (without check sum)	L.DI# ADD.DI		HWKENN 1
2.	Length of data block	L.CX		5
3.	Load check sum with $FF	L.AL		$FF
4.	Rotate check sum 1 bit to the left into Carry	LP	ROL.AL	1
5.	Add up check sum with current WORD and Carry	ADC.AL		(DI)
6.	Increase pointer on next WORD	ADD.DI		1
7.	Finished all addresses? NO ---> 4. YES ---> 8.	LOOP		LP
8.	Check sum is ready			