CO 041

S-DIAS Current Output Module

Instruction Manual

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Translation of the Original Instructions

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S-DIAS Current Output Module CO 041

with 4 current controlled outputs /pulse outputs

4 digital inputs +5 V

The S-DIAS CO 041 current output module is used for the simultaneous operation of four valves on supply voltages from 18-55 volts, a maximum holding current of 1 A and maximum output current of 3.5 A. To ensure the good, dynamic performance of the valve, the inrush current and secondary current (continuous) can be set. The four output stages are short-circuit protected.

The module can also operate without a CPU (stand-alone). In this case, four fast digital inputs (TTL signal) are available over which each output, with pre-definable parameters, are controlled. Since no S-DIAS supply is integrated into the module, the S-DIAS bus must be powered with an S-DIAS supply module.

The module provides the option to configure the current-controlled outputs as pulse signal outputs for operating micro-dosing valve control devices.

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1 Introduction

1.1 Target Group/Purpose of this Operating Manual

This operating manual contains all information required for the operation of the product.

This operating manual is intended for:

- Project planners
- Technicians
- Commissioning engineers
- Machine operators
- Maintenance/test technicians

General knowledge of automation technology is required.

Further help and training information, as well as the appropriate accessories can be found on our website www.sigmatek-automation.com.

Our support team is happily available to answer your questions.
Please see our website for our hotline number and business hours.

1.2 Important Reference Documentation

This and additional documents can be downloaded from our website or obtained through support.

1.3 Contents of Delivery

1x CO 041

2 Basic Safety Directives

2.1 Symbols Used

The following symbols are used in the operator documentation for warning and danger messages, as well as informational notes:

DANGER

Danger indicates that death or serious injury **will occur**, if the specified measures are not taken.

⇨ To avoid death or serious injuries, observe all guidelines.

Danger indique une situation dangereuse qui, faute de prendre les mesures adéquates, **entraînera** des blessures graves, voire mortelles.

⇨ Respectez toutes les consignes pour éviter des blessures graves, voire mortelles.

WARNING

Warning indicates that death or serious injury **can** occur, if the specified measures are not taken.

⇨ To avoid death or serious injuries, observe all guidelines.

Avertissement d'une situation dangereuse qui, faute de prendre les mesures adéquates, **entraînera** des blessures graves, voire mortelles.

⇨ Respectez toutes les consignes pour éviter des blessures graves, voire mortelles.

CAUTION

Caution indicates that moderate to slight injury **can** occur, if the specified measures are not taken.

⇨ To avoid moderate to slight injuries, observe all guidelines.

Attention indique une situation dangereuse qui, faute de prendre les mesures adéquates, **peut** entraîner des blessures assez graves ou légères.

⇨ Respectez toutes les consignes pour éviter des blessures graves, voire mortelles.

INFORMATION

Information

⇨ Provides important information on the product, handling or relevant sections of the documentation, which require attention.

2.2 Disclaimer

INFORMATION

The contents of this operating manual were prepared with the greatest care. However, deviations cannot be ruled out. This operating manual is regularly checked and required corrections are included in the subsequent versions. The machine manufacturer is responsible for the proper assembly, as well as device configuration. The machine operator is responsible for safe handling, as well as proper operation.

The current operating manual can be found on our website. If necessary, contact our support.

Subject to technical changes, which improve the performance of the devices. The following operating manual is purely a product description. It does not guarantee properties under the warranty.

Please thoroughly read the corresponding documents and this operating manual before handling a product.

SIGMATEK GmbH & Co KG is not liable for damages caused through, non-compliance with these instructions or applicable regulations.

2.3 General Safety Directives

The Safety Directives in the other sections of this operating manual must be observed. These instructions are visually emphasized by symbols.

INFORMATION

According to EU Directives, the operating manual is a component of a product.

This operating manual must therefore be accessible in the vicinity of the machine since it contains important instructions.

This operating manual should be included in the sale, rental or transfer of the product, or its online availability indicated.

Regarding the requirements for Safety and health connected to the use of machines, the manufacturer must perform a risk assessment in accordance with machine directives 2006/42/EG before introducing a machine to the market.

Operate the unit with devices and accessories approved by SIGMATEK only.

CAUTION

Handle the device with care and do not drop or let fall.

Prevent foreign bodies and fluids from entering the device.

The device must not be opened!

Manipulez l'appareil avec précaution et ne le laissez pas tomber.

Empêchez les corps étrangers et les liquides de pénétrer dans l'appareil.

L'appareil ne doit pas être ouvert!

If the device does not function as intended or has damage that could pose a danger, it must be replaced!

En cas de fonctionnement non conforme ou de dommages pouvant entraîner des risques, l'appareil doit être remplacé!

The module complies with EN 61131-2.

In combination with a facility, the system integrator must comply with EN 60204-1 standards.

For your own safety and that of others, compliance with the environmental conditions is essential.

Le module est conforme à la norme EN 61131-2.

En combinaison avec une équipement, l'intégrateur de système doit respecter la norme EN 60204-1.

Pour votre propre sécurité et celle des autres, le respect des conditions environnementales est essential.

2.4 Software/Training

The application is created with the software LASAL CLASS 2 and LASAL SCREEN Editor.

Training for the LASAL development environment, with which the product can be configured, is provided. Information on our training schedule can be found on our website.

3 Standards and Directives

3.1 Directives

The product was constructed in compliance with the following European Union directives and tested for conformity.

3.1.1 EU Conformity Declaration

EU Declaration of Conformity

The product CO 041 conforms to the following European directives:

- **2014/35/EU** Low-voltage Directive
- **2014/30/EU** Electromagnetic Compatibility (EMC Directive)
- **2011/65/EU** “Restricted use of certain hazardous substances in electrical and electronic equipment” (RoHS Directive)

The EU Conformity Declarations are provided on the SIGMATEK website. See Products/Downloads or use the search function and the keyword “EU Declaration of Conformity”.

4 Type Plate

Exemplary nameplate (symbol image)

HW: Hardware version
SW: Software version

5 Technical Data

5.1 Current Controlled PWM Outputs

Number	4
Configuration	plus-switching (current controlled)
Short-circuit proof	yes
Maximum inrush current/channel	3.5 A (corresponds to setpoint inrush current 100 %)
Minimum inrush current/channel	0,30 A (1) (corresponds to setpoint inrush current 8.5 %)
Maximum holding current/channel (peak value)	1.35 A (corresponds to setpoint holding current 100 %)
Minimum holding current/channel (peak value)	0.115 A (1) (corresponds to setpoint holding current 8,5 %)
Maximum holding current/channel (average value)	1.0 A (2)
Maximum total current per supply group (+UV1/+UV2)	7.0 A peak current (peak value) 2.0 A holding current (average value)
Default resolution value for inrush current	8 bits
Max. inrush current duration	100 ms (3)
Preset resolution value for holding current	8 bits
Min. period in holding current phase	50 µs (corresponds to a maximum PWM frequency of 20.0 kHz)
Max. period in holding current phase	32.77 ms (corresponds to a minimum PWM frequency of 30.5 Hz)
Turn-on delay	adjustable via software in 1 µs increments from 0-32767
Turn-off delay	adjustable via software in 1 µs increments from 0-32767
Status display	4x LED (yellow)
Safety functions	Short circuit cutoff/Over temperature cut-off (4)

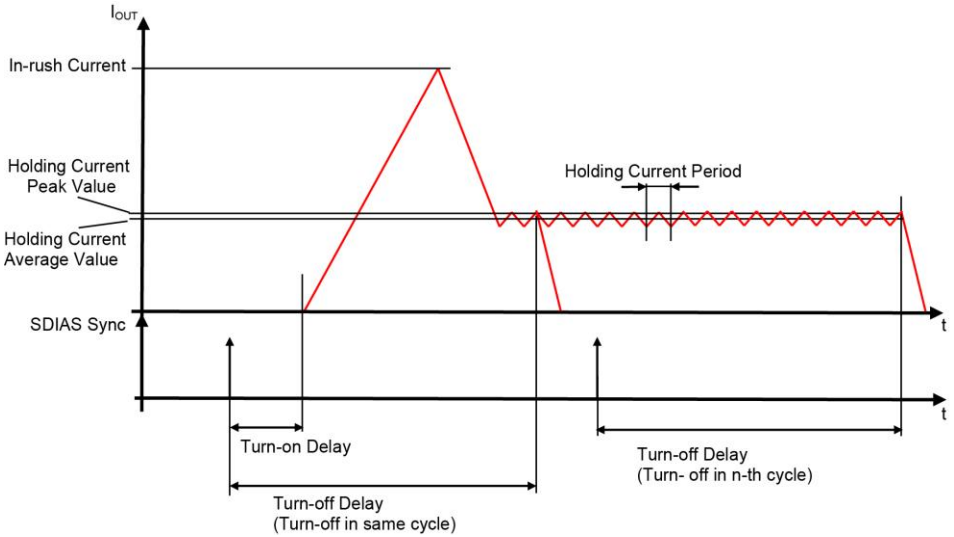
(1) A minimum switch-on/holding current (peak value) of 8.5% of the maximum value is required for the correct functionality of the peak value current controller. Set current specifications below this can lead to the current controller not outputting any current.

(2) Basically, the current regulator for the PWM outputs regulates the peak current in holding current mode. For the reference valve, for which the module is designed, a peak current of 1.35 A and an average current of 1.0 A are obtained with a supply voltage of 48 V and a period of 255 µs. The average current is relevant for controlling the valve.

(3) If the defined inrush current is not reached after 100 ms, the output is deactivated for 100 ms to protect it from overloading and informs the user software with an error bit.

(4) Temperature warning at 100 °C; Over temperature cut-off at 105 °C on the circuit board.

Current controlled PWM output – schematic



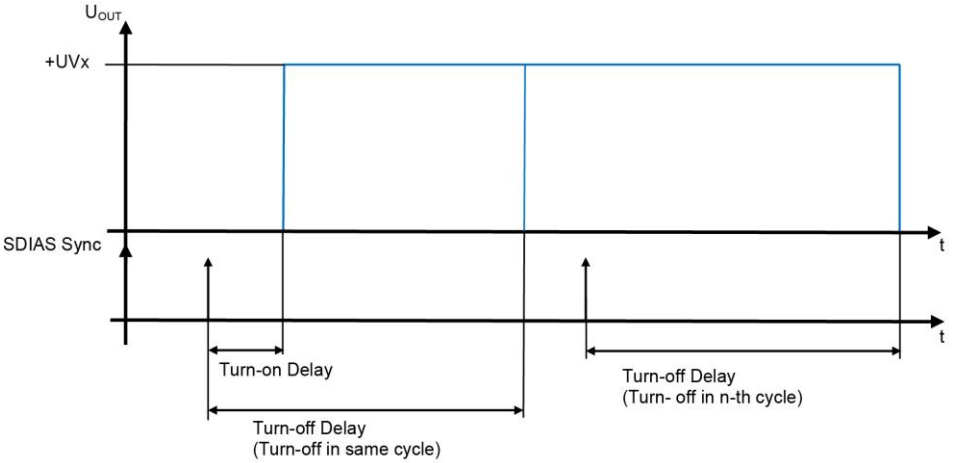
5.2 Pulse Signal Output Specifications

Number	4
Configuration	Push-Pull (voltage controlled) [1]
Short-circuit proof	yes
Maximum holding current/channel	1.0 A
Maximum total current per supply group (+UV1/+UV2)	2.0 A
Min. Activation time	50 µs
Turn-on delay	Adjustable via software in 1 µs increments from 0-32767
Turn-off delay	Adjustable via software in 1 µs increments from 0-32767
Hardware activation delay	< 10 µs
Hardware cutoff delay	< 10 µs
Status display	4x LED (yellow)
Safety functions	Short circuit cutoff Over temperature cutoff [2]

[1] The pulse signal output stage is designed to operate micro-dosing valve control devices. Supported valve control device: DCON (valve control ON: 15-24 V, Valve Control OFF: 0-5 V, internal valve control resistance: 100 kΩ)

[2] Temperature warning at 100 °C; Over temperature cut-off at 105 °C on the circuit board.

Pulse signal output – schematic



5.3 Digital Input Specifications

Number	4	
Input voltage	typically +5 V	maximum +7 V
Signal level	low: < +0.8 V	High: > +2.0 V
Switching threshold	typically +1.4 V	
Input current	1.5 mA at +5 V	
Input delay	typically 100 µs	
Status display	4x LED (green)	

5.4 Stand-Alone Operating Mode

For operation in stand-alone mode, the module must be connected to a SIGMATEK CPU and configured using a hardware class. Via the configuration, all values for inrush current, holding current and the holding current period for stand-alone mode are remnantly stored in the module. In stand-alone mode, the outputs switch according to the status of the digital inputs.
After the module has been configured, the stand-alone mode is always active as soon as the module is supplied with power and not operated by the primary CPU.
For operation in stand-alone mode, the S-DIAS PSB 001 power module, as well as any SIGMATEK control module can be used as the S-DIAS supply.
If the module is operated with a CPU, but should still work in stand-alone mode, the stand-alone mode can be activated with the hardware class. In this mode, the valve control parameters can be changed and the module status bits read. The outputs however, only react to the digital inputs.

5.5 Electrical Requirements

Valve supply voltages +UV/1-2	18-55 V	
Current consumption of the valve supply +UV/1-2	corresponds to the load on valve outputs	
Voltage supply from S-DIAS bus	+24 V	
Current consumption on the S-DIAS bus (+24 V supply) while operating all valves	typically 35 mA	maximum 50 mA

INFORMATION

Note on voltage ripple in valve supply

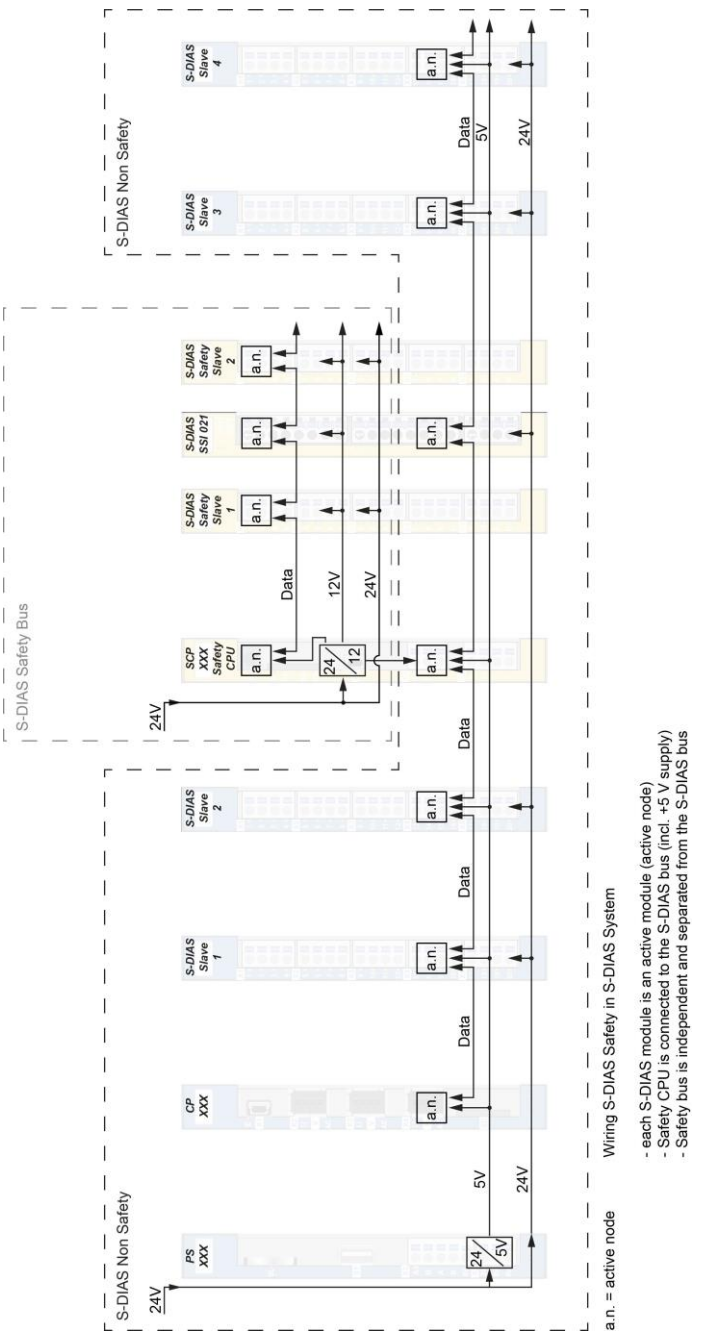
To ensure proper functioning of the module, the voltage ripple must be kept within the permissible range (< 2 Vss)! If the capacity of the power supply is insufficient, it may be necessary to connect an additional electrolytic capacitor of sufficient capacity and dielectric strength in parallel to the valve supply terminals. As a reference value for the required capacitance, approximately 2000 µF per Ampere supply current can be assumed. To achieve optimal EMC ratio, it is recommended that the capacitor be mounted near the capacitor of the module and the connection lines be as short as possible.

If several S-DIAS modules are connected, the total current of the S-DIAS modules used must be determined and checked.

The total current of the +24 V supply on the S-DIAS bus cannot exceed 1.6 A!

The total current of the +5 V supply on the S-DIAS bus cannot exceed 1.6 A!

The specification for the current can be found in the module-specific documentation under "Electrical Requirements".



a.n. = active node

Wiring S-DIAS Safety in S-DIAS System

- each S-DIAS module is an active module (active node)
- Safety CPU is connected to the S-DIAS bus (incl. +5 V supply)
- Safety bus is independent and separated from the S-DIAS bus

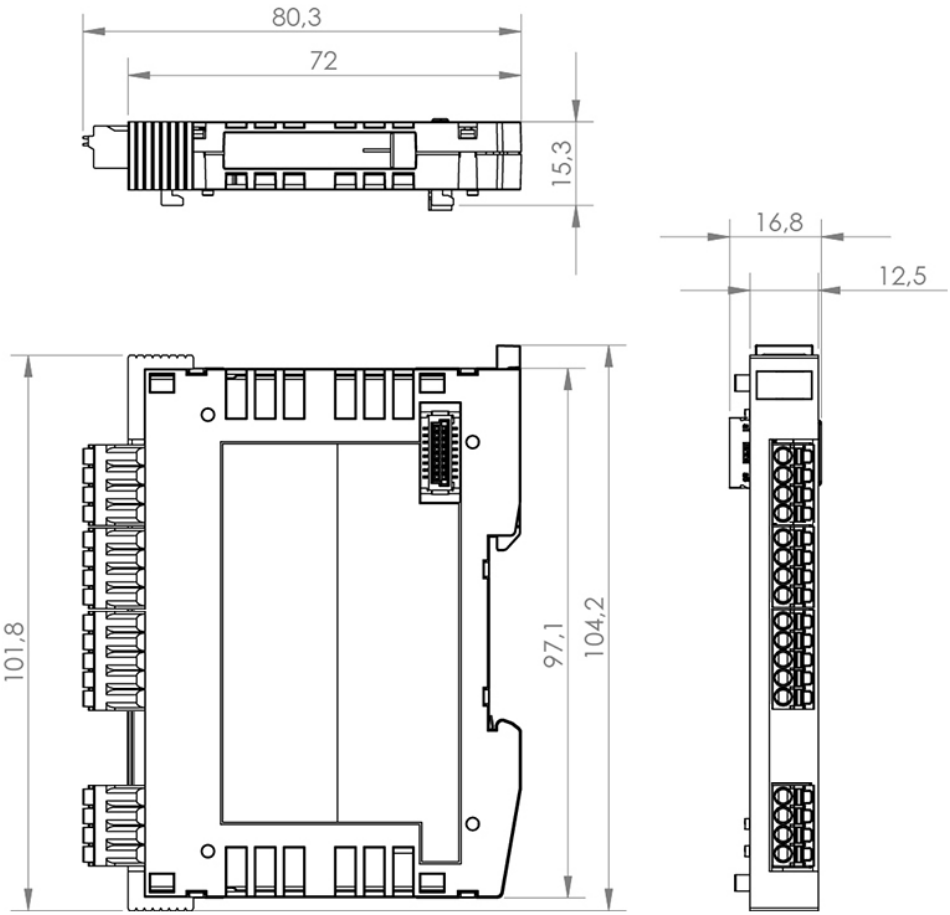
5.6 Miscellaneous

Article number	20-030-041
Standard	CE

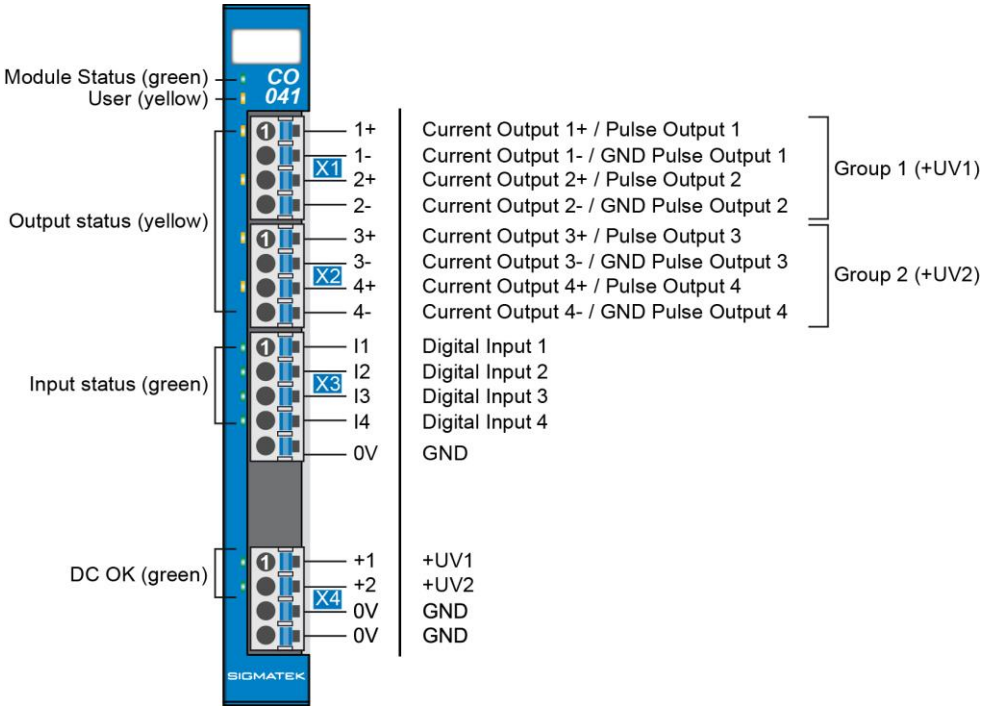
5.7 Environmental Conditions

Storage temperature	-20 ... +85 °C	
ambient temperature	0 ... +55 °C	
Humidity	0-95 %, non-condensing	
Installation altitude above sea level	0-2000 m without derating > 2000 m up to a maximum of 5000 m with derating of the maximum environmental temperature by 0.5 °C per 100 m	
Operating conditions	pollution degree 2	
EMC resistance	in accordance with EN 61000-6-2 (industrial area)	
EMC noise generation	in accordance with EN 61000-6-4 (industrial area)	
Vibration resistance	EN 60068-2-6	3.5 mm from 5-8.4 Hz 1 g from 8.4-150 Hz
Shock resistance	EN 60068-2-27	15 g
Protection type	EN 60529	IP20

6 Mechanical Dimensions



7 Connector Layout



INFORMATION

The GND supply (X4: Pin 3 and Pin 4) is internally bridged. Only one GND pin (pin 3 or pin 4) is required to power the module. The bridged connections may be used for further looping of the GND supply. However, it must be taken into account that a total current of 6 A per connection is not exceeded by the forward looping!

7.1 Status LEDs

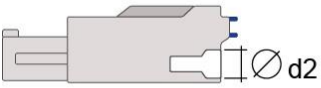
Module status	green	ON	module active
		OFF	no supply available
		BLINKING (5 Hz)	No communication / stand-alone mode
User	yellow	ON	can be set from the application (e.g. the module LED can be set to blinking through the visualization, so that it is easily found in the control cabinet)
		OFF	
		BLINKING (2 Hz)	
		BLINKING (4 Hz)	
Current output	yellow	ON	Output on
		OFF	Output off
Input Status	green	ON	input ON
		OFF	input OFF
Power supply	green	ON	Valve supply available
		OFF	Valve supply missing

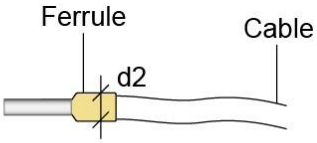
7.2 Applicable Connectors

Connectors:
X1-X4: Connectors with spring terminals (included in delivery)

Connections:

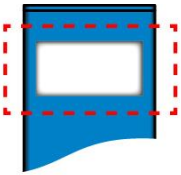
Stripping length:	10 mm
Mating direction:	parallel to the conductor axis or circuit board
Conductor cross section rigid:	0.2-1.5 mm^2
Conductor cross section flexible:	0.2-1.5 mm^2
Conductor cross section AWG/kcmil:	24-16
Conductor cross section flexible with ferrule without plastic sleeve:	0.25-1.5 mm^2
Conductor cross section flexible with ferrule with plastic sleeve:	0.25-0.75 mm^2 (reason for reduction d2 of the ferrule)





d2 = max. 2.8 mm

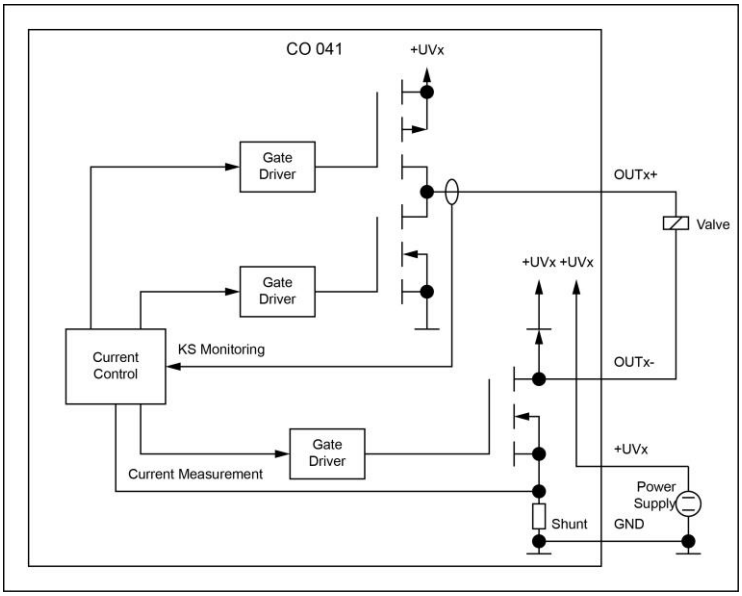
7.3 Labeling Field



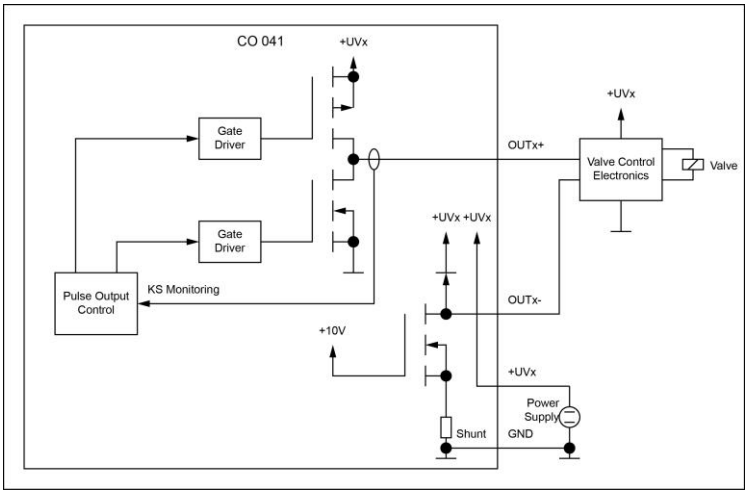
Manufacturer	Weidmüller
Type	MF 10/5 CABUR MC NE WS
Article number Weidmüller	1854510000
Compatible printer	Weidmüller
Type	Printjet Advanced 230V
Article number Weidmüller	1324380000

7.4 Output Scheme

7.4.1 Use as a Current Controlled PWM Output for Direct Valve Control

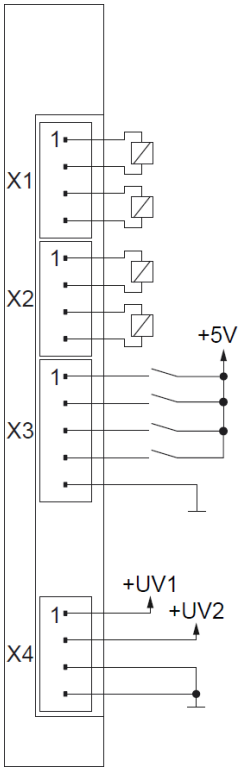


7.4.2 Use as an Pulse Signal Output for Controlling Valve Control Electronics



8 Wiring

8.1 Wiring Example



8.2 Notes

The following guidelines should be observed:

- The DIN rail must have an adequate mass connection.
- The shielding must be connected to a shielding bus.
- Avoid parallel connections between input lines and load-bearing circuits.
- For the digital input wiring, a shielded cable is required. The shield must be placed in front of the module as close as possible.

INFORMATION

The ground bus should be connected to the control cabinet if possible!

The S-DIAS module CANNOT be connected/disconnected while voltage is applied!

The maximum length of the digital input and valve cables is 30 m.

9 Assembly/Installation

9.1 Check Contents of Delivery

Ensure that the contents of the delivery are complete and intact. See chapter 1.3 Contents of Delivery.

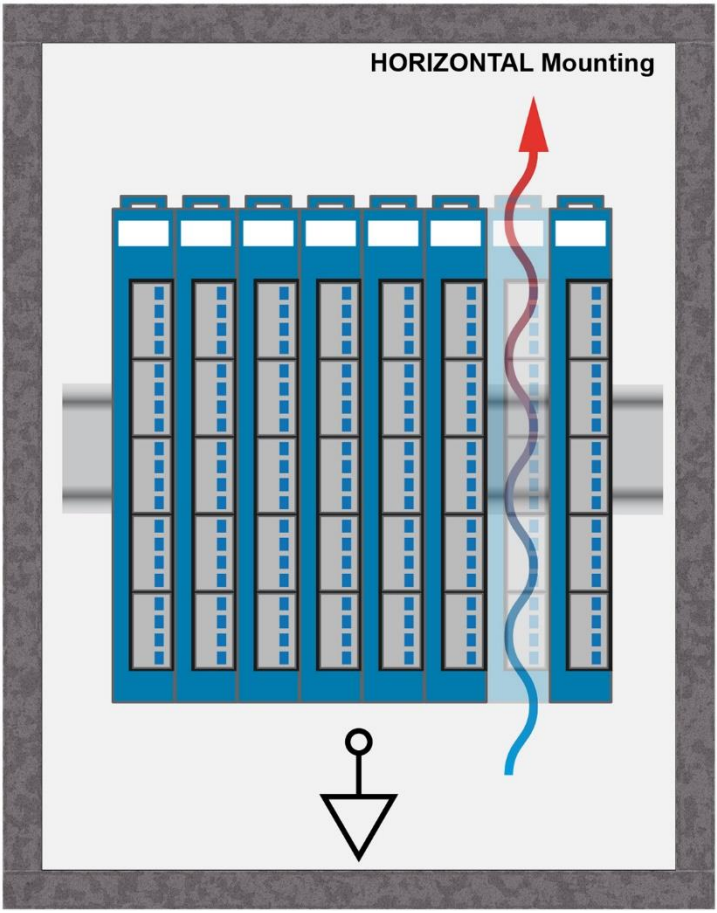
INFORMATION

On receipt and before initial use, check the device for damage. If the device is damaged, contact our customer service and do not install the device in your system.

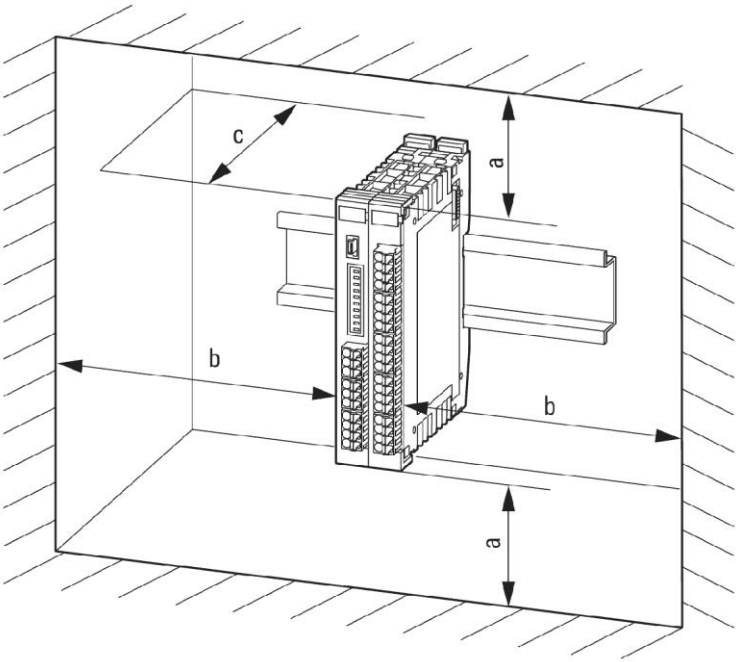
Damaged components can disrupt or damage the system.

9.2 Mounting

The S-DIAS modules are designed for installation into the control cabinet. To mount the modules, a DIN-rail is required. The DIN rail must establish a conductive connection with the back wall of the control cabinet. The individual S-DIAS modules are mounted on the DIN rail as a block and secured with latches. The functional ground connection from the module to the DIN rail is made via the grounding clamp on the back of the S-DIAS modules. The modules must be mounted horizontally (module label facing up) with sufficient clearance between the ventilation slots of the S-DIAS module blocks and nearby components and/or the control cabinet wall. This is necessary for optimal cooling and air circulation, so that proper function up to the maximum operating temperature is ensured.



Recommended minimum distances of the S-DIAS modules to the surrounding components or control cabinet wall:



a	b	c	ϑ
30 mm (1.18″)	**30 mm** (1.18″)	**100 mm** (3.94″)	**≦ 55 °C** (≦ 131 °F)

a, b, c … distances in mm (inches)
ϑ … valid ambient temperature in °C (°F)

10 Transport/Storage

INFORMATION

This device contains sensitive electronics. During transport and storage, high mechanical stress must therefore be avoided.

For storage and transport, the same values for humidity and vibration as for operation must be maintained!

Temperature and humidity fluctuations may occur during transport. Ensure that no moisture condenses in or on the device, by allowing the device to acclimate to the room temperature while turned off.

When sent, the device should be transported in the original packaging if possible. Otherwise, packaging should be selected that sufficiently protects the product from external mechanical influences. Such as cardboard filled with air cushioning.

11 Storage

INFORMATION

When not in use, store the operating panel according to the storage conditions. See chapter 10.

During storage, ensure that all protective covers (if available) are placed correctly, so that no contamination, foreign bodies or fluids enter the device.

12 Maintenance

INFORMATION

During maintenance as well as servicing, observe the safety instructions from chapter 2 Basic Safety Directives.

12.1 Service

This product was constructed for low-maintenance operation.

12.2 Repair

INFORMATION

In the event of a defect/repair, send the device with a detailed error description to the address listed at the beginning of this document.

For transport conditions, see chapter 10 Transport/Storage.

13 Disposal

INFORMATION

Should you need to dispose of the device, the national regulations for disposal must be followed.

The device appliance must not be disposed of as household waste.

14 Addressing

Address (hex)	Size (bytes)	Access Type	Description	Reset Value
Write PDO (up to 32 bytes)				
Programmable output 1				
0000	4	r/w32	Step Frequency Register Frequency of one step in 64-micro steps (Internal signal is 21Bit)	00000000
0000	2	r16/w16	Start-time 1 Bit 14..0: Start-time Bit 15: 0 = Start-time invalid 1 = Start-time valid (reset after data_exchange)	0000
0002	2	r16/w16	Stop-time 1 Bit 14..0: Stop-time Bit 15: 0 = Stop-time invalid 1 = Stop-time valid (reset after data_exchange)	0000
0004	2	r16/w16	Start-time 2 Bit 14..0: Start-time Bit 15: 0 = Start-time invalid 1 = Start-time valid (reset after data_exchange)	0000
0006	2	r16/w16	Stop-time 2 Bit 14..0: Stop-time Bit 15: 0 = Stop-time invalid 1 = Stop-time valid (reset after data_exchange)	0000
Programmable output 2				
0008	2	r16/w16	Start-time 1	0000
000A	2	r16/w16	Stop-time 1	0000
000C	2	r16/w16	Start-time 2	0000
000E	2	r16/w16	Stop-time 2	0000
Programmable output 3				
0010	2	r16/w16	Start-time 1	0000
0012	2	r16/w16	Stop-time 1	0000
0014	2	r16/w16	Start-time 2	0000
0016	2	r16/w16	Stop-time 2	0000
Programmable output 4				
0018	2	r16/w16	Start-time 1	0000
001A	2	r16/w16	Stop-time 1	0000

001C	2	r16/w16	Start-time 2	0000
001E	2	r16/w16	Stop-time 2	0000
0020	16	r	Reserved	0..0
SDO[1] Data with 26 Bytes				
0030	2	r/w	Programmable output 1 Stop-time period [µs] (min. 2)	Flash
0032	2	r/w	Programmable output 2 Stop-time period [µs] (min. 2)	Flash
0034	2	r/w	Programmable output 3 Stop-time period [µs] (min. 2)	Flash
0036	2	r/w	Programmable output 4 Stop-time period [µs] (min. 2)	Flash
0038	2	r16/w16	Programmable output 1 (standardized value) Upper current threshold [1/10 %]	Flash
003A	2	r16/w16	Programmable output 1 (standardized value) Lower current threshold [1/10 %]	Flash
003C	2	r16/w16	Programmable output 2 (standardized value) Upper current threshold [1/10 %]	Flash
003E	2	r16/w16	Programmable output 2 (standardized value) Lower current threshold [1/10 %]	Flash
0040	2	r16/w16	Programmable output 3 (standardized value) Upper current threshold [1/10 %]	Flash
0042	2	r16/w16	Programmable output 3 (standardized value) Lower current threshold [1/10 %]	Flash
0044	2	r16/w16	Programmable output 4 (standardized value) Upper current threshold [1/10 %]	Flash
0046	2	r16/w16	Programmable output 4 (standardized value) Lower current threshold [1/10 %]	Flash
0048	2	r16/w16	PLL period [µs] Bit 14..0: Period Bit 15: Reserved	Flash
004A	6	r	Reserved	0..0
0050	78	r	Storage buffer for data from the SPI Flash with 78 bytes (NO write access)	0..0
009E	**66**	**r**	**Reserved**	**0..0**

[1] When writing SDO data, the configuration phase is restarted after the last byte (address 0x0049, high byte “PLL period”). This means that the SDO data is recalculated with the calibration data and copied to the registers. During this time, the outputs are deactivated (min. 10 ms). Only then can the outputs be reactivated. The “Operational” status of MicroBlaze is inactive during this time.

00E0	16	r	MicroBlaze Debugging and Scratch Pad (NO write access)	0..0
00F0	15	r	Reserved	0..0
00FF	1	r	MicroBlaze Status Register Bit 0: calibration data could not be read Bit 1: Calibration data CRC invalid Bit 2: Reserved Bit 3: MicroBlaze ready (1 = Operational) Bit 4: Data output 1 invalid Bit 5: Data output 2 invalid Bit 6: Data output 3 invalid Bit 7: Data output 4 invalid	00
Read PDO with 5 bytes				
Register components				
0100	1	r	Status Latch Register Bit 0: DC OK current circuit 1 Bit 1: DC OK current circuit 2 Bit 2: Temperature warning threshold exceeded Bit 3: Maximum temperature value exceeded Bit 4: Digital input 1 (external start) Bit 5: Digital input 2 (external start) Bit 6: Digital input 3 (external start) Bit 7: Digital input 4 (external start)	00
0101	1	r	Short circuit monitoring latch register Bit 0: Valve 1 KS HS Bit 1: Valve 1 KS LS Bit 2: Valve 2 KS HS Bit 3: Valve 2 KS LS Bit 4: Valve 3 KS HS Bit 5: Valve 3 KS LS Bit 6: Valve 4 KS HS Bit 7: Valve 4 KS LS	00
0102	2	r16	16-bit Temperature (signed value)	0000
0104	1	r	Inrush current timeout 100 ms Bit 0: Valve 1 inrush current timeout (1=active) Bit 1: Valve 2 inrush current timeout (1=active) Bit 2: Valve 3 inrush current timeout (1=active) Bit 3: Valve 4 inrush current timeout (1=active) Bit 7..4: Reserved	00
0105	1	r	Reserved	00

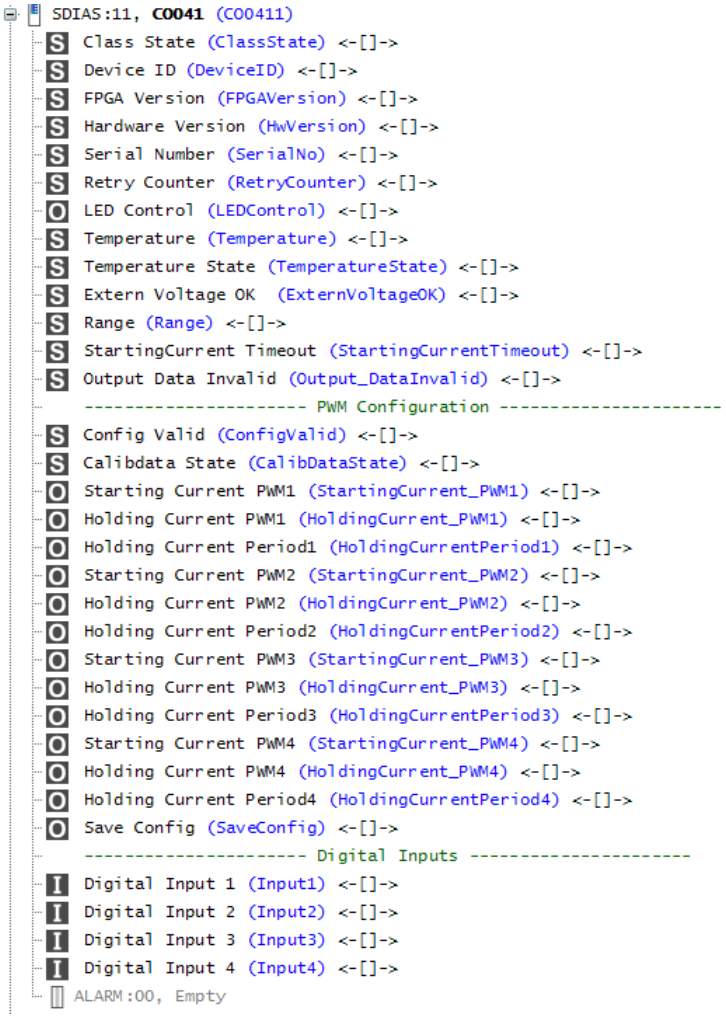
0106	1	r	Current threshold register Bit 0: Valve 1 upper threshold reached Bit 1: Valve 2 upper threshold reached Bit 2: Valve 3 upper threshold reached Bit 3: Valve 4 upper threshold reached Bit 4: Valve 1 lower threshold reached Bit 5: Valve 2 lower threshold reached Bit 6: Valve 3 lower threshold reached Bit 7: Valve 4 lower threshold reached	
0107	1	r/w	PMB register (This register cannot be operated)	00
0108	1	r/w	MicroBlaze control register Bit 0..5: Reserved Bit 6: New configuration (1 = generate tick on irq_config) Bit 7: MicroBlaze Reset (1 = µC is in Reset)	00
0109	1	r/w	Global control register Bit 0: CPU Mode Enable2 Bit 6..1: Reserved Bit 7: Pulse signal output active3	00

[2] "CPU Mode Enable" ends the stand-alone mode via the digital inputs. The settings are accepted after bit 6 is set in the "MicroBlaze control register" or by writing the SDO data.
[3] With "Pulse signal active", the threshold value is ignored and it remains active for the defined start/stop time of the output.

15 Hardware Class CO041

Hardware Class CO041 for the S-DIAS current output module CO 041

This hardware class is used to control the CO 041 hardware module. The module has 4 current- or pulse outputs with adjustable starting and lowering current.



This hardware class is used to control the hardware module CO 041. The module has 4 current or pulse outputs with adjustable switch-on and setback current.

15.1 General

ClassState	State	This server shows the actual status of the hardware class.
DeviceID	State	This server shows the device ID of the hardware module.
FPGAVersion	State	FPGA version of the module in the format 16#XY (e.g. 16#10 = version 1.0).
Hardware Version	State	Hardware version of the module in the format 16#XXYY (e.g. 16#0120 = version 1.20)
Serial Number	State	The serial number of the hardware module is shown in this server.
Retry Counter	State	This server increments when a transfer fails.
LED Control	Output	With this server, the application LED of the S-DIAS module can be activated to find the module in the network more quickly. The following status are possible: 0 LED off 1 LED on 2 blinks slowly 3 blinks rapidly
Required	Property	This client is activated by default, i.e. this S-DIAS hardware module at this position is absolutely necessary for the system and may under no circumstances be missing, disconnected or deliver an error, otherwise the entire hardware is switched off. If the hardware module is missing, it returns an error or if it is removed, this triggers an S-DIAS error. If his client is initialized with 0, the hardware module located in this position is not mandatory. This means that it can be inserted or removed at any time. However, which components identified as "not required" should be selected with regard to the safety of the system.
Stand Alone Active	Property	This client activates the stand-alone operation. 0 deactivated 1 activated As an initialization value
Activate SPI Write	Property	This setting can activate the SPI Write function. Writing SPI is needed to save the PWM1-4 configuration on the module. 0 activated 1 deactivated As an initialization value
Impuls Output Active	Property	With this client the outputs are configured between current controlled PWM output and pulse output. 0 current output 1 pulse output As an initialization value
Temperature	State	This server shows the current temperature of the module. [1/10 °C]
Temperature State	State	An error is displayed on this server if the permitted temperature is exceeded. Bit 0 Temperature warning threshold exceeded Bit 1 Temperature maximum value exceeded

Extern Voltage OK	State	This server indicates whether the external module supply is OK for the respective output. Bit 0 Output 1-2 Bit 1 Output 3-4
Range	State	This server indicates whether a short-circuit has occurred on a valve. More information, see internal properties Bit 0 Valve 1 HS Bit 1 Valve 1 LS Bit 2 Valve 2 HS Bit 3 Valve 2 LS Bit 4 Valve 3 HS Bit 5 Valve 3 LS Bit 6 Valve 4 HS Bit 7 Valve 4 LS
Starting Current Timeout	State	This server indicates whether the 100 ms timeout at inrush current has been exceeded. Bit 0 Valve 1 Timeout Bit 1 Valve 2 Timeout Bit 2 Valve 3 Timeout Bit 3 Valve 4 Timeout
Data Out Invalid	State	Indicates whether the configuration data of the current outputs are invalid. If the data is invalid, the output is switched off. Bit 0 Output 1 Bit 1 Output 2 Bit 2 Output 3 Bit 3 Output 4

15.2 Current - PWM Outputs 1-4

Config Valid	State	Indicates whether the configuration of the current outputs is valid. 0 configuration currently being written 1 configuration valid -1 error
Calibdata State	State	Indicates whether an error has occurred when reading the calibration data of the current outputs. 0 configuration currently being written 1 configuration valid -1 CRC invalid -2 reading configuration failed
Starting Current PWM [1-4]	Output	The inrush current of the respective current-controlled PWM output can be specified on this server. [0-100 %] Value range: 0-1000 [1/10 %]
Holding Current PWM [1-4]	Output	The hold current peak value of the respective current-controlled PWM output can be specified on this server. [0-100 %] Value range: 0-1000 [1/10 %]
Holding Current Period [1-4]	Output	The holding current period of the respective current-controlled PWM output can be specified on this server. Value range: 2-32767 [µs]
Save Config	Output	With this server you can store the set values of the current-controlled PWM outputs. 0 saving completed 1 save configuration 2 delete configuration (all values are set to 0) When using a VI021/22 the SPI writing works only with firmware > 1.10

15.3 Digital Inputs 1-4

Save Config	Shows the status of the digital inputs 1-4. In standalone operation the digital inputs are used for direct control of the outputs.

15.4 Communication Interfaces

ALARM	Downlink	With this downlink the corresponding alarm class can be placed via the hardware editor.

15.5 Global Methods

The following methods can be called via the ClassState server.

15.5.1 SetStartTime

With this function, the preset times until the next pulse to be started is switched off can be set for each output of the module. Two different, independent start times can be assigned. If the function is called twice with the same output transfer parameter in one cycle, start time 1 is set first and then start time 2. However, if it is called more than twice with the same output transfer parameter in one cycle, the previously set start times are overwritten. After running one cycle, new start times can be assigned again.

Transfer parameters	Type	Description
usOutput	USINT	Number of the output, where the pulse should be output (output 1-4)
uiTime	UINT	Preset time in µs; The value must be lower than the bus cycle time. Value range: 0-32767 [µs]
Return parameters	**Type**	**Description**
sdRetval	DINT	0 OK 1 class status different to 0, the data were not accepted 2 the value entered for the preset time is higher than or equal to the bus cycle time. The data were not accepted. 3 the value entered for the preset time is higher than or equal to the maximum allowed time. The data were not accepted.

15.5.2 SetStopTime

With this function, the preset times until the current or the next pulse is switched off can be set for each output of the module. Two different, independent stop times can be assigned. If the function is called twice with the same output transfer parameter in one cycle, stop time 1 is set first and then stop time 2. However, if it is called more than twice with the same output transfer parameter in one cycle, the previously set stop times are overwritten. After running one cycle, new stop times can be assigned again.

Transfer parameters	Type	Description
usOutput	USINT	Number of the output, where the pulse should be stopped (output 1-4)
uiTime	UINT	Preset time in µs; The value must be lower than the bus cycle time. Value range: 0-32767 [µs]
Return parameters	**Type**	**Description**
sdRetval	DINT	0 OK 1 class status different to 0, the data were not accepted 2 the value entered for the preset time is higher than or equal to the bus cycle time. The data were not accepted. 3 the value entered for the preset time is higher than or equal to the maximum allowed time. The data were not accepted.

15.6 Internal Properties

15.6.1 Stand-alone Operation

To use stand-alone operation, valid configuration data must be stored in the module during initial commissioning. The new configuration data can be saved in the SPI Flash using the "SafeConfig" server.

In stand-alone mode it is possible to use the module without CPU. In this case, four fast digital inputs (TTL signal) are available over which each output, with fixed parameters, are controlled.

The pulse outputs cannot be used in stand-alone operation.

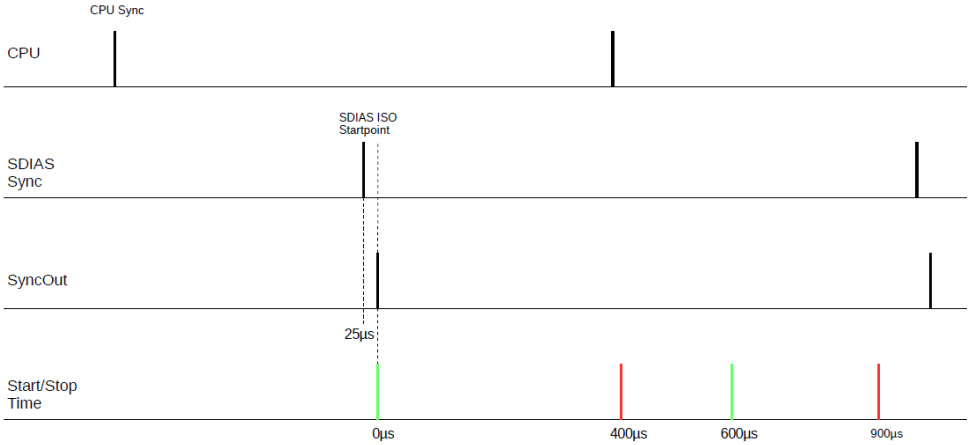
15.6.2 Short-circuit Behavior

There are 3 types of short circuits that are monitored.

- Highside: A short circuit has occurred between the positive current output and ground. The HS bit of the corresponding output is set.
- Lowside: A short circuit has occurred between the negative current output and the supply voltage. The LS bit of the corresponding output is set.
- Short circuit between the current output pins: A short circuit has occurred between positive and negative current output. Both short circuit bits HS and LS of the respective output are set.

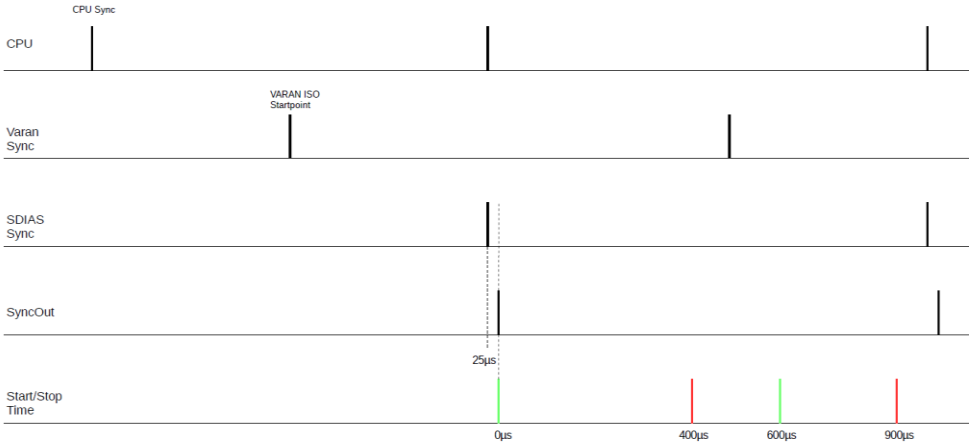
15.6.3 Timing on the local S-DIAS

The outputs are always started after SyncOut. The SyncOut is shifted by 25 µs to the SDIAS ISO start time. This must be taken into account when selecting the start or stop time. The start and stop times refer to SyncOut. In the diagram an example for 2 switch-on and switch-off procedures with different times. Green = on; red = off.



15.6.4 S-DIAS timing behind VARAN

When using a VI, the SDIAS Sync is the same as the CPU Sync. The SyncOut is shifted by 25 µs to the SDIAS Sync. This must be taken into account when selecting the start or stop time. The start and stop times refer to SyncOut. In the diagram an example for 2 switch-on and switch-off procedures with different times. Green = on; red = off.



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Documentation Changes

Change date	Affected page(s)	Chapter	Note
18.06.2018	1	1.1 Current Controlled PWM Outputs	table and footnotes extended
20.09.2018		3 Connector Layout	Note added
14.11.2019	25	7 Supported Cycle Times	Chapter added
28.02.2020	25	7 Supported Cycle Times	Text adapted
28.05.2020	25	7 Supported Cycle Times	Chapter removed
08.09.2020	25	7 Hardware Class CO041	Chapter added
04.11.2020	19	5 Mounting	Expansion functional ground connection
20.04.2023	13	3 Connector Layout	Info box corrected
26.07.2023		Document	General chapters added, design