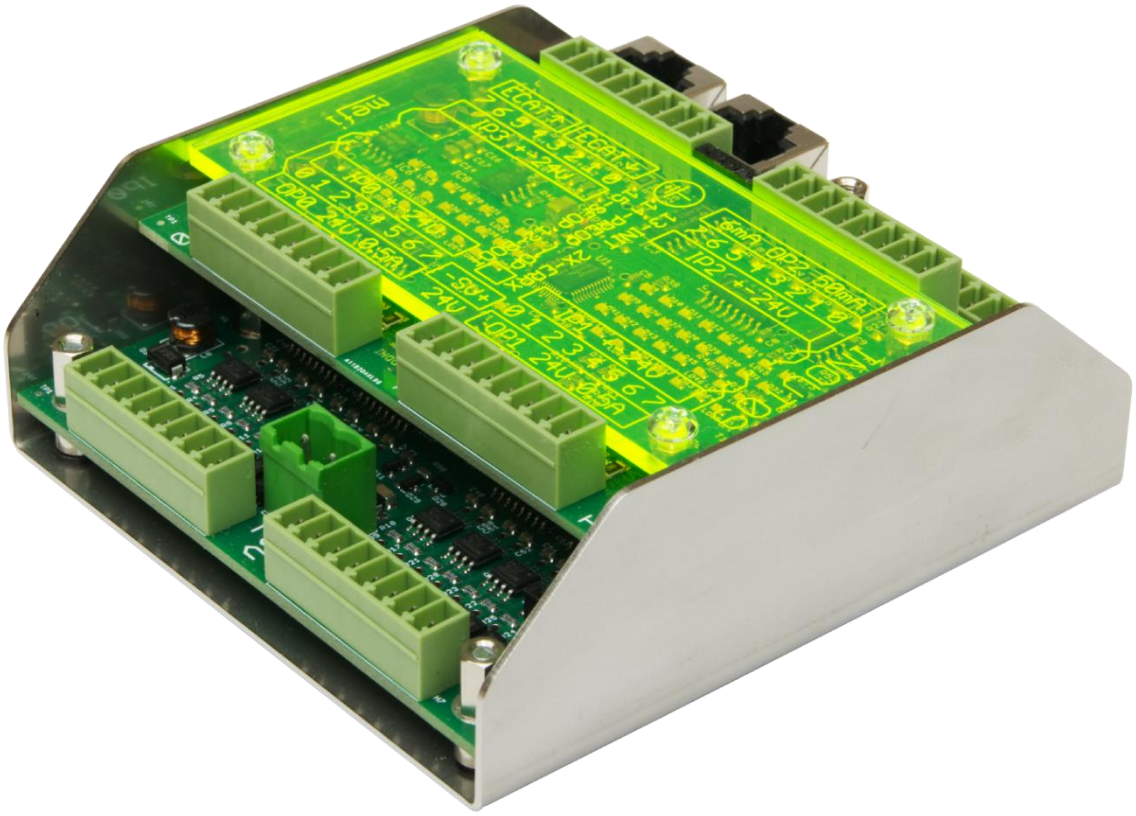
INOUT 09



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Input and output module, EtherCAT

- **32 digital inputs 24V or up to 32 analog inputs ±10V**
- **16 digital outputs 24V / 0,5 A**
- **4 digital outputs 24V / 50 mA or up to 4 PWM outputs**
- **4 digital outputs 24V / 6 mA or up to 4 analog outputs 0 ÷ +10 V**
- **Supply voltage 18 ÷ 30V max. 120 mA (+ current drawn from the outputs)**
- **Communication protocol EtherCAT – COE**

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- Communication protocol EtherCAT – COE

Description

The INOUT 09 implements analog and digital outputs in the industrial control systems. Analog and digital inputs share common input pins, one pin can be used for both digital and analog input. Inputs have digital filter with adjustable time constant for suppression of the spurious signals. Analog outputs and PWM outputs share common output pins with digital outputs, if used, appropriate digital output must be switched off. Outputs are short protected, except the outputs in PWM mode and the analog mode. Information about shorted output is available in the status word, and also individually about every output. There is also available information about unconnected outputs (excluding outputs on the port OP2).

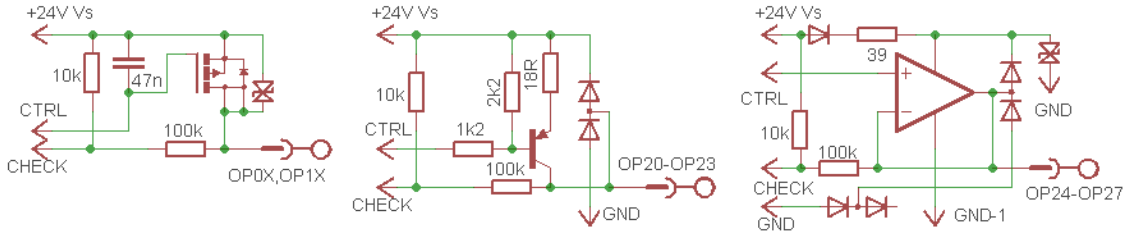
Inputs and outputs -function

Port	Function
Ports IP0, IP1, IP2, port IP3 bits 0 – 5	Digital inputs, analog inputs
Port IP3 bits 6 – 7	Fast digital inputs
Port OP0 and port OP1	Digital outputs 0,5A
Port OP2 bits 0 - 3	Digital outputs 0,05A or PWM outputs
Port OP2 bits 3 - 7	Digital outputs 0,006A or analog outputs

Absolute maximum ratings

Parameter	Conditions	Min.	Max.	Unit.
Supply voltage Vs		18	30	V
Voltage on input pins		-30	+30	V
Output current - ports OP0 a OP1		-0,1	+0,5	A
Output current - pins OP2.0 - OP2.3		-0,01	+0,05	A
Output current - pins OP2.4 - OP2.7		-1	+6	mA
Ambient temperature		0	45	°C
Relative humidity	Without condensation	5	95	%

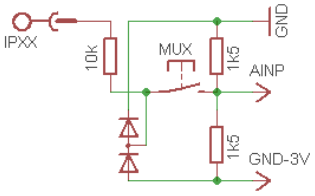
Outputs schematic – simplified



Outputs parameters

Parameter	Port	Conditions	Min.	Max.	Unit
High level output voltage. 1	OP0,OP1	Io=0.5A	Vs-1	Vs-0.01	V
	OP2.0÷OP2.3	Io=0.05A	Vs-2.5	Vs-0.8	V
	OP2.4÷OP2.7	Io=6mA Vs=24V	13	22	V
Leakage current - log. 0	Except OP2.4÷OP2.7	Vs=30V	0.2	0.3	mA
Output analog voltage	OP2.4÷OP2.7	Set 10000	9.9	10.1	V
		Set 0	-0.07	+0.07	V
Analog output nonlinearity	OP2.4÷OP2.7	Set 0÷10000	0	0.2	%
Delay from internal variable to output pin	OP0, OP1 OP2.4÷OP2.7	70% output change, Io=0,5 Iomax	0.01	1	ms
	OP2.0÷OP2.4		0.01	0.4	ms

Input schematic - simplified



IP00 to IP37.can be used as analog inputs. IP36 and IP37 can be used as fast digital inputs – they are not multiplexed. For better precision and higher spurious signals suppression is recommended to use two adjacent inputs in differential connection. Then use the even output and output higher by one (for example IP2B0 and IP2B1) – they are measured nearly in the same moment and possible interference between spurious voltage and differential input voltage is limited. In such a case is desirable to set input filters for both inputs to the same value. Max. indicated value of the Inputs is approx. +-20V.

Input parameters

Parameter	Port	Conditions	Min.	Max.	Unit
Input voltage for log. 0	IP0.0÷IP3.5		-30	+9	V
	IP3.6, IP3.7		-30	+9	V
Input voltage for log. 1	IP0.0÷IP3.5		+11	+30	V
	IP3.6, IP3.7		+11	+30	V
Input resistance	All		10	16	kΩ
Input voltage at value +10000	IP0.0÷IP3.5		9.9	10.1	V
Input voltage at value 0	IP0.0÷IP3.5		-0.05	+0.05	V
Input voltage at value -10000	IP0.0÷IP3.5		-10.1	-9.9	V
Nonlinearity	IP0.0÷IP3.5		0	0.2	%

Delay time from input pin to internal variable	IP0.0÷IP3..5	filter disabled	1	3	ms
	IP3.6, IP3.7	filter disabled	0.004	0.14	ms

Board status displayed by LED diode

Number	Meaning
12	BOOTSTRAP – board expects new firmware download
13	INIT – state after switch on before communication starts
14	PREOPERATIONAL – board prepared for parameters setup
15	SAFE OPERATIONAL – inputs active, outputs disabled
16	BOOTSTRAP – download started.
17	BOOTSTRAP –download completed successfully
Continuous light	OPERATIONAL – board fully functional-
21	ERROR - communication lost from the lower to the upper board
22	ERROR - communication lost from the upper to the lower board
23	ERROR – no software on D board
24	ERROR – wrong software download on D board
25	ERROR – no bootloader software on D board

Status LED is located in the middle of the board near the power supply connector.

The output and input LEDS lit, if log. 1. is on the pin. Output LED is blinking if output is shorted.

Errors reported in the status register

Bit	Meaning
0	Any error – set if any other error is active
1	Overcurrent – Some output is shorted or overloaded
2	Undervoltage – supply voltage is too low
3	-
4	-
5	Flash memory error – wrong checksum of the calibration values
6	-
7	Communication error – data from upper (input) board are missing

Implemented COE objects

Index	Subind.	Length*1	Name	Meaning*2
0x1000	0	32Bit	Device type	
0x1001	0	8Bit	Error register	
0x1008	0	Str	Device name	
0x1009	0	Str	Hardware version	
0x100A	0	Str	Software version	
0x1018	0	4	Identity	
	1	32Bit	Vendor ID	
	2	32Bit	Product code	
	3	32Bit	Revision	
	4	32Bit	Serial number	
0x10F1	0	2	Error settings	
	1	32Bit	Local Error Reaction	
	2	32Bit	Sync Error Counter Limit	

Index	Subind.	Length*1	Name	Meaning*2
0x1600	0	25	RxPDO Dout Map ….	
0x1601	0	4	RxPDO Aout Map ….	
0x1602	0	5	RxPDO PWM Map ….	
0x1603	0	2	RxPDO Calibration Map….	
0x1A00	0	32	TxPDO DIn Map….	
0x1A01	0	4	TxPDO Diag Map….	
0x1A02	0	30	TxPDO AIn Map….	
0x1A03	0	1	TxPDO ErrReg Map….	
0x1A04	0	10	TxPDO Calibration Map….	
0x1C00	0	4	Sync manager type….	
0x1C12	0	3	RxPDO Assign….	
0x1C13	0	5	TxPDO Assign….	
0x1C14	0	1	TxPDO2 Assign….	
0x1C32	0	32	SM output parameter….	
0x1C33	0	32	SM input parameter….	
0x2101	0	2	Output diagnostic	
	1	32Bit	Shorts	1 – Shorted output
	2	32Bit	No Loads	1 – Unconnected outp. (B0 – B18 only)
0x210B	0	16Bit	Supply Voltage	Supply voltage in [mV]
0x210C	0	16Bit	Under-voltage Limit	Low limit for supply voltage in [mV]
0x210E	0	5	PWM Output	
	1	16Bit	OP2B0 On Time	Output pulse length on OP2B0 [0.1us]
	2	16Bit	OP2B1 On Time	Output pulse length on OP2B1 [0.1us]
	3	16Bit	OP2B2 On Time	Output pulse length on OP2B2 [0.1us]
	4	16Bit	OP2B3 On Time	Output pulse length on OP2B3 [0.1us]
	5	16Bit	PWM Cycle time	Cycle length in [0.1us] – 0: 100µs
0x2141	0	13	Calibration	
0x2142	0	16Bit	Chip Temperature	Processor temperature in [0.1 °C]
0x2143	0	32	Input Filters	
	1	8Bit	IP0B0 Filter ……	Filter for IP0B0 ….. (values in tab..)
0x6020	0	32	Digital Inputs	
	1	1B	IP0B0 digital input….	1 – there is log. 1 on the input IP0B0 i
0x6220	0	24	Digital Outputs	
	1	1B	OP0B0 digital output ….	1 – Switch on output OP0B0 ….
0x6401	0	30	Analog Inputs	
	1	16Bit	Analog Input IP0B0 …	Voltage on input IP0B0 in [0.001V] ….
0x6404	0	15	Analog Inputs Difference	
	1	16Bit	Analog Input IP0B0-IP0B1	Voltage difference IP0B0-B1 [0.001V]….
0x6411	0	4	Analog Outputs	
	1	16Bit	Analog Output OP2B4 ….	Voltage on output OP2B4 in [0.001V]….

*1 – Length in bits or count of fields of the array

*2 – If not mentioned, conforms to CANopen norm DS301

…. – Object continues - some subindexes follows up to mentioned count. (shortened for clarity)

Time constants of the input filters

Value	τ[ms]	Value	τ[ms]	Value	τ[ms]	Value	τ[ms]
0	Off.	4	12	8	185	12	2954
1	1,5	5	23	9	369	13	5909
2*	3	6	46	10	738	14	11819
3	6	7	92	11	1447	15	23637

* - Preset value for all filters – 3ms

Values greater than 15 are undefined – do not use.

Filters active for all digital and analog inputs with exception of IP3B6 and IP3B7.

IP3B6 a IP3B7: (fast inputs) for digital input filter is not used, for analog input is time constant 8 times lower, then one mentioned in this table.

Dimensions [mm]