econ9 PLC i4-100

Automation. Punktgenau.

econ9 PLC i4-100

Variants	Part.-No.
econ9 PLC i4-100	10910401
Accessories	**Part.-No.**
Patch Cable, Length 2 m	3030166
CrossOver Cable, Length 2 m	3030167
Backup Battery	2080205
2 GB Micro-SD-Card (max. 32 GB)	6010146
St 2x10pol FMCD 1,5 RM3,5 (terminal clamp for I/O)	2050217
Extensions	**Part.-No.**
in planning	

Functions Overview CODESYS Firmware

CODESYS Firmware	Dig I/O	Analog I/O	Interrupt-Inputs	PWM-Outputs	PTO-Outputs	Encoder-Inputs	Fast-Counter-Inputs	CAN / CANopen	RS485	Webvisu	remanent RAM	SD-Card	USB	Ethernet	FTP-Server
econ9 V121	X	X						X	X			X	X	X	X	X

Description:

The base controller econ9 PLC i4-100 combines a large number of functions. This functions can be extended by the modular structure of the overall system. The basic version includes multifunctional interfaces, which allow a high flexibility for optimal adaptation to the requirements.

The econ9 PLC i4-100 base controller is also fitted with multiple communication interfaces for easy networking and remote expansion, data can be stored on the optional µSD card permanently.

Technical Data:
- 1 CAN-Interface
- 1 RS485
- 1 Ethernet-Interface (10/100 Base-T)
- 1 USB 2.0 Host
- 64 MB DDR2 RAM
- 256 MB Nand-Flash
- Backup Battery, Typ CR2032
- Real-time clock
- 2 MB SRAM, battery buffered
- 1 Slot for Micro-SD-Card (microSDHC, max 32 GB)
- Power supply: 24 V / ≤ 1 A DC
- Housing Protection: IP20
- Mounting: DIN Rail DIN EN 60715, 35mm
- Dimension (B x H x T): 53.2 x 110 x 100 mm
- Operating Temperature: 5 ... + 55 °C
- Weight: aprox. 0.2 kg
- Programming Software: CODESYS V3

Multifunctional In- / Outputs
alternatively usable see combination matrix Page 6

- 8 Inputchannels, alternatively usable as
    - 8 digital Inputs 24V 7mA, non isolated, high active
    - 2 Interruptports
    - 2 Incrementalencoderinputs 24V, max. 100 kHz
    - 2 Fast Counter 24V, max. 100 kHz
    - 4 analog Inputs, non isolated 0 ... +10 V, 12 Bit

- 8 In- / Outputchannels, alternatively usable as
    - 8 digital Inputs 24V 7mA, non isolated, high active
    - 8 digital Outputs 24V 0.5 A, non isolated
    - 2 digital Outputs, PWM/PTO, max. 100 kHz
    - 2 analog Outputs, non isolated 0 ... +10 V, 12 Bit

CAN according to ISO/DIS 11898, isolated

Number of Channels	1
Output Differential Voltage	min. + 1.5 V, max. + 3 V
Input Differential Voltage recessive dominant	min - 1 V, max. + 0.4 V min. + 1 V, max. + 5 V
Input Offset Voltage (versus CAN-GND)	max. +/- 6 V
Input Differential Resistance	min. 20 kΩ, max.100 kΩ
Transmission Rate up to 15 m Cable Length up to 50 m Cable Length up to 150 m Cable Length up to 350 m Cable Length	max. 1 MBit max. 500 kBit max. 250 kBit max. 125 kBit
Number of Subscribers	max. 64
Connecting Cable up to 100 m Cable Length up to 350 m Cable Length	shielded, twisted 0.25 mm² 0.5 mm²
Recommended Cable Fixed Installation Flexible Installation	UNITRONIC® BUS CAN UNITRONIC® BUS FD P CAN Twisted Pair

PIN assignment CAN-Interface
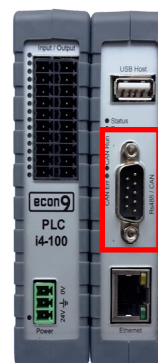
Pin	CAN 1/2
1	nc
2	CAN_L
3	CAN_GND
4	---
5	---
6	---
7	CAN_H
8	---
9	---

NOTE:
Termination of the CAN bus via a **120 Ω resistor** between CAN_L (pin 2) and CAN_H (Pin 7) must be installed in the Sub-D socket of the CAN connection cable.

Ethernet, isolated

Number of Channels	1, Twisted Pair (10/100BASE-T)
Transmission according to	IEEE/ANSI 802.3, ISO 8802-3, IEEE802.3u
Transmission Rate	10/100 Mbit/s
Cable Length	max. 100 m
Cable	shielded
Impedance	100 Ω
Plug	RJ45 (Western Plug)
LED – Status Display Yellow Green	Active Link

## PIN-Belegung Ethernet-Schnittstelle

Pin	Ethernet
1	TX+
2	TX-
3	RX+
4	GND
5	GND
6	RX-
7	GND
8	GND

RS485, non isolated

Number of Channels	1
Output Differential Voltage	min. +/- 1.5 V max. +/- 5 V
Input Differential Voltage	min. +/- 0.5 V max. +/- 5 V
Input Offset Voltage (versus GND)	max. - 6 V/+ 6 V
Output Drive Current Udiff = +/- 1.5 V)	max. +/- 55 mA
Transmission Rate	1200 ... 115200 Bd
Connecting Cable up to 0.14 mm² up to 0.25 mm²	shielded, min. 0.14 mm² max. 300 m max. 600 m
Termination	by bridging Pin 4 and 5 and Pin 8 and 9, see note

PIN assignment R485-Interface
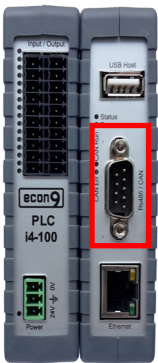
Pin	RS485
1	nc
2	---
3	---
4	Data - (B)
5	Termination -
6	GND
7	---
8	Data + (A)
9	Termination +

NOTE:
The termination of the RS485 interface has to be done on the both endpoints of the bus **by bridging** the pins 4 and 5 (Data -), and the pins 8 and 9 (Data +), in the Sub-D socket of the RS485 connection cable!

USB 2.0

Number of Channels	1 x Host (fullspeed)
USB 2.0	USB 2.0 compatible, connector Typ A
Cable Length	max. 5 m
Output Current	max. 0.5 A

PIN assignment USB-Interface

Pin	USB
1	+ 5V
2	Data -
3	Data +
4	GND

econ9 PLC i4-100

Power Supply

Logic supply Rated Value Permissible Range	24 V DC +20 % / -15% plus AC component with peak value of 5% of nominal voltage => 30 ... 19.2 V
Actuator supply Rated Value Permissible Range	24 V 30...19.2 V
Sensor supply Rated Value Permissible Range	24 V 30..19.2 V
Current Consumption from 24 V	≤ 1 A for base unit

PIN assignment Power Supply

Pin	Supply
1	+ 24 V
2	⏚
3	0 V

CPU, ARM cortex M4 Processor, memory

Clock Rate	120 MHz
Nand-Flash	256 MB
RAM	64 MB
SRAM	2 MB, battery buffered
µSD-Karte	max. 32 GB

Environmental conditions according to EN 61131-2

Temperature Operating Storage	5 ... + 55 °C - 25 ... + 70 °C
Humidity	10 ... 95 % non-condensing
Oscillations	5...8.4 Hz, const.Ampl. 1.75 mm 8.4...150 Hz, Acceleration. 0.5g
Shock	occasional peak values up to 15 g over 11 ms half sine wave
Elevation Operating Storage	up to 2000 m 0 … 3000 m

econ9 PLC i4-100

Real-time clock

Accuracy at 25° C at -10 ... +70° C	≤ +/- 1 s / Day ≤ + 1 s ... - 11 s / Day

Backup battery, Lithium - Cell, pluggable

Battery Type	Li 3V / 220mAh CR2032
Backup Time at 20 °C	nom. 5 Years
Recommendation	Battery Change after 2 Years
Battery Change	see User Manual

NOTE:
To avoid data loss while performing battery change, turn the device on for least 10 minutes prior to change over.

Mechanical Data

Housing	plastic module housing
Dimensions (B x H x T)	53.2 x 110 x 100 mm
Mounting Method	DIN RAIL 35 mm according DIN EN 60715
Compliance	according DIN 40050 / 7.80
Housing	IP 20
Resistive according to DIN 42115	Alcohol, diluted acid and Alkaline, household cleaner
Weight	aprox. 0.2 kg

Electromag. compatibility according to EU Directive 2004/108/EG:

Immunity for industrial environments in accordance with EN 61131-2 / EN 61000-6-2

Electrostatic discharge Contact Air	EN 61000-4-2 min. ± 4 kV min. ± 8 kV
Electromag. RF field ampl.mod. 80 MHz - 1 GHz 1.4 GHz - 2 GHz 2.0 GHz – 2.7 GHz	EN 61000-4-3 10 V/m 80% AM (1 kHz) 3 V/m 80% AM (1 kHz) 1 V/m 80% AM (1 kHz)
Fast transients DC network inputs / outputs Signal connections	EN 61000-4-4 ± 2 kV ± 1 kV
Surge unbalanced and balanced DC power inputs	EN 61000-4-5 ± 0.5 kV, measured at the AC input of the used AC / DC converter
High-frequency asymmetrical 0.15 - 80 MHz	EN 61000-4-6 10 V, 80% AM (1 kHz)

Emission standard for industrial areas according to EN 61131-2 / EN 61000-6-4

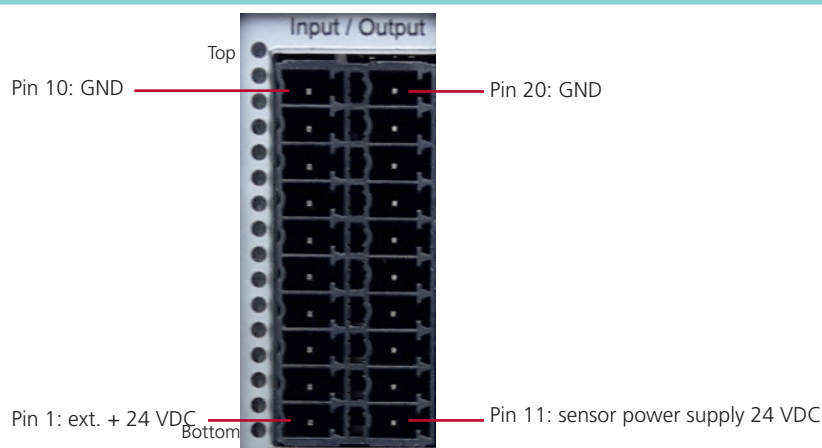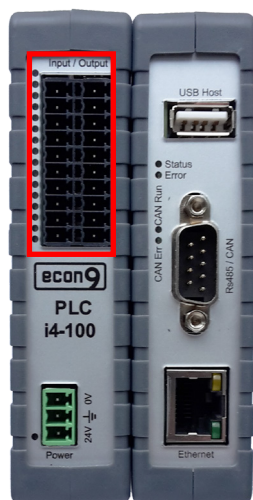| Radio interference 30 MHz - 1 GHz	IEC/CISPR 16-2-3 40 / 47 dB (µVm)

NOTE:
To keep the rules of EMC/CE, a correct and entire construction, according to User Manual, is neccessary.

The manufacturer assembling the system / machine, in which the controller is integrated, is responsible for the electromagnetic compatibility.

In order to improve the quality we reserve the rights to change the product.

Multifunctionale In- /Outputs

Input / Output

Top
Pin 10: GND
Pin 20: GND
Pin 1: ext. + 24 VDC
Bottom
Pin 11: sensor power supply 24 VDC

Caution:
Reverse voltage on sensor power supply may damage the device!!
Do not bridge Pin1 with Pin11!

					combination matrix In- / Outputchannels econ9 PLC i4-100					
Pin/ J1	dig. Input	dig. Output	analog Input 0...+10V; 12 Bit	analog Output 0...+10V; 12 Bit	Interrupt- input	PWM-Output function blocks: (FB1; FB2)	PTO-Output function blocks: (FB1; FB2)	Encoder- Input function blocks: (FB1; FB2)	Fast-Counter- Input function blocks: (FB1; FB2)	LED
2	I0	Q0				PWM0-FB1	PTO0-FB1			Bottom
3	I1	Q1				PWM1-FB1				
4	I2	Q2				PWM2-FB2	PTO1-FB2			
5	I3	Q3				PWM3-FB2				
6	I4	Q4								
7	I5	Q5								
8	I6	Q6		AO0						
9	I7	Q7		AO1						
12	I8				INT0					
13	I9				INT1					
14	I10							CH0A-FB1	Cnt0-FB1	
15	I11							CH0B-FB1		
16	I12		AI0					CH0Idx-FB1		
17	I13		AI1					CH1A-FB2	Cnt1-FB2	
18	I14		AI2					CH1B-FB2		
19	I15		AI3					CH1Idx-FB2		Top

Note:
PWM- / PTO-Outputs, Encoderinputs and Fast Counter-Inputs are grouped into functional blocks **FB1** and **FB2**. There is only **1 functionality per function block** possible according to pin assignment.

PWM0 und PWM2 may be used alone.
PWM1 may be used only in combination with PWM0.
PWM2 may be used only in combination with PWM3.

Digital Inputs / Special Function Inputs, non-isolated

Number of Channels Interruptports Incremental Encoder Inputs Timer- / Counter-Inputs Analog Inputs	8, usable as 2 2 2 4 (see below)
Supply Voltage Rated Value Permissible Range	24 V - 30 ... + 30 V
Input Current at Nominal Voltage (24 V)	6.3 mA
Input frequency at duty cycle 0.5	≤ 100 kHz
Delay Time Standard Inputs tLOW - HIGH tHIGH - LOW	2 µs 2 µs
Input Voltage LOW - Level HIGH - Level	≤ 5 V ≥ 15 V
Input Current LOW - Level HIGH - Level	≤ 1.5 mA ≥ 3 mA
Input Impedance	3.8 kΩ
Sensor Suppply (Output)	24 V DC, max. 200 mA
when using as Incremental enco-der Inputs	
Input signals	2-Phases-Rectangle moved about 90°, 1 Zero Impulse
Signal Evaluation	quadruple

Block Diagram of digital Inputs
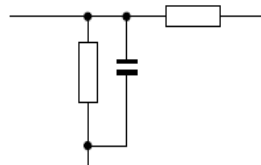
| Pin/J1	Input / ENC / IN
11	+24 V Sensor Power Supply (Output)
12	I8 / INT0
13	I9 / INT1
14	I10 / CH0A-FB1 / Cnt0-FB1
15	I11 / CH0B-FB1
16	I12 / CH0Idx-FB1
17	I13 / CH1A-FB2 / Cnt1-FB2
18	I14 / CH1B-FB2
19	I15 / CH1Idx-FB2
20	GND

Analog Inputs, non-isolated

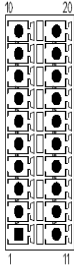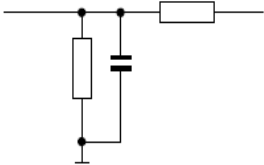|	
Number of Channels	4
Voltage Range	0 .. +10 V
AD-Change Principle Resolution Conversion Time limiting frequency	ADC successive approximation 12 Bit 7 µs 935 Hz
max. Input Area Voltage	0 .. +15 V
Input Impedance Voltage Range	90.8 kΩ
Offset Error (0-Point)	≤ + 30 mV
Gain Error	+/- 1%
Connection Cable length	shielded max. 10 m

Block Diagram of analog Inputs
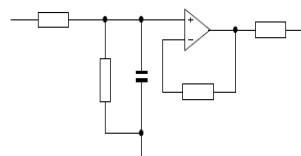
Pin/J1	AIN
11	+24 V Sensor Power Supply (Output)
16	AI0
17	AI1
18	AI2
19	AI3
20	GND

econ9 PLC i4-100

Digital In- / Outputs / Special Function Inputs, non-isolated	
Number of Channels	8
uses as digital Inputs	**8**
Input Voltage Permissible Range	24 V - 30 ... + 30 V
Input Current HIGH – Level	6.4 mA
Delay Time tLOW – HIGH tHIGH - LOW	1.5 ms 1.9 ms
Threshold ULOW – HIGH UHIGH - LOW	$\leq$ 5 V $\geq$ 15 V
Input Impedance	3.8 kΩ
used as digital Outputs	**see page 9**

Block Diagram of digital Inputs

Pin/J1	Input
1	ext. + 24 VDC
2	I0
3	I1
4	I2
5	I3
6	I4
7	I5
8	I6
9	I7
10	GND

Caution:
Reserve current at the outputs may damage the output stage!

Digital In- / Outputs / Special Function Inputs, non-isolated

Number of Channels	8
used as Digital-Eingänge	**see page 8**
used as digital Outputs	**4**
Load Voltage Vin Nominal Value Permissible Range	24 V 18 ... 30 V
Output Voltage HIGH – Level LOW – Level	min. V_{in} – 0.39 V max. 2 µA x R_{Last}
Short Circuit Protected	yes, thermal Overload Protection
Output Current	0.5 A DC
Parallel switching of Outputs	no
Utilization factor	100%
used as PWM/PTO Output	**2**
Output Current	0.5 A DC
Short Circuit Protected	yes, thermal Overload Protection
Switching Frequency standard Output resistive load inductive load	100 kHz 100 kHz
Simultaneous Factor	100%

Block Diagram of digital Outputs 0.5 A or of PWM/PTO Outputs
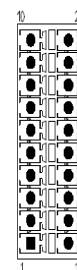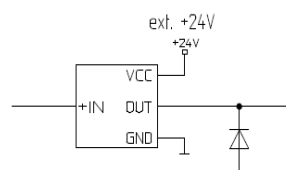
Pin/J1	Output
1	ext. + 24 VDC
2	Q0 / PWM0-FB1 / PTO0-FB1
3	Q1/ PWM1-FB1
4	Q2 / PWM2-FB2 / PTO1-FB2
5	Q3 / PWM3-FB2
6	
7	
8	
9	
10	GND

Note:
PWM- / PTO-Outputs, Encoderinputs and Fast Counter-Inputs are grouped into functional blocks **FB1** and **FB2**. There is only **1 functionality per function block** possible according to pin assignment.

PWM0 und PWM2 may be used alone.
PWM1 may be used only in combination with PWM0. PWM2 may be used only in combination with PWM3.

Digital In- / Outputs / Special Function Inputs, non-isolated

Number of Channels	8
used as Digital-Eingänge	**see page 8**
used as digital Outputs	**4**
Load Voltage Vin Nominal Value Permissible Range	24 V 18 ... 30 V
Output Voltage HIGH – Level LOW – Level	min. V_{in} – 0.07 V max. 5 µA x R_{Last}
Output Current	0.5 A DC
Parallel switching of Outputs	possible, max. 4 Outputs
Short Circuit Protected	yes, thermal Overload Protection
Switching Frequency standard Output resistive load inductive load	100 Hz 2 Hz (depends on inductivity)
Lamp load	max. 6 Watt
Utilization factor	100%

Block Diagram of digital Outputs 0.5 A
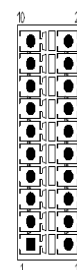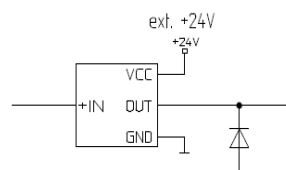
Pin/J1	Output
1	ext. + 24 VDC
2	
3	
4	
5	
6	Q4
7	Q5
8	Q6
9	Q7
10	GND

Caution:
Reserve current at the outputs may damage the output stage!

Analog Outputs, non-isolated

Number of Channels	2
Output Area Voltage Range	Voltage 0 ... +10 V
DA Change Principle Resolution Load Conversion Time max. Frequency	R2R 12 Bit max. 5 mA ≤ 100 µs aprox. 5 kHz
Offset Error (0-Point)	≤ +/- 30 mV
Gain Error	≤ +/- 0.5%
Connection Cable length	shielded max. 10 m

Block Diagram of analog Outputs
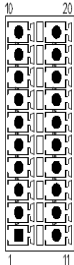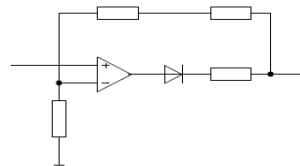
Pin/J1	AOUT
1	ext. + 24 VDC
8	AO0
9	AO1
10	GND

Wiring example

Digital In - / Outputs (here 8E/8A)

ext. +24V

+24V Sensor Power Supply
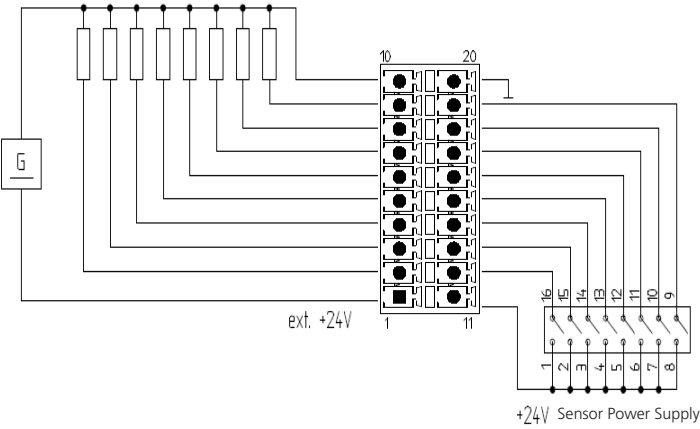
Caution:
Reseve voltage on sensor power supply may damage the device!! **Do not bridge Pin1 with Pin11!**

Caution:
Reserve current at the outputs may damage the output stage!