

ULAD 31 - User Guide

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1 ULAD 31 Converter Features

Technical Specifications of ULAD 31 :

Quantity	Value	Units
Supply voltage	5 to 12	VDC
Max. single unit supply current	100	mA
Max. supply current in power distribution mode	500	mA
Absolute max. analog input voltage	± 15	V
Number of analog inputs (continuous acquisition)	1	
Analog input multiplexer	(2 ch.)	(optional)
Sampling frequency	10	Hz
Basic input voltage range (gain $\times 1$)	± 10	V
Software selectable gain and range reduction	$\times 1, \times 2, \times 4, \dots, \times 64, \times 128$	
AD converter resolution	18 to 20	bit
Width of input software filter	from 1 to 64 samples	
Number of digital inputs/outputs	4 / 4	
Sample valve position/mark detection	Yes	
Communication interface	RS-485	
Protocol	uLan	
Communication baud rate	19200	Baud

2 Setup

ULAD 31 device can be connected to control/acquisition computer by USB cable or through uLan network. To connect ULAD 31 to computer by means of uLan network another ULAD 31, uLan to USB converter or uLan RS-485 card is required to interface uLan RS-485 link to the PC. In the case of direct USB connection, ULAD 31 is powered by computer over USB cable. If multiple ULAD 31 should be connected to one PC then they should be interconnected by uLan cable and only one device connected to the PC. Up to 3 more interconnected devices can be powered through that ULAD 31 device which is connected to the PC if power distributed mode is selected and cables for power distribution is used (typically white cables). If long distance or more devices are used then the power supply adapter has to be used to provide power for other devices. Device can be even switched to USB device disable mode to use USB connection only for power up. Independed power adapter over USB can be used to provide power supply for distant units.

2.1 Configuration switches

ULAD 31 is equipped by two switches. SW1 enables USB device interface. If disabled, computer does not see the device but device can be powered through USB. The SW2 select high current USB mode to receive enough power to distribute to other interconnected devices.

3 Control and Communication over uLan RS-485 Line

3.1 Accessible Variables Dictionary

3.1.1 Actual AD Converter Input Voltage Values

The ULAD converters provide single or multiple channels providing converted digital value for input analog signal. The channels are labeled CHA, CHB etc. The CHX label is used for any of the channels. As for ULAD31 there is only one continually sampled channel - channel CHA.

Name	R/W	Type	Function
CHA	R	f4	Actual value of A channel input
CHAi	R	s2 (/3)	Channel A as fixed value (unit 10^{-4})
ADCAI	R	s4	Raw A channel ADC value

Actual reported actual channel value is obtained as result of more scaling steps applied to the raw ADC output value:

- converter proceeds conversion according to a selected mode CHX_MODE, result is raw value ADCXI
- value is filtered by moving averaging filter of width CHX_FILT samples
- factory preset callibration constants (CHX_CM, CHX_CA) scales value resulting from previous steps such, that they correspond to voltage value (in Volt units) connected to the **ULAD 31** input (max. range ± 10.000 V).
- user can select user defined scaling by constants CHX_UM, CHX_UA. The default values of these constants are CHX_UM = 1 and CHX_UA = 0.

The steps are corresponding to the equation

$$CHX = CHX_UA + CHX_UM \cdot (CHX_CA + CHX_CM \cdot ADCX_{norm})$$

where $ADCX_{norm}$ is given as ratio of input voltage to the basic (jumper selected) input range

3.1.2 User Scaling and Offset for A and B Channels

Name	R/W	Type	Function
CHA_UM	R/W	f4	User selectable channel A multiplier
CHA_UA	R/W	f4	User selectable channel A additive offset

3.1.3 Channel A and B Voltage Calibration Scaling and Offset

Name	R/W	Type	Function
CHA_CM	R/W	f4	Channel A voltage calibration multiplier
CHA_CA	R/W	f4	Channel A voltage calibration additive offset

3.1.4 ADC input samples filter

Name	R/W	Type	Function
CHA_FILT	R/W	u2 <1,64>	Channel A averaging filter length in samples

3.1.5 Conversion mode of AD converters

Name	R/W	Type	Function
CHA_MODE	R/W	u2	ADC channel A mode

The next table describes possible MODE setting for base range ± 10 V

Gain	Mode value	Input voltage range
1×	0	± 10 V
2×	1	± 5 V
4×	2	± 2.5 V
8×	3	± 1.25 V
16×	4	± 625 mV
32×	5	± 300 mV
64×	6	± 150 mV
128×	7	± 75 mV

3.1.6 Digital Inputs Outputs

Name	R/W	Type	Function
AUXUAL	R/W	u2	Actual state on digital inputs and outputs and outputs preset value
AUX_DIR	R/W	u2	Controls selection of input/output function for given I/Ox terminal, 1- input, 0 - output
MARK_DADR	R/W	u2 <1,100>	The destination uLan address for MARK delivery
MARK_MASK	R/W	u2	Mask of changes producing MARK

ULAD 31 is populated with crew terminal connector. The four digital input/output signals (I/O1, I/O2, I/O3, I/O4) are connected to the connector contacts. Actual state of inputs and last set value of of outputs can be read through AUXUAL dictionary variable. This variable is used for setting of value of output signals as well. Bits corresponding to the inputs are ignored in such case. Read and written value is equal to logical or arithmetic sum of weights corresponding to the signals. The direction of each pin is controlled by MARK_MASK property. If the bit/weight for given signal is set/applied then corresponding I/O terminal is configured for input.

Signal	I/O	Weight
1	I/O	1
2	I/O	2
3	I/O	4
4	I/O	8

The mask enables to select signals which are monitored for changes. If change is detected, MARK is sent to the address defined through MARK_DADR variable. Low byte of MARK_MASK variable masks responses to the rising edges of signals, high byte (basic weights multiplied by 256) is used for monitoring of falling edges.

3.1.7 Miscellaneous device properties

Name	R/W	Type	Function
ERRCLR	E		Clear device error state

3.1.8 Configuration storage to non-volatile memory

Name	R/W	Type	Function
SAVECFG	E		Store actual selected configuration into EEPROM memory

Initial values of most of writable variables are setup according to the values stored EEPROM memory at **ULAD 31** power up. Different values can be written into dictionary and stored into EEPROM by SAVECFG command invocation.

4 Producer

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