

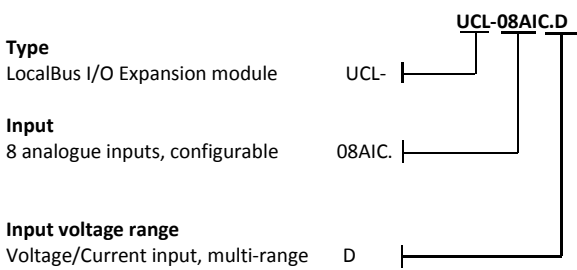
INTRODUCTION

8 channel configurable 16bit analogue input expansion module. Each channel can be configured individually to input type, range and digital filter functions.

Each input channel is individually isolated from each other and from other electronics (LocalBus etc.).

The analogue input I/O Expansion module can be used with all Brodersen RTUs that support I/O Local-Bus. That includes e.g. RTU32, RTU32S, RTU32R and other RTU32 Series products.

VERSION/ORDERING CODES



TECHNICAL DESCRIPTION

Input Channels Configuration

The type of input for each channel is changed from voltage mode to the current mode by connecting a wire jumper between “I” and “-” terminals.

The range of input for each channel is configured through web-based configurator and/or WorkSuite configuration. Details are provided in RTU User Guides. Filters for each channel are adjusted in Brodersen WorkSuite project for the actual application.

Analogue Input Ranges

Each analogue input can be configured individually for an input type and range. The ranges supported are:

- Disabled – input not used.
- 0 to +10V
- -10V to +10V
- 0 to +5V
- -5V to +5V
- 0 to 20mA
- -20mA to +20mA
- 4 to 20mA

Noise Filtering features

Digital Filter mode configuration for each channel:

There are 4 configurable digital filter modes:

- Filter mode 0: No IIR Filter
- Filter mode 1: Light IIR filter
- Filter mode 2: Medium IIR filter
- Filter mode 3: Strong IIR filter



Digital Filter modes description:

Three types of digital filters are implemented in this module, including power frequency rejection filter, FIR filter (Finite Impulse Response filter) and IIR filter (Infinite Impulse Response filter). The power frequency rejection filter is included and enabled in all modes and is not configurable or able to change by user. However, an IIR/FIR filter could be deployed for each channel. There are 4 varieties for filter mode (based on IIR filter), which could be selected or changed by user via configurator, as the following descriptions:

- Filter mode 0: No Filter (Disable IIR Filter)

In this mode, the IIR low-pass filter is disabled. This mode, however, deploys a light version of FIR low-pass filter. This mode is suitable for low-noise environments with shielded cables. Also, this mode is preferred for applications that require lower response time for data changing. In this mode, typical response time for full scale change is about 60msec and maximum response time in worse case is less than 90msec.

- Filter mode 1: Light Filter

This mode deploys a light IIR low-pass filter. This mode is also useful for low-noise environments with shielded cables. However, the noise removing characteristic for this mode is more than mode 0. Moreover, the response time of this mode is a little bit more than mode 0 (but the difference is not considerable). Typical response time for full scale change in this mode is about 60msec and maximum response time in worse case is less than 120msec.

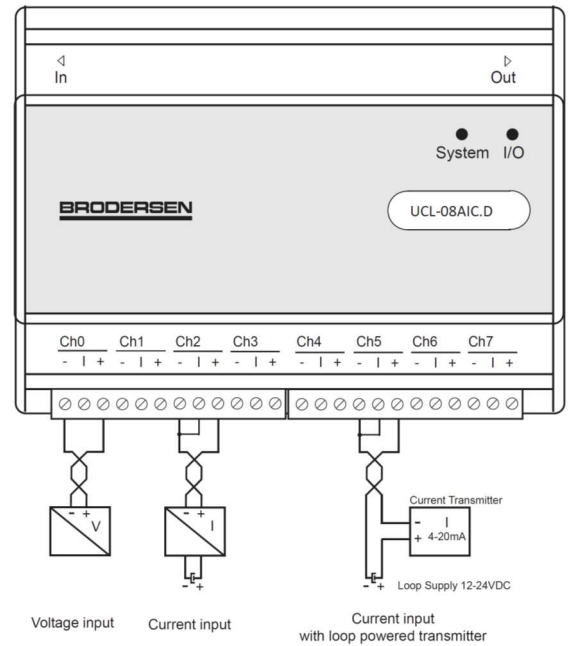
- Filter mode 2: Medium Filter (Default setting)

In this mode, a medium IIR low-pass filter is deployed. This mode is good for medium noisy environments. In this mode, the noises are removed more than the previous modes. Instead, the response time is also increased a little. In this mode, typical response time for full scale change is about 90msec and maximum response time in worse case is less than 500msec.

- Filter mode 3: Strong Filter

In this mode, a strong IIR low-pass filter is used. This mode is suitable for very noisy environments. In this mode, noises are removed dramatically. Typical response time for full scale change in this mode is about 150msec. Although the maximum response time is increased in this mode instead of the previous modes, it is still remained less than 1 sec in worse case for full scale change.

Wiring Diagram



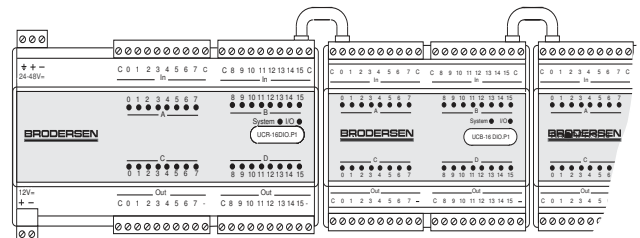
LocalBus connections

The analogue input I/O Expansion module is connected to the intelligent module and additional expansion modules using the local bus 8-pole RJ45 connectors on the left and right top side of the module. Technical details of the LocalBus can be ordered from your module supplier. A range of appropriate cables for adding expansion modules is available. Length of local bus cable is max. 300cm.

I/O Expansion general

The basic I/O fit of the Brodersen RTU Series can be expanded by attaching the UCL I/O Expansion modules. Number of modules supported by the RTUs varies from type to type. But in general up to 1000 I/Os are supported by the RTUs.

Example: RTU with expansion modules



In the event that the current consumption of the expansion modules exceeds the capability of the power supply, an additional power supply must be inserted.

**TECHNICAL DATA**

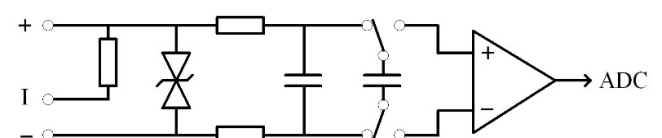
Inputs:	8 differential configurable analogue inputs, channel to channel isolated
Input ranges:	
- Voltage mode:	0 to 10V, 0 to 5V, -5V to +5V, -10V to +10V
- Current mode:	0 to 20mA, -20mA to +20mA, 4mA to 20mA
Input impedance:	
- Voltage mode:	More than 1M Ω
- Current mode:	125 Ohm \pm 0.1%
Effective resolution:	16 bit
ADC resolution:	24 bit
Update time:	30ms (for all 8 channels)
Accuracy (at 25°C):	\pm 0.1%
Linearity:	$> \pm 0.001\%$
Temperature Stability:	$> \pm 25\text{ppm}/^\circ\text{C}$ (typical)
Common mode voltage:	Max. $\pm 80\text{V DC}$
CMRR:	Min. 80dB
Isolation:	
- Input to electronics:	At least 350V
- Channel to channel:	At least 350V
Power Frequency noise rejection:	
- Default:	50Hz
- Option:	60Hz (set by manufacturer)
Digital Low-pass filter:	Yes (Configurable)
Ambient Temperature range:	
- Operating:	-20°C to +75°C
- Storage:	-40°C to +85°C
Absolute maximum ratings*:	
- Voltage:	$\pm 40\text{V DC}$
- Current:	$\pm 40\text{mA}$
Power Supply:	12VDC – powered via the Local-Bus interface by the RTU or additional power supply
Current consumption:	
- Through Local-Bus (12V):	Max. 75mA

* Input signals exceeding the absolute maximum values **MAY CAUSE PERMANENT DAMAGE** to the module.

EMC:	IEC 61000-6-2, IEC 61000-6-4
Safety Requirements:	IEC 60950-1
Climatic:	
- Damp Heat:	IEC 60068-2-30
- Damp Heat Steady:	IEC 60086-2-3
- Dry Heat:	IEC 60086-2-2
Mechanical:	
- Vibration:	IEC 60255-21-1
- Shock:	IEC 60068-2-27
- Shock and Bump Test:	IEC 60255-21-2
Protection:	IP20
Housing:	Aluminum housing with plastic end caps, according to DIN 43880
Mounting:	35 mm DIN-rail, EN 50022
Input terminals:	
- Number of Terminals:	24 (2x12) input terminals, 3 terminals for each channels
- Wiring Connection:	Max. 1 mm ² wire
Indicators:	One LED for System status and one LED for I/O status.
Dimensions (HxWxD):	
- Without connector:	80x108x62mm
- Plus connector:	90x108x62mm
Weight:	0.45Kg

CIRCUIT CONFIGURATION**Configuration of each input channel:**

- Input type (V/I) selection: By connecting a wire jumper between terminals "I" and "-" of each channel
- Input range selection: Through web configuration
- Digital filter configuring: Through web configuration

Input block diagram



Data Format and Ranges

Ideal output digital values:

Input Range	Underflow	0000h	7FFFh	FFFFh	Overflow
0 to +10V	< -1V	0V	+5V	+10V	> +11V
-10V to +10V	< -11V	-10V	0V	+10V	> +11V
0 to +5V	< -0.5V	0V	+2.5V	+5V	> +5.5V
-5V to +5V	< -5.5V	-5V	0V	+5V	> +5.5V
0 to 20mA	< -2mA	0mA	+10mA	+20mA	> +22mA
-20mA to +20mA	< -22mA	-20mA	0mA	+20mA	> +22mA
4 to 20mA	< +2mA	+4mA	+12mA	+20mA	> +22mA

Statuses (Status byte of each channel)

The following statuses and diagnostics could be generated by the module through the status byte of each channel:

Status byte (for each channel)	Description
Bit 0	Data is under range (Underflow)
Bit 1	Data is over range (Overflow)
Bit 2	Data is invalid
Bit 3	Channel is disabled
Bit 4-7	Reserved

- **Data is under range (Underflow):** if the input signal goes below than 10% of minimum of selected input range, then bit 0 of the status byte is set. In 4-20mA mode, this flag also means wire-break or open-circuit.

- **Data is over range (Overflow):** if the input signal goes over than 10% of maximum of selected input range, then bit 1 of the status byte is set.

- **Data is invalid:** if the generated data is invalid, due to any reason, then bit 2 of the status byte is set.

- **Channel is disabled:** if the channel is disabled, then bit 3 of the status byte is set.

Note: when the status byte of a channel is 0, it means that this channel is active and working properly, the input signal is in the selected range and the data related to this channel is valid.

LED Status indication

Some of the statuses are illustrated by two LEDs which are located on the top of the module. These statuses are described in the following:

Status	System LED	I/O LED
Normal working	ON	ON
Module is not activated	ON	OFF
Configuration Error	ON	Flashing
Module hardware Error	Flashing / OFF	ON

- **Module is not activated:** It means that module have not detected any communication activity on the Local-Bus.

- **Configuration Error:** It means that configuration mismatch – current I/O configuration do not match pre-configuration setup. Cause could be I/O module failure or modules connection not according to pre-stored I/O configuration. The I/O modules that is available to scan will be maintained but with slower update time. Normal I/O scan will return when the I/O configuration again is correct.

- **Module Hardware Error:** It means that some internal hardware problems is detected. So, the module may malfunction or the data generated by the module may be wrong.

NOTE:

This data sheet is subject to change without notice!