

DM20A

Module with 10 Digital input
and 10 High Side output

Data Sheet

Doc: 40403 v1.7



BRODERSEN
simplifying systems



INTRODUCTION

Before using the LB2 Series I/O Modules, read the LB2 User manual.

The Brodersen LB2 modules can be used with the RTU32N and RTU32M series products. The I/O modules are in two parts, a bottom part containing the backplane bus, and a top part containing the I/O board and logic. All LB2 I/O modules are hot pluggable and equipped with a 200 MHz processor to handle filtering, de-bouncing and logic processing of I/O.

Module firmware updates are managed by the RTU using Brodersen Worksuite. Use only genuine Brodersen bus cables for connection to Brodersen RTUs and extension of I/O module blocks. The LB2 connection cables are made to handle the power and shielding requirements of the LB2 bus communications. The maximum overall length of complete system is 30m. Each I/O module & Power supply module is calculated as 2cm. The cables are as their length indicates, e.g. UCC-610/100 cable is 100 cm.

The maximum number of I/O modules on one LB2 Bus is 60.

Cable ordering codes:

| | |
|-------------|-----------------|
| UCC-610/25 | 25cm LB2 Cable |
| UCC-610/50 | 50cm LB2 Cable |
| UCC-610/100 | 100cm LB2 Cable |
| UCC-610/200 | 200cm LB2 Cable |

POWER SUPPLY MODULE BACKPLANE PART

| Description | Part Nr. |
|-------------------------------|----------|
| BUS module for IOs, Start | BB21A |
| BUS module for IOs, Middle | BB21B |
| BUS module for IOs, Extension | BB21C |

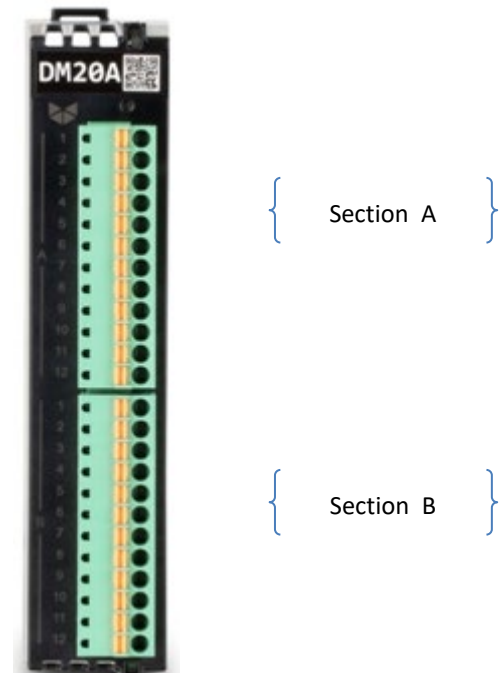
VERSIONS / ORDERING CODES

Hardware basic version

Order code: **DM20A**

I/O INTERFACE

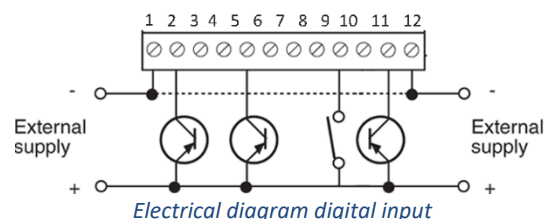
2x 12 way 3.5mm pluggable spring clamp connectors. The maximum conductor cross sectional area is AWG 16 (1.3mm²). The wire conductor type should be Copper and it must meet the minimum temperature criteria of 105°C.



TERMINAL LAYOUT

Connector top section A:

| | |
|------------|----------------------|
| Pin 1: | Common section A |
| Pin 2...11 | Digital input 0 to 9 |
| Pin 12: | Common section A |

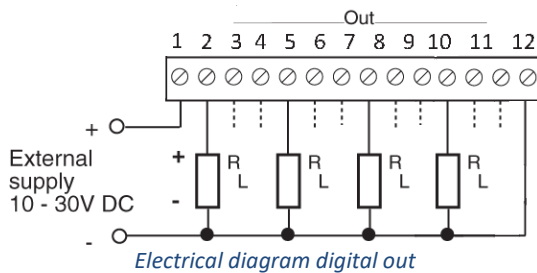


**Connector bottom section B:**

Output terminals layout are as follows:

Connector Bottom:

Pin 1: Vin + Section B
Pin 2...11 Digital output 0...9 section B.
Pin 12: Vin – Section B

**ELECTRICAL****Power consumption (from backplane bus):**

- Current consumption: 25mA (typ.) @ 12V
- Power consumption: 300mW (typ.)

DIGITAL INPUT

10 bipolar optical isolated digital inputs for 12...24 VDC is provided. Arranged in one section of 10 inputs, with 2 common terminals. Section A

Input 0... 9 provides counters, with up to 100 Hz counting frequency @ 50% duty cycle.

A user programmable debounce filter, in 1ms units, is provided for each digital input, to filter out noise or mechanical relay bounce. This could also be used in combination with software counters, in case a low frequency mechanical contact is used for counters.

Digital input voltage:

Input 0...9 Activated 10-30 VDC
Input 0...9 Deactivated Max 3 VDC

Digital input current:

Input 0...7 typical 2.5 mA @ 12 V
Input 0...7 typical 5 mA @ 24 V
Input 8...9 typical 4 mA @ 12 V
Input 8...9 typical 8 mA @ 24 V

Input delay:

100 µs typical.

Isolation:

2 kV input to electronics, 1 minute.

Separated/Safe Extra Low Voltage (SELV) limits:

VAC (RMS) 30V
VAC (Peak) 42.4V
VDC 60V

Note: The SELV limits relies on input supply and all connected voltages.

DIGITAL OUTPUT

10 smart high side switch, optical isolated, digital outputs for 10...30 VDC are provided. Arranged in one section of 10 outputs. The section is channel to channel isolated and isolated from electronics. The outputs are protected against Short-circuit, overload, over temperature, over voltage, wrong connections.

External feed voltage:

10 – 30 VDC

Output current:

Max 0.5A, max 2A per section (10 outputs)

Output delay:

100 µs typical

On resistance:

160mΩ (typical)

Output leakage current:

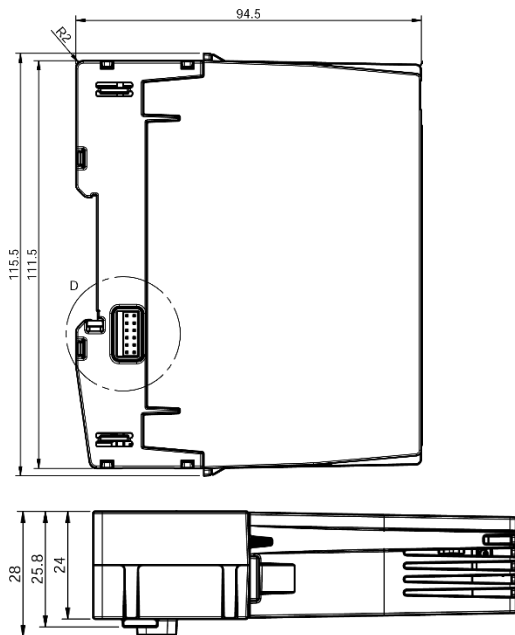
7µA (max. in off state)

Protections:

Short-circuit, overload, over temperature, over voltage, wrong connections.

Isolation:

2kV V input to electronics, 1 minute.

**MECHANICAL**

| | |
|----------|-----------|
| Mounting | DIN 35 |
| Width | 24 mm |
| Height | 111.5 mm |
| Depth | 94.5 mm |
| Weight | 102 grams |

ENVIRONMENTAL CONDITIONS

| | |
|-------------------------------------|----------------|
| Ambient operating temperature range | -25°C to +75°C |
| Ambient operating temperature range | -40°C to +85°C |
| Marked degree of protection | IP20 |
| Humidity | 0...99.8% |
| Ventilation Restrictions | No |
| Pollution degree | 2 |

STANDARDS**EMC:**

- **IEC 61000-6-2:** EMC - Immunity standard for industrial environments
- **IEC 61000-6-4:** EMC - Emission standard for industrial environments
- **IEC 50121-4:** Railway applications - EMC - Emission and immunity of the signalling and telecommunications apparatus

Safety:

- **IEC 60950-1:** Safety requirements for Information technology equipment
- **IEC 61010-1:** Safety requirements for electrical equipment for measurement, control, and laboratory use

Environmental:

- **IEC 60068-2-1:** Environmental testing - Cold
- **IEC 60068-2-2:** Environmental testing - Dry heat
- **IEC 60068-2-30:** Environmental testing - Damp heat, cyclic (12 h + 12 h cycle)
- **IEC 60068-2-78:** Environmental testing - Damp heat, steady state
- **IEC 60068-2-6:** Environmental testing - Vibration (sinusoidal)
- **IEC 60068-2-27:** Environmental testing - Shock




MODULE LED STATUS

A dual color (red/yellow) LED is provided on the module to indicate the module status. Yellow indicates the module mode / state and red indicates module error or warnings (according to the table below):

| Status | Yellow | Red |
|---|--------------------|-----------------|
| Normal operating | ON | OFF |
| Communication timeout | Blinking | OFF |
| Module is not configured / wrong configuration | Single flashing | OFF |
| Module is configured but is in stopped mode (ready for being started) | Double flashing | OFF |
| Module is in firmware update mode | Quadruple flashing | OFF |
| Communication error | N/A | Blinking |
| Communication warning | N/A | Single flashing |
| Corrupted module info in EEPROM | N/A | Flickering |
| Hardware fatal error | OFF | ON |
| No module power | OFF | OFF |

Each pattern / color will operate in 2 sec duty cycles. When the red LED is inactive (off), only the 2 sec yellow duty cycle will operate (yellow is always active). When the red LED is active, a switch between 2 sec yellow, and 2 sec red patterns will occur.

SAFETY PRECAUTIONS

- Follow the national safety regulation (IEC 61010-1) 
- Only skilled person is allowed to install and operate the modules.
- Modules can only be mounted in an end-use enclosure which provides protection against fire, electrical and mechanical hazards.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

SOE in LB2 I/O DI series:

The SOE (Sequence Of Event) function is used for storing digital inputs events in a firmware FIFO with 1ms time stamp resolution and status information.

The features of the SOE Driver are:

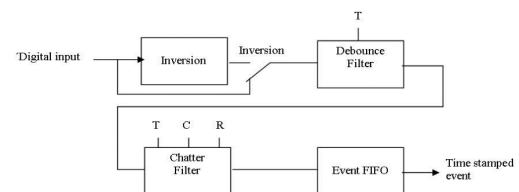
- Buffering of digital input events in the firmware independent of the PLC runtime application cycle.
- Available for digital inputs on a RTU32M node
- Support debounce and chattering filter functions.
- Each SOE I/O are buffered with four types of information:
 - The DI value (BOOLEAN)
 - Full time stamp (LINT)
 - Blocked status if chattering filters are active (BOOLEAN)
 - Buffer overflow status (BOOLEAN)

SOE buffered data sets in the FIFO buffer are read from the PLC application and each buffered data sets will only be available in one PLC cycle.

Filter functions for SOE

The SOE filter is a multi-stage processing filter that handles the physical value before presenting it as a SOE value. The processing of the value is individually adjustable for each SOE.

Filter block diagram

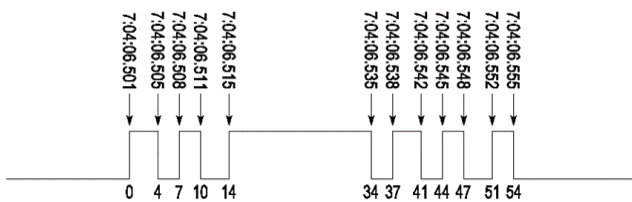


The multistage include the following functions/level before the data sets are sent to the event FIFO:

- Inversion of input value. Used for inverting the input value transmitted to the next level.
- Debounce filter. Debouncing can be used on the first 200 inputs and prevents the processing of fast state changes of the inputs, like for example, those caused by contact bouncing. Signal changes are ignored depending on the present time.
 - Chatter filter. Chatter filter can be used for the first 200 inputs. It limits the number of events to a configurable value during a configurable period. This should prevent multiple event registrations for the same input, e.g., disturbance influences due to slowly changing inputs (because the hysteresis is possibly set to small).

**Debounce filter function for SOE**

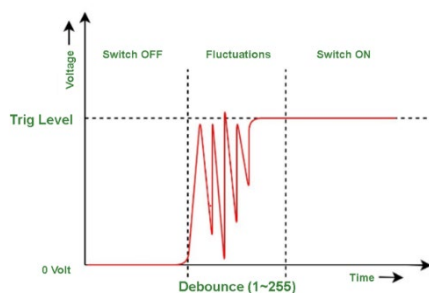
An adjustable debounce filter is provided for each digital input. On detection of an input change, a timer with the filter time 'T' is started for the changed input and forwarding of the information is suppressed. If the input changes back to the original state, before the timer has expired, the timer is cancelled. If the input doesn't change back, and the timer expires, the new input state is forwarded. The time stamp forwarded is the time when the actual input change was detected.



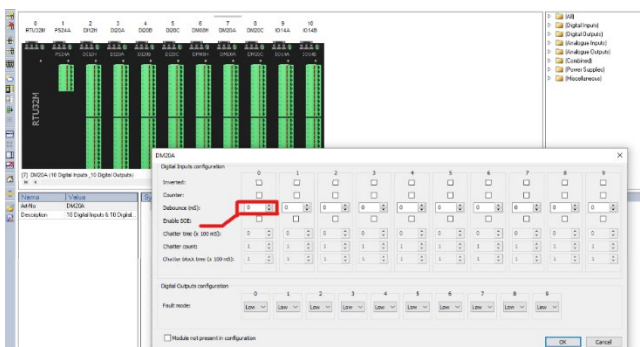
The value range for the filter time is 0 to 32767 milliseconds; the value 0 deactivated the debounce filter.

Figure show example of how SOE events are handled by the filter at T=10ms:

- Stable ON Event at 7:04:06.515 is forwarded at 7:04:06.525, with time stamp 7:04:06.515
- Stable OFF Event at 7:04:06.555 is forwarded at 7:04:06.565, with time stamp 7:04:06.555
- If filter time T=25 milliseconds, no event is recorded with these settings.

**Note:**

- The default value for debounce filtering is '0'. To activate it, you need to ensure a stable source voltage. If you have a mechanical interface or unstable input voltage, it is advisable to increase this value.

**Chatter filter function for SOE**

An adjustable chatter filter is provided for each digital input. A digital input is disabled if the number of state changes, encountered during a defined time interval, is excessively high. While the chatter filter is ON, all state transitions are ignored. While it is OFF, state transitions are gated through without further delay. Events are reported whenever the chatter filter state changes from OFF to ON, or from ON to OFF. Three parameters are used to adjust the filter and is individual adjustable for each input.

- **Chatter time [T]:**
The chatter time 'T' defines the minimum time a state must be stable in order not to increment the Chatter times counter when state change occur. However, every time a state is stable longer than the filter time, the Chatter times counter is reset. The filter time is configurable from 0.1 to 6553.5 sec, in units of 100 milliseconds. If set to 0 the chatter filter is disabled.
- **Chatter count (changes) [C]:**
The maximum allowable numbers of consecutive state transitions 'C', that can occur with state width less than the filter time, without turning the chatter filter ON. If the number is exceeded, the chatter filter will turn ON, and any further transitions will be ignored for the duration of the "lock-out" period. The maximum number of state transitions is configurable from 1 to 255 changes.
- **Chatter block time [R]:**
The chatter block time 'R' is defined as the time during which the chatter filter is ON (if triggered), before turned OFF again. It is programmable from 0.1 to 6553.5 sec, in units of 100 milliseconds.



Chatter function diagram:

