# Data sheet

## SM 238C, Digital In-/Output, Counter, Analog In-/Output (238-2BC00)

### Technical data

| Order no. | 238-2BC00 |
|---|---|
| Type | SM 238C, Digital In-/Output, Counter, Analog In-/Output |
| **General information** | |
| Note | - |
| Features | 16 (12) digital inputs<br>0 (4) digital outputs<br>max. 3 counter<br>4 analog inputs<br>2 analog outputs |
| **Current consumption/power loss** | |
| Current consumption from backplane bus | 280 mA |
| Power loss | 5.5 W |
| **Technical data digital inputs** | |
| Number of inputs | 16 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | - |
| Current consumption from load voltage L+ (without load) | - |
| Rated value | DC 20.4...28.8 V |
| Input voltage for signal "0" | DC 0...5 V |
| Input voltage for signal "1" | DC 15...28.8 V |
| Input voltage hysteresis | - |
| Frequency range | - |
| Input resistance | - |
| Input current for signal "1" | 7 mA |
| Connection of Two-Wire-BEROs possible | ✔ |
| Max. permissible BERO quiescent current | 1.5 mA |
| Input delay of "0" to "1" | 3 ms |
| Input delay of "1" to "0" | 3 ms |
| Number of simultaneously utilizable inputs horizontal configuration | 16 |
| Number of simultaneously utilizable inputs vertical configuration | 16 |
| Input characteristic curve | IEC 61131-2, type 1 |
| Initial data size | 16 Byte |
| **Technical data digital outputs** | |
| Number of outputs | 4 |
| Cable length, shielded | 1000 m |
| Cable length, unshielded | 600 m |
| Rated load voltage | DC 20.4...28.8 V |
| Reverse polarity protection of rated load voltage | - |
| Current consumption from load voltage L+ (without load) | 20 mA |
| Total current per group, horizontal configuration, 40°C | 4 A |



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| | |
|---|---|
| Total current per group, horizontal configuration, 60°C | 2 A |
| Total current per group, vertical configuration | 4 A |
| Output voltage signal "1" at min. current | L+ (-125 mV) |
| Output voltage signal "1" at max. current | L+ (-0.8 V) |
| Output current at signal "1", rated value | 1 A |
| Output delay of "0" to "1" | 150 µs |
| Output delay of "1" to "0" | 100 µs |
| Minimum load current | - |
| Lamp load | 5 W |
| Parallel switching of outputs for redundant control of a load | not possible |
| Parallel switching of outputs for increased power | not possible |
| Actuation of digital input | ✓ |
| Switching frequency with resistive load | max. 1000 Hz |
| Switching frequency with inductive load | max. 0.5 Hz |
| Switching frequency on lamp load | max. 10 Hz |
| Internal limitation of inductive shut-off voltage | L+ (-52 V) |
| Short-circuit protection of output | yes, electronic |
| Trigger level | 1.5 A |
| Number of operating cycle of relay outputs | - |
| Switching capacity of contacts | - |
| Output data size | 16 Byte |

## Technical data analog inputs

| | |
|---|---|
| Number of inputs | 4 |
| Cable length, shielded | 200 m |
| Rated load voltage | DC 24 V |
| Reverse polarity protection of rated load voltage | ✓ |
| Current consumption from load voltage L+ (without load) | 70 mA |
| Voltage inputs | ✓ |
| Min. input resistance (voltage range) | 120 kOhm |
| Input voltage ranges | +1 V ... +5 V<br>0 V ... +10 V<br>-10 V ... +10 V<br>-400 mV ... +400 mV<br>-4 V ... +4 V |
| Operational limit of voltage ranges | +/-0.3% ... +/-0.7% |
| Operational limit of voltage ranges with SFU | - |
| Basic error limit voltage ranges with SFU | +/-0.2% ... +/-0.5% |
| Basic error limit voltage ranges with SFU | - |
| Destruction limit current | - |
| Current inputs | ✓ |
| Max. input resistance (current range) | 90 Ohm |
| Input current ranges | +4 mA ... +20 mA<br>0 mA ... +20 mA<br>-20 mA ... +20 mA |
| Operational limit of current ranges | +/-0.3% ... +/-0.8% |
| Operational limit of current ranges with SFU | - |
| Basic error limit current ranges | +/-0.2% ... +/-0.5% |
| Radical error limit current ranges with SFU | - |
| Destruction limit current inputs (electrical current) | - |
| Destruction limit current inputs (voltage) | - |

| | |
|---|---|
| Resistance inputs | ✓ |
| Resistance ranges | 0 ... 600 Ohm<br>0 ... 3000 Ohm |
| Operational limit of resistor ranges | +/-0.4% |
| Operational limit of resistor ranges with SFU | - |
| Basic error limit | +/-0.2% |
| Basic error limit with SFU | - |
| Destruction limit resistance inputs | - |
| Resistance thermometer inputs | ✓ |
| Resistance thermometer ranges | Pt100<br>Pt1000<br>Ni100<br>Ni1000 |
| Operational limit of resistance thermometer ranges | +/-0.4% ... +/-1.0% |
| Operational limit of resistance thermometer ranges with SFU | - |
| Basic error limit thermoresistor ranges | +/-0.2% ... +/-0.5% |
| Basic error limit thermoresistor ranges with SFU | - |
| Destruction limit resistance thermometer inputs | - |
| Thermocouple inputs | - |
| Thermocouple ranges | - |
| Operational limit of thermocouple ranges | - |
| Operational limit of thermocouple ranges with SFU | - |
| Basic error limit thermoelement ranges | - |
| Basic error limit thermoresistor ranges with SFU | - |
| Destruction limit thermocouple inputs | - |
| Programmable temperature compensation | - |
| External temperature compensation | - |
| Internal temperature compensation | - |
| Internal temperature compensation | - |
| Technical unit of temperature measurement | - |
| Resolution in bit | 16 |
| Measurement principle | Sigma-Delta |
| Basic conversion time | 7 ms - 272 ms |
| Noise suppression for frequency | 50 Hz and 60 Hz |
| Initial data size | 8 Byte |

## Technical data analog outputs

| | |
|---|---|
| Number of outputs | 2 |
| Cable length, shielded | 200 m |
| Rated load voltage | DC 24 V |
| Reverse polarity protection of rated load voltage | ✓ |
| Current consumption from load voltage L+ (without load) | 70 mA |
| Voltage output short-circuit protection | ✓ |
| Voltage outputs | ✓ |
| Min. load resistance (voltage range) | 1 kOhm |
| Max. capacitive load (current range) | 1 µF |
| Max. inductive load (current range) | 30 mA |
| Output voltage ranges | -10 V ... +10 V<br>+1 V ... +5 V<br>0 V ... +10 V |

| | |
|---|---|
| Operational limit of voltage ranges | +/-0.4% ... +/-0.8% |
| Basic error limit voltage ranges with SFU | +/-0.2% ... +/-0.4% |
| Destruction limit against external applied voltage | - |
| Current outputs | ✔ |
| Max. in load resistance (current range) | 500 Ohm |
| Max. inductive load (current range) | 10 mH |
| Max. inductive load (current range) | 13 V |
| Output current ranges | -20 mA ... +20 mA<br>0 mA ... +20 mA<br>0 mA ... +20 mA |
| Operational limit of current ranges | +/-0.3% ... +/-0.8% |
| Radical error limit current ranges with SFU | +/-0.2% ... +/-0.5% |
| | - |
| Settling time for ohmic load | 0.3 ms |
| Settling time for capacitive load | 1 ms |
| Settling time for inductive load | 0.5 ms |
| Resolution in bit | 12 |
| Conversion time | 1.50 ms |
| Substitute value can be applied | yes |
| Output data size | 4 Byte |

## Status information, alarms, diagnostics

| | |
|---|---|
| Status display | yes |
| Interrupts | yes |
| Process alarm | yes, parameterizable |
| Diagnostic interrupt | yes, parameterizable |
| Diagnostic functions | yes |
| Diagnostics information read-out | possible |
| Supply voltage display | green LED per group |
| Group error display | red SF LED |
| Channel error display | none |

## Isolation

| | |
|---|---|
| Between channels | - |
| Between channels of groups to | - |
| Between channels and backplane bus | ✔ |
| Between channels and power supply | ✔ |
| Max. potential difference between circuits | - |
| Max. potential difference between inputs (Ucm) | DC 4 V |
| Max. potential difference between Mana and Mintern (Uiso) | - |
| Max. potential difference between inputs and Mana (Ucm) | - |
| Max. potential difference between inputs and Mintern (Uiso) | DC 75 V/ AC 60 V |
| Max. potential difference between Mintern and outputs | - |
| Insulation tested with | DC 500 V |

## Datasizes

| | |
|---|---|
| Input bytes | 8 + 16 |
| Output bytes | 4 + 16 |
| Parameter bytes | 18 + 71 |
| Diagnostic bytes | 12 + 12 |

## Housing

| | |
|---|---|
| Material | PPE / PA 6.6 |
| Mounting | Profile rail 35 mm |

## Mechanical data

| | |
|---|---|
| Dimensions (WxHxD) | 50.8 mm x 76 mm x 88 mm |
| Weight | 150 g |

## Environmental conditions

| | |
|---|---|
| Operating temperature | 0 °C to 60 °C |
| Storage temperature | -25 °C to 70 °C |

## Certifications

| | |
|---|---|
| UL508 certification | yes |



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