

Data sheet

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

Technical data

Order no.	238-2BC00
Туре	SM 238C, Digital In-/Output, Counter, Analog In-/Output
Cananal information	
General information	
Note Features	16 (12) digital inputs 0 (4) digital outputs max. 3 counter 4 analog inputs 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 20.428.8 V
Input voltage for signal "0"	DC 05 V
Input voltage for signal "1"	DC 1528.8 V
Input voltage hysteresis	-
Frequency range	-
Input resistance	-
Input current for signal "1"	7 mA
Connection of Two-Wire-BEROs possible	yes
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 20.428.8 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



Total current per group, horizontal configuration, 60°C	2 A A YASKAWA COMPANY
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	yes
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	yes
Current consumption from load voltage L+ (without load)	70 mA
Voltage inputs	yes
Min. input resistance (voltage range)	120 kOhm
Input voltage ranges	+1 V +5 V 0 V +10 V -10 V +10 V -400 mV +400 mV -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 voltage	max. 15V
Current inputs	yes
Max. input resistance (current range)	90 Ohm
Input current ranges	+4 mA +20 mA 0 mA +20 mA -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)	max. 50mA
Destruction limit current inputs (voltage)	max. 15V
Resistance inputs	yes



Operational limit of resistor ranges with SPU	Resistance ranges	0 600 OhmA YASKAWA COMPANY 0 3000 Ohm
Basic error limit 4-6.2%	Operational limit of resistor ranges	+/-0.4%
Basic error limit with SFU Destruction limit resistance inpruse Resistance thermometer inputs Resistance thermometer ranges Resistance thermometer ranges Resistance thermometer ranges Resistance thermometer ranges PHOO NITION INTO NITION I	Operational limit of resistor ranges with SFU	-
Destruction limit resistance inputs Resistance thermometer inputs Per Pti00 Phi000 Resistance thermometer ranges Pti00 Phi000 Ni1000 Ni10000 Ni10000 Ni10000 Ni10000 Ni10000 Ni10000 Ni10000 Ni10000 Ni100000 Ni10000 Ni100000 Ni10000 Ni100000 Ni1	Basic error limit	+/-0.2%
Resistance thermometer injusts Resistance thermometer ranges Pritod Pr	Basic error limit with SFU	-
Resistance thermometer ranges PH000 N1000 N10000 N1000 N10000 N1000 N10000 N10000 N10000 N10000 N1000 N10000 N10000 N10000 N10000 N10000 N10000	Destruction limit resistance inputs	max. 15V
Pricoon Pric	Resistance thermometer inputs	yes
Departmental limit of resistance thermometer ranges with SFU	Resistance thermometer ranges	Pt1000 Ni100
Basic error limit thermoresistor ranges with SFU - Destruction limit resistance thermometer inputs max. 15V Thermocouple inputs - Thermocouple ranges - Operational limit of thermocouple ranges - Operational limit of thermocouple ranges with SFU - Basic error limit thermoresistor ranges with SFU - Basic error limit thermoresistor ranges with SFU - Destruction limit thermocouple inputs - Programmable temperature compensation - External temperature compensation - Internal temperature compensation - Temperature error internal temperature measurement °C 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	Operational limit of resistance thermometer ranges	+/-0.4% +/-1.0%
Basic error limit thermoresistor ranges with SFU	Operational limit of resistance thermometer ranges with SFU	-
Destruction limit resistance thermometer inputs max. 15V Thermocouple inputs - Thermocouple ranges - Operational limit of thermocouple ranges - Operational limit of thermocouple ranges with SFU - Basic error limit thermoeistor ranges with SFU - Basic error limit thermoeistor ranges with SFU - Destruction limit thermoeistor ranges with SFU - Programmable temperature compensation - External temperature compensation - External temperature compensation - Temperature error internal compensation - Technical temperature compensation - Temperature error internal compensation - Technical temperature error internal compensation - Resolution in bit 16 Measurement principle Sigma-Delta Basic conversion time 7 ms - 272 ms	Basic error limit thermoresistor ranges	+/-0.2% +/-0.5%
Thermocouple inputs	Basic error limit thermoresistor ranges with SFU	-
Thermocouple ranges Operational limit of thermocouple ranges Operational limit of thermocouple ranges with SFU Basic error limit thermocelement ranges Basic error limit thermocelement ranges Basic error limit thermocouple inputs Destruction limit thermocouple inputs Programmable temperature compensation External temperature compensation External temperature compensation Temperature error internal compensation Temperature error internal compensation Temperature error internal compensation Technical until of temperature measurement °C 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 Reverse polarity protection of rated load voltage yes Current consumption from load voltage L+ (without load) 70 mA Voltage output short-circuit protection yes Voltage output short-circuit protection yes Min. load resistance (voltage range) 1 µF Max. inductive load (current range) 30 mA Output voltage ranges Li DV +6 V OV +10 V Voltage ranges	Destruction limit resistance thermometer inputs	max. 15V
Operational limit of thermocouple ranges - Operational limit of thermocouple ranges with SFU - Basic error limit thermoelement ranges - Basic error limit thermoelement ranges with SFU - Destruction limit thermocouple inputs - Programmable temperature compensation - External temperature compensation - Internal temperature compensation - Temperature error internal compensation - Technical unit of temperature measurement °C 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 yes Current consumption from load voltage L+ (without load) 70 mA Voltage output short-circuit protection yes Voltage output short-circuit protection yes Max. capacitive load	Thermocouple inputs	-
Operational limit of thermocouple ranges with SFU - Basic error limit thermoceistor ranges with SFU - Destruction limit thermocouple inputs - Programmable temperature compensation - Internal temperature compensation - Internal temperature compensation - Temperature error internal compensation - Technical unit of temperature measurement °C 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 a Byte Technical data analog outputs Technical data analog outputs Number of outputs 2 Cable length, shielded 200 m Rated load voltage yes Current consumption from load voltage L+ (without load) 70 mA Voltage output short-circuit protection yes Voltage output short-circuit protection yes Voltage range) 1 kOhm Max. inductive load (current range) 1 µF	Thermocouple ranges	-
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 Temperature error internal compensation Technical unit of temperature measurement Resolution in bit Measurement principle Basic conversion time Noise suppression for frequency Initial data size Technical data analog outputs Technical data analog outputs Technical data analog outputs Destruction of outputs Cable length, shielded Resures polarity protection of rated load voltage Current consumption from load voltage L+ (without load) Voltage output short-circuit protection Max. capacitive load (current range) Mux. inductive load (current range) Output voltage ranges Programmable temperature emeasurement	Operational limit of thermocouple ranges	-
Basic error limit thermoresistor ranges with SFU - Destruction limit thermocouple inputs - Programmable temperature compensation - External temperature compensation - External temperature compensation - Temperature error internal compensation - Temperature error internal compensation - Technical unit of temperature measurement °C 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 yes Current consumption from load voltage L+ (without load) 70 mA Voltage output short-circuit protection yes Min. load resistance (voltage range) 1 kOhm Max. capacitive load (current range) 1 µF Max. inductive load (current range) 30 mA Output voltage ranges 100 miles 1	Operational limit of thermocouple ranges with SFU	-
Destruction limit thermocouple inputs - Programmable temperature compensation - External temperature compensation - Internal temperature compensation - Temperature error internal compensation - Technical unit of temperature measurement °C 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 yes Current consumption from load voltage L+ (without load) 70 mA Voltage output short-circuit protection yes Voltage outputs yes Min. load resistance (voltage range) 1 kOhm Max. capacitive load (current range) 1 μF Max. inductive load (current range) 10 μF Max. inductive load (current range) 1 γ0 ν +10 ν	Basic error limit thermoelement ranges	-
Programmable temperature compensation - External temperature compensation - Internal temperature compensation - Temperature error internal compensation - Technical unit of temperature measurement °C 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 yes Current consumption from load voltage L+ (without load) 70 mA Voltage output short-circuit protection yes Voltage outputs yes Min. load resistance (voltage range) 1 kOhm Max. capacitive load (current range) 1 μF Max. inductive load (current range) 10 V +10 V Voltage ranges +1 V +8 V O'Uput voltage ranges +1 V +8 V O'Uput voltage ranges +1 V	Basic error limit thermoresistor ranges with SFU	-
External temperature compensation - Internal temperature compensation	Destruction limit thermocouple inputs	-
Internal temperature compensation - Temperature error internal compensation - Technical unit of temperature measurement °C 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 yes Current consumption from load voltage L+ (without load) 70 mA Voltage output short-circuit protection yes Voltage outputs yes 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 +1 V +5 V O V +10 V	Programmable temperature compensation	-
Temperature error internal compensation Technical unit of temperature measurement Resolution in bit 16 Measurement principle Basic conversion time 7 ms - 272 ms Noise suppression for frequency Initial data size 8 Byte Technical data analog outputs Number of outputs 2 Cable length, shielded 200 m Rated load voltage Reverse polarity protection of rated load voltage Current consumption from load voltage L+ (without load) Voltage outputs yes Voltage outputs yes Min. load resistance (voltage range) 1 µF Max. inductive load (current range) Output voltage ranges -10 V +10 V +1 V +5 V O V +10 V +1 V +5 V O V +10 V 16 -16 -16 -16 -16 -16 -16 -16	External temperature compensation	-
Technical unit of temperature measurement Resolution in bit Measurement principle Basic conversion time 7 ms - 272 ms Noise suppression for frequency Initial data size 8 Byte Technical data analog outputs Number of outputs 2 Cable length, shielded Reverse polarity protection of rated load voltage Current consumption from load voltage L+ (without load) Voltage outputs Voltage outputs Wind desistance (voltage range) Min. load resistance (voltage range) Aux. capacitive load (current range) Output voltage ranges	Internal temperature compensation	-
Resolution in bit Measurement principle 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) Voltage output short-circuit protection yes Voltage outputs short-circuit protection yes Min. load resistance (voltage range) 1 kOhm Max. capacitive load (current range) 1 upf Max. inductive load (current range) 30 mA Output voltage ranges -10 V +10 V +1 V +5 V 0 V +10 V -11 V +5 V 0 V +10 V	Temperature error internal compensation	-
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 yes Current consumption from load voltage L+ (without load) 70 mA Voltage output short-circuit protection yes Voltage outputs yes 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 +10 V +1 V +5 V 0 V +10 V -10 V +10 V -10 V +10 V	Technical unit of temperature measurement	°C
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 yes Current consumption from load voltage L+ (without load) 70 mA Voltage output short-circuit protection yes Voltage outputs yes 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 +1 V +6 V 0 V +10 V +1 V +6 V 0 V +10 V	Resolution in bit	16
Noise suppression for frequency 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) Voltage output short-circuit protection yes Voltage outputs Win. load resistance (voltage range) Max. capacitive load (current range) Max. inductive load (current range) Output voltage ranges -10 V +10 V +1 V +5 V 0 V +10 V +1 V +5 V 0 V +10 V	Measurement principle	Sigma-Delta
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 yes Current consumption from load voltage L+ (without load) 70 mA Voltage output short-circuit protection yes Voltage outputs yes 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 +1 V +5 V O V +10 V	Basic conversion time	7 ms - 272 ms
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 yes Current consumption from load voltage L+ (without load) 70 mA Voltage output short-circuit protection yes 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 +1 V +5 V 0 V +10 V 0 V +10 V	Noise suppression for frequency	50 Hz and 60 Hz
Number of outputs Cable length, shielded Rated load voltage Reverse polarity protection of rated load voltage Current consumption from load voltage L+ (without load) Voltage output short-circuit protection Voltage outputs Voltage outputs Min. load resistance (voltage range) Mix. capacitive load (current range) Max. inductive load (current range) Output voltage ranges Voltage ranges Al No Max. output voltage range Output voltage ranges Al No Max. output voltage range Voltage ranges Current consumption from load voltage L+ (without load) To mA To	Initial data size	8 Byte
Cable length, shielded Rated load voltage DC 24 V Reverse polarity protection of rated load voltage Current consumption from load voltage L+ (without load) Voltage output short-circuit protection yes Voltage outputs Win. load resistance (voltage range) Max. capacitive load (current range) Max. inductive load (current range) Output voltage ranges -10 V +10 V +1 V +5 V 0 V +10 V	Technical data analog outputs	
Rated load voltage DC 24 V Reverse polarity protection of rated load voltage yes Current consumption from load voltage L+ (without load) 70 mA Voltage output short-circuit protection yes Voltage outputs yes 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 +1 V +5 V 0 V +10 V 0 V +10 V 0 V +10 V	Number of outputs	2
Reverse polarity protection of rated load voltage Current consumption from load voltage L+ (without load) Voltage output short-circuit protection Voltage outputs Voltage outputs Voltage range) Min. load resistance (voltage range) Max. capacitive load (current range) Max. inductive load (current range) Output voltage ranges Voltage ranges Voltage outputs yes 1 kOhm 1 µF Max. inductive load (current range) 30 mA Output voltage ranges -10 V +10 V +1 V +5 V 0 V +10 V	Cable length, shielded	200 m
Current consumption from load voltage L+ (without load)70 mAVoltage output short-circuit protectionyesVoltage outputsyesMin. load resistance (voltage range)1 kOhmMax. capacitive load (current range)1 μFMax. inductive load (current range)30 mAOutput voltage ranges-10 V +10 V +1 V +5 V 0 V +10 V0 V +10 V	Rated load voltage	DC 24 V
Voltage output short-circuit protection yes Voltage outputs yes 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 +1 V +5 V 0 V +10 V 0 V +10 V -10 V +10 V	Reverse polarity protection of rated load voltage	yes
Voltage outputs Min. load resistance (voltage range) Max. capacitive load (current range) Max. inductive load (current range) Output voltage ranges -10 V +10 V +1 V +5 V 0 V +10 V	Current consumption from load voltage L+ (without load)	70 mA
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 +1 V +5 V 0 V +10 V	Voltage output short-circuit protection	yes
Max. capacitive load (current range) 1 μF Max. inductive load (current range) 30 mA Output voltage ranges -10 V +10 V +1 V +5 V 0 V +10 V	Voltage outputs	yes
Max. inductive load (current range) Output voltage ranges -10 V +10 V +1 V +5 V 0 V +10 V	Min. load resistance (voltage range)	1 kOhm
Output voltage ranges -10 V +10 V +1 V +5 V 0 V +10 V	Max. capacitive load (current range)	1 μF
+1 V +5 V 0 V +10 V	Max. inductive load (current range)	30 mA
Operational limit of voltage ranges +/-0.4% +/-0.8%	Output voltage ranges	+1 V +5 V
	Operational limit of voltage ranges	+/-0.4% +/-0.8%
Basic error limit voltage ranges with SFU +/-0.2% +/-0.4%	Basic error limit voltage ranges with SFU	+/-0.2% +/-0.4%
Destruction limit against external applied voltage max. 15V	Destruction limit against external applied voltage	max. 15V



Current outputs	yes A YASKAWA COMPANY
Max. in load resistance (current range)	500 Ohm
Max. inductive load (current range)	10 mH
Typ. open circuit voltage current output	13 V
Output current ranges	-20 mA +20 mA 0 mA +20 mA 0 mA +20 mA
Operational limit of current ranges	+/-0.3% +/-0.8%
Radical error limit current ranges with SFU	+/-0.2% +/-0.5%
	max. 15V
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	yes
Between channels and power supply	yes
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 50 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	
UL certification	yes
KC certification	-