

Z109REG₂
UNIVERSAL CONVERTER
WITH GALVANIC SEPARATION

GENERAL CHARACTERISTICS

- Universal input: voltage, current, thermocouples, thermoresistances, potentiometer, rheostat.
- Sensor powered by 2-wire technique: 20 Vcc stabilised, 20mA max with short-circuit protection.
- Measurement and re-transmission on isolated analog output, with voltage and current output.
- DIP-switch for selecting: type of input, START-END, output mode (zero elevation, scale inversion), output voltage type (mA or V).
- Front panel indicating: power on, off scale or setting error, alarm status.
- Relay (spst) output, programmable through PC.
- STROBE input to activate the analog output on PLC command (alternatively to alarm contact)
- Facility for programming the following with a PC: beginning and end scale, additional input types, square root extraction, filter, burn-out etc.
- 3-point insulation: 1500 Vac.

TECHNICAL SPECIFICATIONS

Power supply:	10 - 40 Vdc, 19-28 Vac 50-60Hz, max 2.5 W; 1.6W @ 24Vdc with 20mA output.
Voltage input:	Bipolar from 75 mV up to 20 V in 9 scales, input impedance 1 M Ω , resolution max 15 bit + sign.
Current input:	Bipolar up to 20 mA, input impedance ~50 Ω , resolution: 1 μ A.
Thermoresistance (RTD) input	PT100, PT500, PT1000, NI100, KTY81, KTY84 and NTC. 2, 3 or 4 wires measurement, energising current 0.56 mA, resolution 0.1 °C, automatic detection of cable interruption or RTD. Resistive value for NTC: < 25 k Ω . KTY81, KTY84 an NTC may be set only via software.
Thermocouple input:	Type J,K,R,S,T,B,E,N; resolution: 2.5 μ V, automatic detection of TC interruption, input impedance >5 M Ω
Rheostat input:	Full scale min 500 Ω , max 25 k Ω .
Potentiometer input:	Excitation voltage 300 mV, input impedance > 5 M Ω , potentiometer value from 500 Ω to 10 k Ω (with the aid of a parallel resistance equal to 500 Ω).
Sampling frequency:	Variable from 240 sps with 11 bits resolution + sign to 15 sps with 15 bits + sign resolution (typical values).

Response Time:	35 ms with 11 bits resolution, 140 ms with 16 bits resolution (measurement of voltage, current, potentiometer).
Output:	1: 0-20 / 4-20 mA, max load resistance 600 Ω V: 0-5V / 0-10V / 1-5V / 2-10V, min load resistance 2 k Ω Resolution: 2.5 μ A / 1.25 mV.
Relay output (spst):	Capacity : 1 A - 30 Vdc/Vac
Environmental conditions:	Temperature: -20 - 60 °C, Humidity min: 30%, max: 90% a 40°C non condensing (see Installation instructions).
Errors referred to max measuring range:	Calibration Error: 0.1% Thermal Coefficient: 0.01%/°K Linearity error: 0.05% Others: EMI: <1%
Input for voltage/current:	0.1% 0.01%/°K 0.2 °C + (2) EMI: <1%
Input for PTCs J,K,E,T,N:	0.1% 0.01%/°K 0.5 °C + (2) EMI: <1%
Input for PTCs R,S:	0.1% 0.01%/°K 1.5 °C + (2) EMI: <1%
Input for PTC B (4):	0.1% 0.01%/°K 1.5 °C + (2) EMI: <1%
Cold junction compens.:	2°C in ambient range 0 to 50°C
Potentiometer/resistor:	0.1% 0.01%/°K 0.1% EMI: <1%
Input for thermoresistance (5):	0.1% 0.01%/°K t > 0°C 0.02% (1) t < 0°C 0.05% EMI: <1%
Voltage output (3):	0.3% 0.01%/°K 0.01%
Data Memory	EEPROM for all configuration data; storage time: 40 years.
Standards	EN61000-6-4 / 2007 (electromagnetic emission, industrial environment) EN61000-6-2 / 2005 (electromagnetic immunity, industrial environment) EN61010-1/2001 (safety) All circuits are to be safely isolated from hazardous live by double insulation. The power supply transformer must comply with EN60742: isolating transformers and safety isolating transformers requirements.

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Notes:
 - Use with copper conductor.
 - Use in Pollution Degree 2 Environment.
 - Power Supply must be Class 2.
 - When supplied by an Isolated Limited Voltage/Limited Current power supply a fuse rated max 2.5 A shall be installed in the field.

(1) Influence of cable resistance 0.005% Ω max 20 Ω .
 (2) Influence of cable resistance 0.1 μ V/ Ω .
 (3) Values to be added to the errors of the selected input.
 (4) Output zero if t < 400 °C.
 (5) All the values have to be calculated on the resistive value.

SELECTION: INPUT / MEASURING SCALE

The type of input is selected by setting the SW1 dip-switch group at the side of the module.
 Every type of input is matched to a certain number of scale beginnings and ends values which can be selected with the SW2 group.
 The table below lists possible START and END values according to the type of input selected.

SW1: INPUT TYPE		SW2 : START and END	
INPUT TYPE	INPUT TYPE	START	END
1 2 3 4 V	1 2 3 4 Tc K	1 2 3 4 1 4 5 6 1	1 2 3 4 1 4 5 6 1
1 2 3 4 Ω / Rheostat	1 2 3 4 Tc R	1 2 3 4 2 3 4 5 2	1 2 3 4 2 3 4 5 2
1 2 3 4 mA	1 2 3 4 Tc S	1 2 3 4 3 4 5 6 3	1 2 3 4 3 4 5 6 3
1 2 3 4 NI100	1 2 3 4 Tc T	1 2 3 4 4 5 6 7 4	1 2 3 4 4 5 6 7 4
1 2 3 4 PT100	1 2 3 4 Tc B	1 2 3 4 5 6 7 8 5	1 2 3 4 5 6 7 8 5
1 2 3 4 PT500	1 2 3 4 Tc E	1 2 3 4 6 7 8 9 6	1 2 3 4 6 7 8 9 6
1 2 3 4 PT1000	1 2 3 4 Tc N	1 2 3 4 7 8 9 10 7	1 2 3 4 7 8 9 10 7
1 2 3 4 Tc J	1 2 3 4 Potentiometer	1 2 3 4 8 9 10 11 8	1 2 3 4 8 9 10 11 8

SW2 (1 2 3 4 5 6 7 8) ← DIP-Switch to OFF position

	Voltage		Resistance / Rheostat		Current		Potentiometer	
	START	END	START	END	START	END	START	END
1 (*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)
2 0 V	100 mV	0 Ω	1 k Ω	0 mA	1 mA	0 %	40 %	
3 400 mV	200 mV	0.5 k Ω	2 k Ω	1 mA	2 mA	10 %	50 %	
4 1 V	500 mV	1 k Ω	3 k Ω	4 mA	3 mA	20 %	60 %	
5 2 V	1 V	2 k Ω	5 k Ω	-1 mA	4 mA	30 %	70 %	
6 -5 V	5 V	5 k Ω	10 k Ω	-5 mA	5 mA	40 %	80 %	
7 -10 V	10 V	10 k Ω	15 k Ω	-10 mA	10 mA	50 %	90 %	
8 -20 V	20 V	15 k Ω	25 k Ω	-20 mA	20 mA	60 %	100 %	

	NI100 (RTD)	PT100 (RTD)	PT500 (RTD)	PT1000 (RTD)				
	START	END	START	END	START	END	START	END
1 (*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)
2 -50 °C	20 °C	-200°C	50°C	-200 °C	0 °C	-200 °C	0 °C	
3 -30 °C	40 °C	-100°C	100°C	-100 °C	50 °C	-100 °C	50 °C	
4 -20 °C	50 °C	-50°C	200°C	-50 °C	100 °C	-50 °C	100 °C	
5 0 °C	80 °C	0°C	300°C	0 °C	150 °C	0 °C	150 °C	
6 20 °C	100°C	50°C	400°C	50 °C	200 °C	50 °C	200 °C	
7 30 °C	150 °C	100°C	500°C	100 °C	300 °C	100 °C	300 °C	
8 50 °C	200 °C	200°C	600°C	150 °C	400 °C	200 °C	400 °C	

	Thermocouple J	Thermocouple K	Thermocouple R	Thermocouple S				
	START	END	START	END	START	END	START	END
1 (*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)
2 -200°C	100°C	-200°C	200°C	0°C	400°C	0°C	400°C	
3 -100°C	200°C	-100°C	400°C	100°C	600°C	100°C	600°C	
4 0°C	300°C	0°C	600°C	200°C	800°C	200°C	800°C	
5 100°C	400°C	100°C	800°C	300°C	1000°C	300°C	1000°C	
6 200°C	500°C	200°C	1000°C	400°C	1200°C	400°C	1200°C	
7 300°C	800°C	300°C	1200°C	600°C	1400°C	600°C	1400°C	
8 500°C	1000°C	500°C	1300°C	800°C	1750°C	800°C	1750°C	

	Thermocouple T	Thermocouple B	Thermocouple E	Thermocouple N				
	START	END	START	END	START	END	START	END
1 (*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)
2 -200°C	50°C	0°C	500°C	-200°C	50°C	-200°C	200°C	
3 -100°C	100°C	500°C	600°C	-100°C	100°C	-100°C	400°C	
4 -50°C	150°C	600°C	800°C	0°C	200°C	0°C	600°C	
5 0°C	200°C	700°C	1000°C	100°C	300°C	100°C	800°C	
6 50°C	250°C	800°C	1200°C	150°C	400°C	200°C	1000°C	
7 100°C	300°C	1000°C	1500°C	200°C	600°C	300°C	1200°C	
8 150°C	400°C	1200°C	1800°C	400°C	800°C	500°C	1300°C	

(*) START or END are set in the memory with the PC or with the programming push-buttons.
N.B.: DIP-switches must be set while the module is powered down, otherwise, the module may be damaged.

SETTING START AND END AT WILL

The START and END push-buttons under the SW2 DIP-switch group allow to set the beginning and end scale at will within the scale pre-set through the dip-switches.
 To obtain this facility it is necessary to use a suitable signal generator, able to furnish the desired values of beginning and end scale.
 The procedure is following:

1. Set through dip-switches the type of input, START and END measurement which include the required beginning and end values.
2. Power up the module.
3. Supply a calibrator or simulator of the signal you wish to measure and re-transmit.
4. Set the required START value on the calibrator (or other instrument).
5. Press the START push-button for at least 3 sec. The green LED on the front panel flashes to indicate the value has been stored.
6. Repeat points 4 and 5 for the required END value.
7. Cut power to the module and set to OFF position the dip-switches of group SW2, correspondent to the settings of START and END values.

The module is now configured for the required start and end scale. To re-program it (e.g. for a different type of input) repeat the whole procedure.

SELECTING OUTPUT

DIP-switches numbers 7 and 8 of the SW2 group enable you to set the output with or without zero elevation, or as a normal or reversed output. The SW3 DIP-switch group enables you to select the output type.

N.B.: DIP-switches must be set while the module is powered down, avoiding electrostatic discharges, otherwise the module may be damaged.

SW2	OUTPUT MODE	SW3	OUTPUT VOLTAGE
7	0.20mA / 0..10V	1 2	Voltage
8	4..20mA / 2..10V	1 2	Current
7 8	NORMAL		
7 8	REVERSED		

SETTING WITH A PC

By using a PC and ZSETUP2 software, it is possible to set other normally fixed parameters in addition to start and end scale:

- Additional input types.
- Digital filter (normally disabled);
- Square root extraction (normally disabled);
- Negative burn-out (normally positive)
- Alarm (normally set as error signalling)
- Start and end scale of the analog output
- Value of the analog output in case of error
- Rejection programmable for 50 or 60 Hz mains frequency (normally set to 50 Hz).
- Sampling frequency/resolution (normally set to 15 sps/16 bit).
- 3 or 4 wires measure for thermal resistance (normally set to 3 wires).
- Action of the digital output alarm in case of fault;

Instructions for setting and for the connection cable are supplied with the software (to be requested as an accessory item).

LED Indication on the front

Green LED	Meaning
Flashing (freq: 1 Flash./sec)	Out Range, Burn Out or Internal fault
Flashing (freq \approx 2 Flash./sec)	Error on dip-switches setting
Steady ON	Indicates the presence of power supply
Yellow LED	Meaning
Steady ON	Alarm Signalling (relay contact opened)
OFF	No Alarm (relay contact closed)

ELECTRICAL CONNECTIONS

POWER SUPPLY
 Power supply voltage must be in the range 10 to 40 Vcc (at any polarity), 19 to 28 Vac; also see section **INSTALLATION INSTRUCTIONS**.

The upper limits must not be exceeded, to avoid serious damage to the module.
 Protect the power supply source against possible damage of the module by using a fuse of suitable size.

CURRENT INPUT
 mA input (11) 10
 mA input (2 wires) (7) 11

VOLTAGE INPUT
 V input > 300 mV (9) 10

The loop is powered by the sensor
THERMOCOUPLE INPUT
 NTC, KTY81, KTY84
 RTD 2 wires (8) 9 10 12

The loop is powered by the module
THERMORESISTANCE INPUT
 PT100, NI100, PT500, PT1000
 RTD 3 wires (8) 9 10 12
 RTD 4 wires (8) 9 10 12 10

POTENTIOMETER/RHEOSTAT INPUT
 (8) 9 10

STROBE INPUT (7)
 (4) 5

With resistance R=500 Ω (not provided), P= 500 Ω \div 100 k Ω

RE-TRANSMITTED OUTPUT
 Voltage (6) 1
 Generated Current (8) (6) 1
 Ext. Power Supply Current (9) (1) 6
 1 A - 30 V (4) 5

RELAY OUTPUT (10)
 (6) 1
 (1) 5

(7) As alternative to the relay output. It is isolated from the other circuits and enables the current analog output. It may be used to multiplex a PLC input on z109REG2. To enable it see **SETTINGS THROUGH INTERNAL BRIDGES**.
 (8) Active output (powered) to connect to passive inputs.
 (9) Unpowered passive output to be connected to active inputs. To enable it, see **SETTINGS THROUGH INTERNAL BRIDGES**.
 (10) As alternative to STROBE input; relay contact normally closed, opened in event of alarm.

INTERNAL BRIDGES POSITION
 J3 K1
 J2 J3
 SW1 SW3
 SW2

SETTINGS THROUGH INTERNAL BRIDGES
ACTIVE / PASSIVE OUTPUT
 Active Output (J9) 9
 Passive Output (J9) 9

RELAY OUTPUT / STROBE INPUT
 Relay Output (J3) 3
 STROBE Input (J2) 2

INSTALLATION INSTRUCTIONS
 The module was designed for fitting to guide DIN 46277, in a vertical position.
 For optimum operation and long life, make sure adequate ventilation is provided for the module/s, avoiding placing raceways or other objects which could obstruct the ventilation grids. Do not install the modules above appliances generating heat we advise you to install in the lower part of the panel.
SEVERE OPERATING CONDITIONS:
 Severe operating conditions are as follows:
 • High power supply voltage (> 30Vcc / > 26 Vac).
 • Power supply of the sensor at input.
 • Use of the output on generated current.
 When modules are installed side by side, it may be necessary to separate them by at least 5 mm in the following cases:
 • If panel temperature exceed 45°C and at least one of the severe operating conditions exists.
 • If panel temperature exceed 35°C and at least two of the severe operating conditions exist.

ELECTRICAL CONNECTIONS
 We advise you to use shielded cables for connecting signals. The shield must be connected to an earth wire used specifically for instrumentation. Moreover, it is good practice to avoid routing conductors near power appliances such as inverters, motors, induction ovens, etc.

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