Zen IoT
Edge Processing Interface

CE E2180

Modular Industrial IoT interface hardware solution

Designed for industrial and commercial IoT monitoring and interface applications where reliability, rapid development and deployment are demanded. The Zen IoT hardware and monitoring solution delivers robust end to end field measurement to cloud service integration.

› **Industrially hardened design and direct process interface design**
› **IoT edge processor with real-time OS**
› **Sophisticated embedded input conditioning and control functions including signal processing filters and alarms**
› **Modular construction supports up to 22 measurement inputs, 8 analog output channels and up to 40 digital IO (including up to 7 relays)**
› **Low power optimized design**

Easily integrates with your existing automation system

The Zen IoT natively supports MQTT IoT communications protocol. ModBus RTU master/slave communication interface port provides direct connection to metering and control automation. Potential applications include remote machine and process monitoring of pumping, HVAC, IAQ, and energy systems. Onboard logic, math and control functions allow customization to match application measurement and monitoring requirement.

Field process signals direct to wireless interface

Zen IoT converts, conditions and processes analog signals directly to wireless WiFi (801.11) or (eMTC) LTE Cat-M1. No additional wireless modem required.

Extra cloud interface security and Store and Forward data integrity

Connection and data security are paramount, the Zen IoT provides peace of mind with Transport Layer Security (TLS) protocol. During a network communications failure event the Zen IoT Store and Forward functions locally buffers data, forwarding to the cloud server when network communications is reinstated, secure monitoring and recording with total data integrity.

Key features:

› DCS Define Cloud Services (DCS) connection
› MQTT with Transport Layer Security (TLS 1.2)
› Data record store and forward record buffer
› RTC record data time stamp at origin
› Application logic and math functions
› PC configuration tools, USB interface
› Wireless WiFi (801.11) or (eMTC) LTE Cat-M1

› Up to 22 analog inputs
› Up to 40 digital input/outputs
› 8 Isolated process outputs (4-20mA)
› Up to 7 Relay outputs
› RS485 ModBus RTU master/slave interface
› Local display (RS232C) interface port
› AC mains and 24V low power operation

DCS | Define Cloud Services   AWS IoT   TLS 1.2   MQTT.ORG

Cloud connection options

WiFi (801.11)

Enables LOS transmission up to 1500ft (450m) using the supplied 3dBi wireless antenna.

(eMTC) LTE Cat-M1

4G cellular interface for Internet of Things (IoT) and machine-to-machine (M2M) communications.

Connection to IoT Cloud services

The Zen IoT is preconfigured to connect to Define Cloud Services (DCS). Custom connection is available to your own or third party IoT server. Cloud communication is secured using TLS and uses MQTT IoT service transfer protocol. JSON packets contain industry standard SenML (Sensor mark-up language) data.

Simple setup with Define WorkBench software

Define WorkBench configures the Zen IoT for analog and digital inputs, alarms, totalizers and counters, custom scaling for input linearization and scale setup. The cloud interface module configures data transfer to a cloud server.
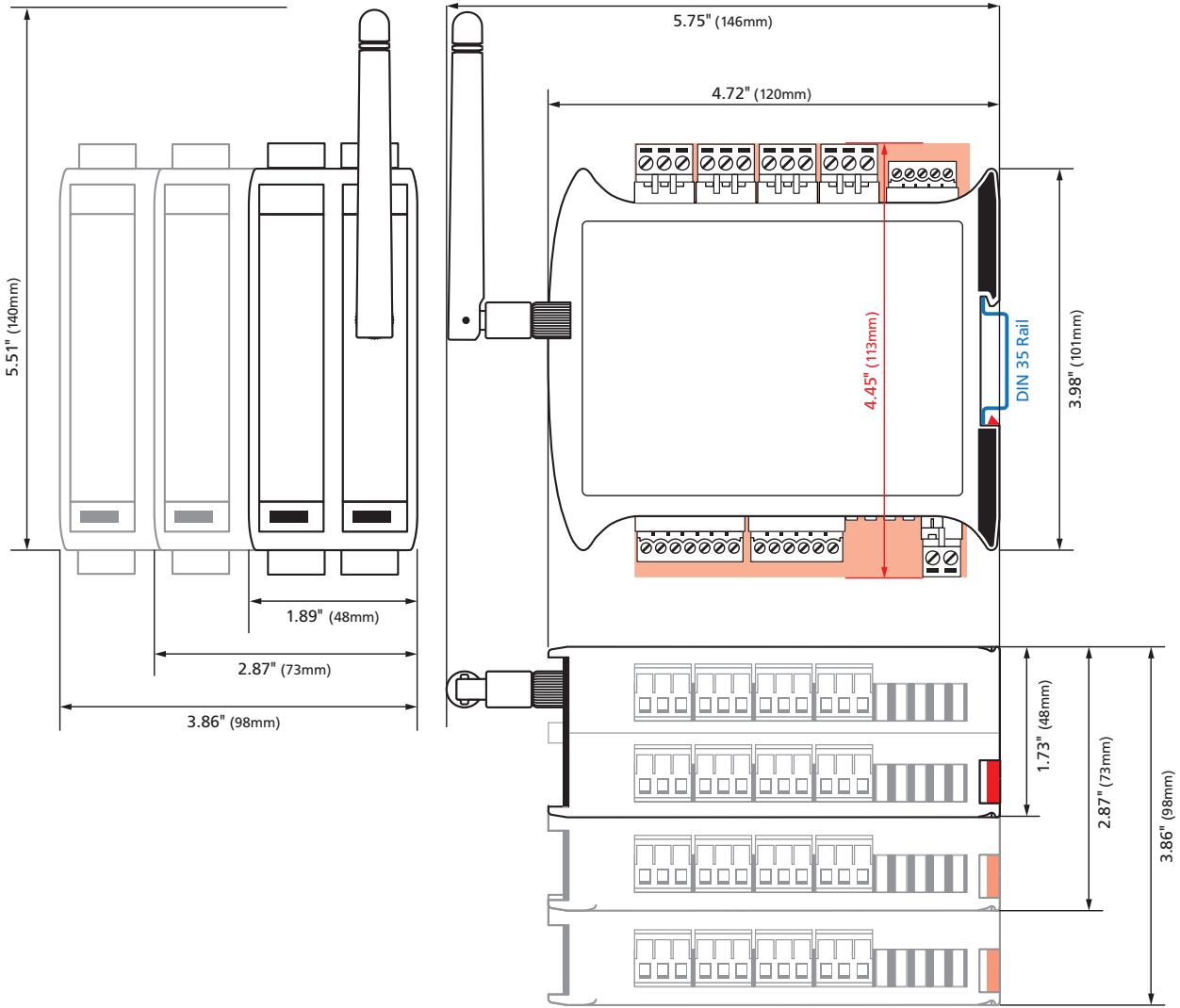
Ordering Codes for Zen IoT

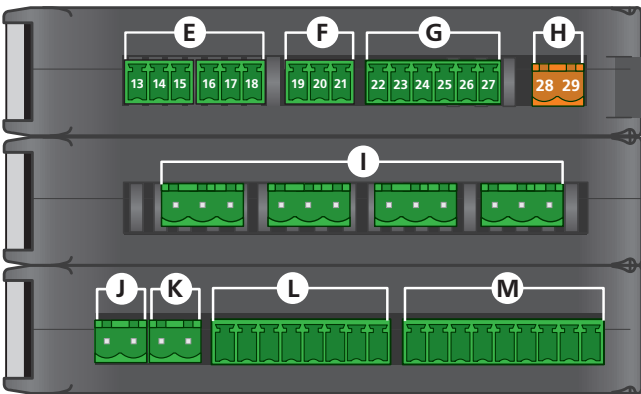| Model/Option Description Zen IoT	Non-Isolated Inputs With Exc. (4-20mA)	Partially Isolated Inputs (4-20mA)	Total Universal Isolated Input (TC/RTD/V/mA)	Isolated Output (4-20mA)	Model	Power supply	Wireless Comms WiFi/LTE	Added Analog IO Option
Zen IoT base configuration: MQTT cloud service interface – TLS security layer, store and forward record buffer, RTC data time stamp, 4x isolated universal inputs (TC/RTD/V/mA/SCII)	2		4	ZEN6	ZEN6			
85-265 V AC/DC power supply	2		4			HV		
10-32 V DC power supply	2		4			LV		
No Wireless communication	2		4				–	
Cellular modem (eMTC) LTE Cat-M1	2		4				CM1	
WiFi (801.11)	2		4				WIF	
No Additional Analog IO	2							–
ADD 4x Universal input (isolated)	2		8					UI4
ADD 8x Universal input (isolated)	2		12					UI8
ADD 12x Universal input (isolated)	2		16					UI12
ADD 16x Process (4-20mA) input (non-isolated)	2	16	4					PI16
ADD 6x Universal input (isolated), 4x process (4-20mA) output (isolated)	2		4	4				UI6E4
ADD 8x Process (4-20mA) input (non-isolated), 8x process (4-20mA) output (isolated)	2	8	4	8				PI8E8

Required Accessories (Sold Separately)

BRIDGE-KEY	USB Bridge Key, required to program this instrument using free WorkBench software.

Case Dimensions

5.75" (146mm)

4.72" (120mm)

5.51" (140mm)

4.45" (113mm)

DIN 35 Rail

3.98" (101mm)

1.89" (48mm)

2.87" (73mm)

3.86" (98mm)

1.73" (48mm)

2.87" (73mm)

3.86" (98mm)

Connectors – main processor

13 14 15 16 17 18 | 19 20 21 | 22 23 24 25 26 27 | 28 29

E | F | G | H

I

J | K | L | M

Color Label Facing Down

N | O | P | Q

R

1 2 3 | 4 5 6 7 | 8 9 | 10 11 12

A | B | C | D
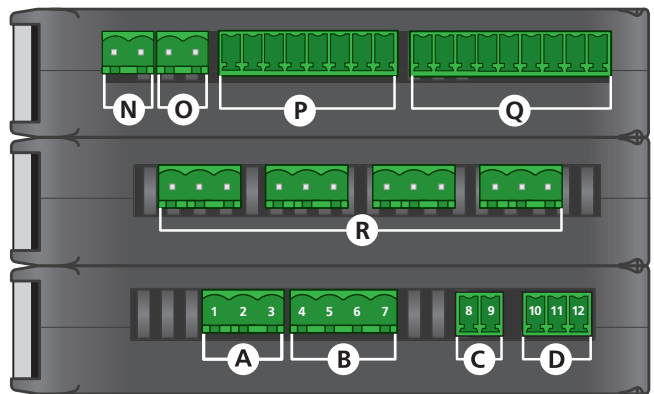
Color Label Facing Up

(A & B)	Relay outputs	(J & K)	Relay 1 & 2
(C)	Logic output open collector	(L)	Digital outputs 5-10
(D)	RS485 Port	(M)	Digital inputs 1-8
(E)	Analog (4-20mA) inputs	(N & O)	Relays 4 & 3
(F)	R232 Display Port	(P)	Digital outputs 11-16
(G)	Digital inputs	(Q)	Digital inputs 9-16
(H)	Power supply (HV shown)	(R)	Universal analog inputs
(I)	Universal analog inputs		

Connectors – expansion IO

| 1.73" (48mm) | 2.87" (73mm) | 3.86" (98mm) |
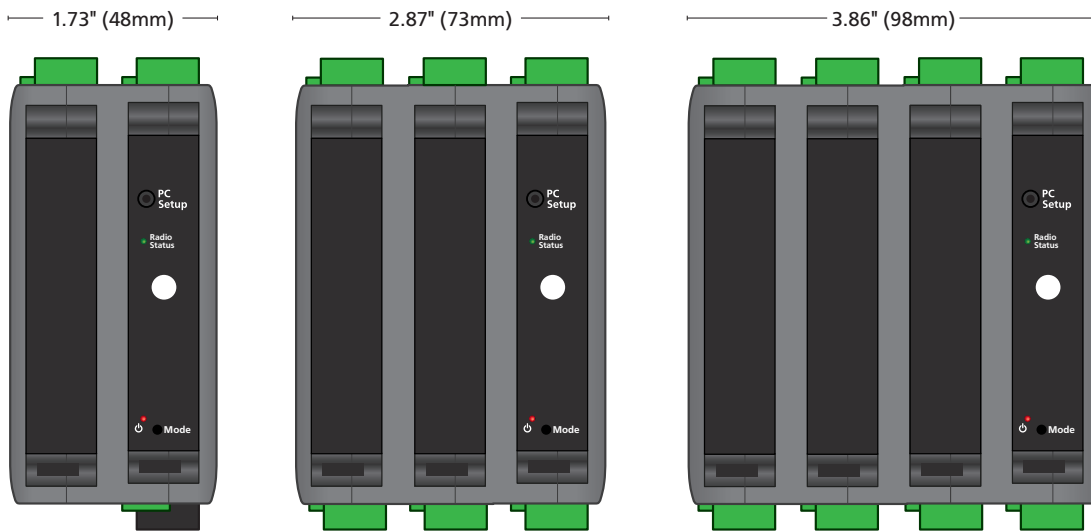
Dimensions of model configurations

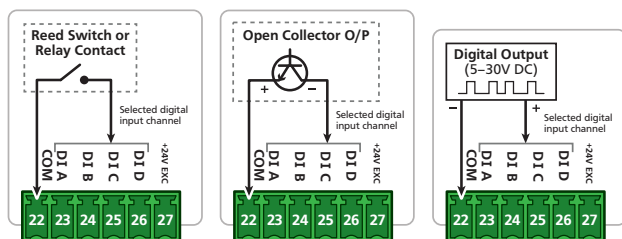| 1.73" wide (48mm)	2.87" wide (73mm)	3.86" wide (98mm)
Zen6-HV	Zen6-HV-CM1-UI8	Zen6-HV-WIF-UI8-DIO12
Zen6-HV-CM1	Zen6-LV-CM1-PI16	Zen6-HV-CM1-PI16-DIO12
Zen6-LV-WIF	Zen6-HV-WIF-UI6E4	Zen6-HV-CM1-PI8E8-DIO12

Non-isolated mA input

4–20mA

2 Wire Loop Powered Transmitter, 4–20mA

3 Wire Loop Powered Transmitter, 4–20mA

4 Wire Loop Powered Transmitter, 4–20mA

4–20mA
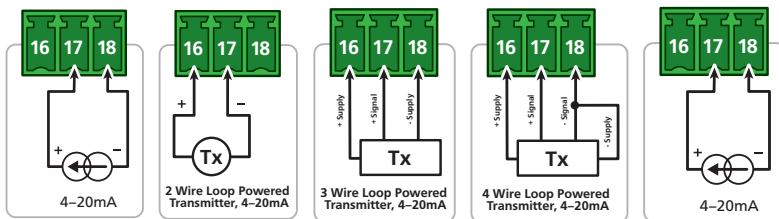
Configurable isolated universal input

RTD 3 Wire Pt100/1000

Thermocouple

Potentiometer

Digital and logic input

Reed Switch or Relay Contact
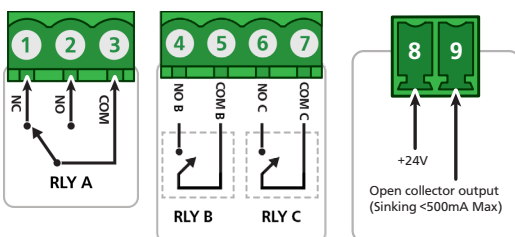
Open Collector O/P

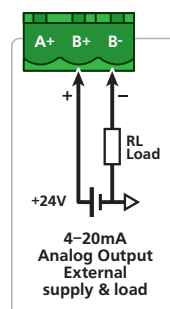Digital Output (5–30V DC)

Selected digital input channel
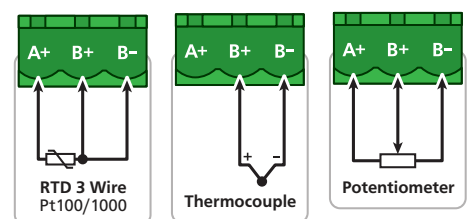
NOTE

The Digital Inputs can be configured in software to be either Sinking (active low input) or Sourcing (active high input). The diagrams in this manual are for **Sinking** wiring, which is the default configuration. To view **Sourcing** wiring, please refer to the help information provided in Define WorkBench.

Relay output

RLY A

RLY B

RLY C

+24V
Open collector output (Sinking <500mA Max)

Process mA output

RL Load

+24V

4–20mA Analog Output External supply & load

Warranty

Define Instruments warrants that its products are free from defects in material and workmanship under normal use and service for a period of five years from the date of shipment. Define Instruments' obligations under this warranty are limited to replacement or repair, at its option, at it's factory, of any of the products which are returned to Define Instruments' facility (within the applicable period after shipment), transportation charges prepaid, and which are, after examination, disclosed to the satisfaction of Define Instruments to be defective.

Warranty does not apply to any equipment which has been repaired or altered, (except by Define Instruments), or which has been subjected to misuse, negligence or accident. In no case shall Define Instruments' liability exceed the original purchase price. The aforementioned provisions do not extend the original warranty period of any product which has been either repaired or replaced by Define Instruments.

General specifications

Power

Power supply 85–265V AC (HV)
10–32V DC (LV)

Power consumption 10W max, 6W typical

Excitation output

24V DC @ 200mA maximum. Total on all +24V output pins

Data Logging

31,774 samples with up to 30 parameters plus time stamp per sample. 32 MB capacity

Available with Real-Time Clock (RTC) option

RTC time base UTC

Local time in device with automatic daylight savings adjustment

Analog input

2x (4–20mA) process input

Input resolution 12 bits

Accuracy <±1.0% FSO (unless otherwise stated in input specifications)

Input isolation: Not isolated to power supply or digital inputs

General specifications

Linearity & repeatability <±0.1% FSO

RF immunity <±1% effect FSO typical

Noise immunity (CMRR) 160dB tested at 300V RMS 50Hz

Permanent memory (E²ROM) 100,000 writes per input parameter

Relay output

1 x Change over Form C Relay (15A 250V AC or 15A 30V DC)

2x Form A Relays (3A 250V AC or 3A 30V DC)

Logic output

1 x Logic output Open collector, (80mA maximum capacity)

Digital input

Functions Status, up counter, up/down counter with direction, debounced counter, frequency, gated frequency

Counter register output 32 bit

Frequency range 0–10,000Hz (Reduced to 0–1,000Hz in Sleep Mode)

Input types NPN, PNP, Clean Contact, Voltage 2–30V DC

Threshold 1.65V typical

Debounce counter range 0–100Hz

Isolation: Not isolated to power supply or analog inputs

Comms

Protocols Modbus RTU, MQTT, RS485 or Define ASCII, EIA485 compliant

Default comm port RS485. Selectable baud rate 2400–230400 baud
Format 8 bit, no parity, 1 stop bit

RS232 display port meets TIA/EIA-232-F and ITU v28 standards

Functional isolation: 1,500VDC (1 min) Electrical isolation 42VAC/ DC (continuous)

Programming

USB programmable Via 'PC Setup' port using Bridge Key USB programmer (sold separately)

Define WorkBench Simple configuration using Define WorkBench:
defineinstruments.com/workbench

Wireless comms interface

WiFi (801.11)

Cellular modem (eMTC) LTE Cat-M1 Regions NA, E1 and AU

TLS security protocol

Transport Layer Security (TLS) V1.2 with server certificate and X.509 client certificate authentication

Over Air Updates

Over The Air updates are available for main plugins, custom macros, certificates, cloud adapter firmware updates (WiFi and cellular)

MQTT interface

Based on MQTT 3.1.1 with QoS 0 & 1

Construction

Casing DIN 35 rail mounting; Material: ABS inflammability V0 (UL94)

Phoenix type removable screw terminal connectors

Dimensions (H x W x D)

6 input channels
3.98 x 1.73 x 4.72" (101 x 48 x 120mm)*
14 input channels
3.98 x 2.87 x 4.72" (101 x 73 x 120mm)*
22 input channels
3.98 x 3.86 x 4.72" (101 x 98 x 120mm)*
*Excludes antenna and connectors

Required mounting height with antenna
4.65" (118mm), WiFi model only

Environmental conditions

Operating temperature –40 to 176°F (–40 to 80°C)

Storage temperature –40 to 176°F (–40 to 80°C)

Operating humidity 5–85% RH max, non-condensing

Compliance approvals

EN-61326-1:2006

EMC: EN61326-1: 2006 Class A

EN61326-1: 2006 Industrial Locations

EN50581: 2012 RoHS

Safety: EN61010, 1:2010, CuL (file listing pending)

General specifications

Input

Input isolation 2,500V AC 1 minute between all input channels

Isolation test voltage 1000V DC for 1min (Analog input to digital input, analog input to analog input)

Input resolution 16 bits

Accurate to <±0.1% FSO

Thermocouple input

Thermocouple types
B= 32 to 3272°F (0 to 1800°C)
E= -328 to 1292°F (-200 to 700°C)
J= -328 to 1832°F (-200 to 1000°C)
K= -328 to 2300°F (-200 to 1260°C)
N= -328 to 2372°F (-200 to 1300°C)
R= 32 to 3092°F (0 to 1700°C)
S= 32 to 3092°F (0 to 1700°C)
T= -328 to 752°F (-200 to 400°C)

Input impedance >500KΩ

T/C lead resistance 100Ω max

Cold junction compensation 14 to 140°F (−10 to 60°C)

CJC drift <0.02°c

Accuracy 0.1% of FSO ±1°C typical

Sensor open Upscale

RTD Input

RTD input type Pt100 3 wire RTD DIN 43760: 1980 RTD Pt1000 3 wire RTD standard

Range
-328–572°F (-200–300°C) = 0.02°F (0.01°C) resolution
-328–1472°F (-200–800°C) = 0.1°F (0.1°C) resolution

Lead resistance 10Ω/lead max recommended

Sensor current 0.6mA continuous

Sensor fail upscale

Accuracy

-328–572°F (-200–300°C) = ±0.1°C

-328–1472°F (-200–800°C) = ±0.3°C

Ambient drift 0.003°C/°C typical

Current Input

Range 0–20mA, 4–20mA

Input impedance 45Ω

Max over-range Protected by PTC to 24V DC

Linearity & repeatability 0.1% FSO max

Accuracy 0.1% FSO max

Channel separation 0.001% max

Ambient drift 0.003%/°C FSO typical

RF immunity 1% effect FSO typical

Voltage Input

Ranges ±200mV, –200mV to 1V, 0–10V, 0–18V

Input impedance >500KΩ on all ranges

Maximum over voltage 24V DC

Linearity & repeatability 0.1% FSO max

Accuracy 0.1% FSO max

Channel separation 0.001% max

Ambient drift 0.003%/°C FSO typical

RF immunity 1% effect FSO typical

Potentiometer input

Potentiometer input 3-wire

Excitation voltage Variable

Potentiometer resistance <2kΩ low pot, >2kΩ high pot

Field programmable zero 0–90% of span

Field programmable span 0.1–100%

Linearity & repeatability <±0.05% fso

Response time 100msec

Ambient drift <50ppm

Digital Pulse Input

Frequency range 0–2500.0Hz

Fast counter range 0–2500.0Hz

Frequency resolution 0.1Hz

Sensors Open collector (NPN, PNP), TTL or Clean Contact

Debounce counter range 0–50Hz max

Counter register output 32 bit

Accuracy ±0.5%

Analog Output

Analog output type Loop powered, isolated 4–20mA or 20–4mA DC

Isolation Isolated to Digital IO GND

Isolation test voltage 1400Vrms for 1min. Working voltage 125V DC

Resolution 15 bits, 16000 steps

Loop drop 10V max

Linearity & repeatability 0.1% FSO max

Accuracy 0.1% FSO max

Digital I/O Expansion (optional)

4 x Form A Relays 3A (3A 250V AC or 3A 30V DC)

16 x Bipolar digital inputs 24V compatible. Up to 2.5KV RMS isolation. Inputs are separated into 2 isolated groups of 8 channels

12 x Digital open collector outputs. Outputs are separated into 2 groups of 6. 0.5A max on each group. Non isolated.

Non-isolated Process input

Range 0–20mA, 4–20mA

Input impedance 45Ω

Max over-range Protected by PTC to 24V DC

Linearity & repeatability 0.1% FSO max

Isolation - none to other process inputs, 2500V AC 1 minute to all other input/output

Ambient drift 0.003%/°C FSO typical