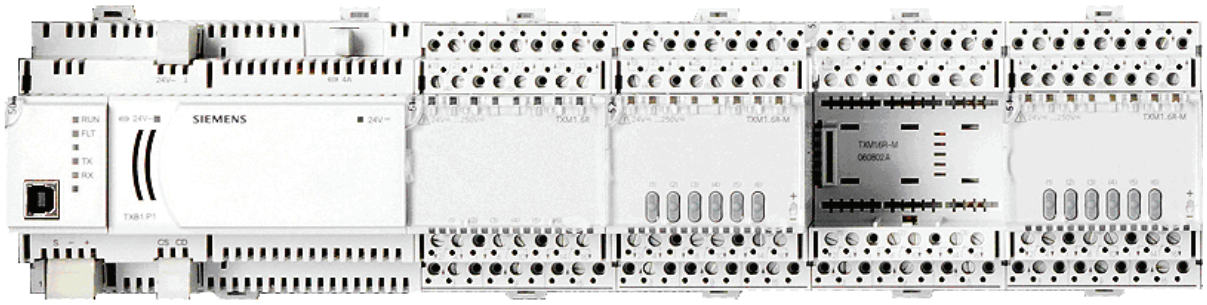
SIEMENS

Technical Specification Sheet
Document No. 149-476
January 5, 2015

TX-I/O Product Range



Description

TX-I/O™ is a range of I/O modules, with associated power and communication modules, for use within the APOGEE Automation System. The TX-I/O product range includes the following:

- Eight types of I/O modules, which act as signal converters. The I/O modules communicate between the PXC Modular or the PXC-36 and the related devices in the building services plant.
- TX-I/O Power Supply for the TX-I/O modules.
- TX-I/O Bus Connection Module, which bridges communication and power from one DIN rail to another.
- TX-I/O Island Bus Expansion (IBE) module, which bridges communication between the primary field panel and expansion field panels.
- P1 Bus Interface Module (BIM), which connects TX-I/O modules to the P1 FLN. The P1 BIM provides power for TX-I/O modules, but it does not contain applications or perform control; the control database for the TX-I/O points resides in a field panel.

TX-I/O Modules provide I/O points for APOGEE based upon TX-I/O Technology. TX-I/O Technology provides flexibility of point types, tremendous flexibility of signal types and support for manual operation.

There are eight types of TX-I/O modules:

- 8 point DI module (TXM1.8D)
- 16 point DI module (TXM1.16D)
- 6 point DO with Relay module (TXM1.6R)
- 6 point DO with Relay and Manual Override module (TXM1.6R-M)
- 8 point Universal module (TXM1.8U)
- 8 point Universal with local override/identification device (LOID) module (TXM1.8U-ML)
- 8 point Super Universal module (TXM1.8X)
- 8 point Super Universal with LOID module (TXM1.8X-ML)

Features

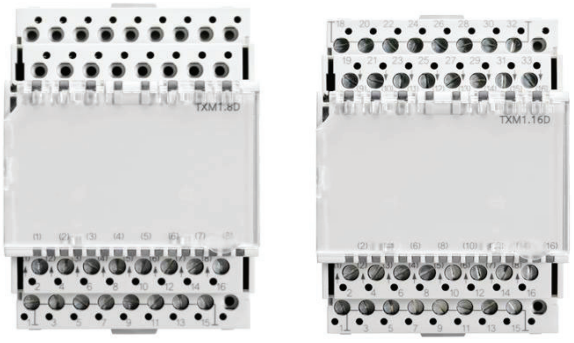
- The *self-forming TX-I/O island bus* transmits power as well as communication signals.
  - The TX-I/O island bus can be extended a maximum of 164 feet (50 meters).
  - Adding an Island Bus Expansion (IBE) module expands communication data up to an additional maximum of 200 feet (61 m) in two directions.
- *Hot-swappable electronic components* allow powered electronics to be disconnected and replaced without removing terminal wiring or disturbing the self-forming bus.

All TX-I/O modules include the following features:

- DIN rail mounting.
- High density (point count to physical dimensions).
- Hardware addressed with address keys.
- Removable label holder that allows for customized point labels.
- LEDs that provide status indication and diagnostic information for the I/O module, as well as for each point on the module.
- Separable into terminal base and plug-in I/O module electronics for:
  - Improved installation workflow, allowing field wiring to be terminated prior to installation of electronics.
  - Optimum diagnostics—connected peripheral devices can be measured without affecting or being affected by the I/O module.
  - Quick replacement of electronics for service.

Module Introduction

Digital Input Modules (TXM1.8D and TXM1.16D)

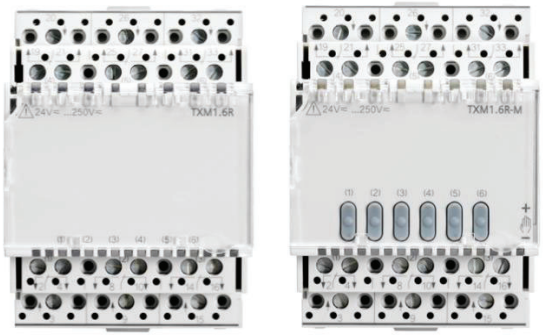


The TXM1.8D and TXM1.16D are dedicated to monitoring, respectively, 8 and 16 digital input points.

- They monitor status signals from normally open (NO) or normally closed (NC), latched voltage free/dry contacts.
- All 8 points on the TXM1.8D module, as well as 8 of the 16 points on the TXM1.16D module, may be used as pulse counters up to 10 Hz.
- Each input point has a green LED for status indication.

NOTE: No potential (dry contact) for all points.

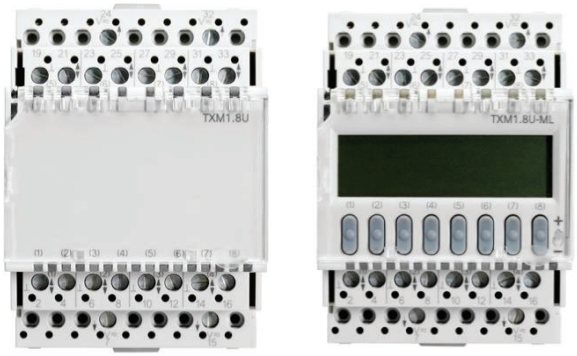
Digital Output Modules (TXM1.6R and TXM1.6R-M)



The TXM1.6R and TXM1.6R-M Digital Output Modules provide six NO or NC (form C), maintained or pulsed, voltage free/dry contacts.

- The contacts are rated for a maximum of 250 Vac at 4A.
- Each I/O point has a green LED for status indication.
- The TXM1.6R-M module is also equipped with manual override switches. An orange LED per override switch indicates override status individually per point.

Universal Modules (TXM1.8U and TXM1.8U-ML)



The TXM1.8U and TXM1.8U-ML Universal I/O modules provide 8 points, which can be individually software configured as digital input, analog input, or analog output to best meet the specific application needs.

All Universal I/O modules provide:

- Class 2 AC distribution voltage for peripheral devices, such as valves and actuators.

- Green LED status per I/O point that varies in intensity according to the voltage and current (directly proportional).

Digital input support includes:

- Voltage free/dry contacts
- Pulse counters up to 25 Hz

Analog input sensor support includes:

- 1K Nickel – Landis & Gyr curve
- 1K Platinum – 375 and 385 coefficient
- 10K and 100K Thermistor – Type II Curve

Active input and output support includes:

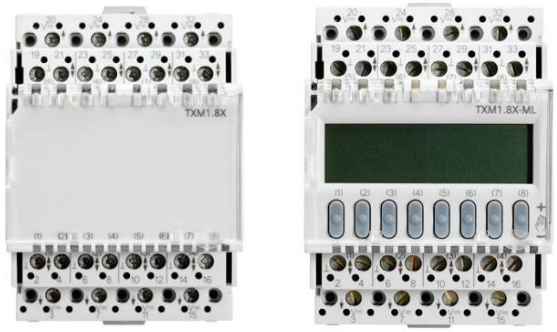
- Analog input voltage 0-10 Vdc
- Analog output voltage 0-10 Vdc

TXM1.8U-ML modules are also equipped with a local override/identification device (LOID), which includes an LCD signal display. The LCD displays the following information for each I/O point:

- Configured signal type
- Symbolic display of process value
- Notification of faulty operation, short circuit, or sensor open circuit

Orange LEDs indicate override status individually per point.

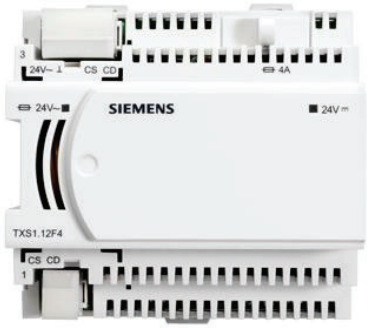
Super Universal Modules (TXM1.8X and TXM1.8X-ML)



The TXM1.8X and TXM1.8X-ML Super Universal modules share all of the Universal module features, and also provide:

- Analog input current 4-20 mA
- Analog output current 4-20 mA (four current outputs maximum per module on Points 5 through 8)
- 24 Vdc distribution from power supply for sensors at a maximum of 200 mA per module

TX-I/O Power Supply (TXS1.12F4)



The TX-I/O Power Supply generates 24 Vdc at 1.2A to power TX-I/O modules and peripheral devices.

- Up to 4 TX-I/O Power Supplies can be operated in parallel, with a maximum of two per DIN rail.
- It can be located within a row of TX-I/O modules or at the beginning of a new DIN rail.

The TX-I/O Power Supply performs the following functions:

- Transfers 24 Vac at 4A to power TX-I/O modules and peripheral devices.
- Routes CS (+24 Vdc Communication Supply) and CD (Communication Data signal) between DIN rails.
- Provides an input point for 24 Vac to power additional peripheral devices.
- Isolates the 24 Vac peripheral device supply in case of overload or short-circuit with Class 2 distribution. The replaceable AC fuse can be accessed from an installed module.
- Indicates the AC fuse status (via LED) for easy diagnostics.

TX-I/O Bus Connection Module (TXS1.EF4)

The Bus Connection Module transfers DC power for TX-I/O modules and peripheral devices and transfers AC power for peripheral devices.

- It can be located within a row of TX-I/O modules or at the beginning of a new DIN rail.

The TX-I/O Bus Connection Module performs the following functions:

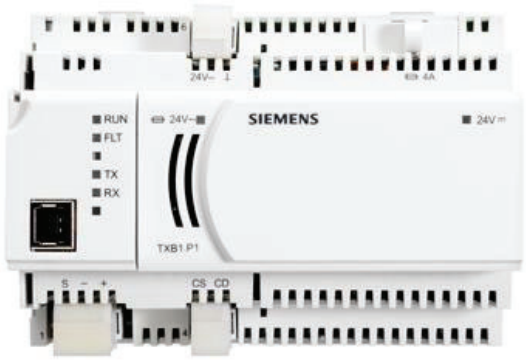
- Routes CS (+24 Vdc Communication Supply) and CD (Communication Data Signal) between DIN rails.
- Provides an input point for 24 Vac to power additional peripheral devices.
- Isolates the 24 Vac peripheral device supply in case of overload or short-circuit with Class 2 distribution. The replaceable AC fuse can be accessed from an installed module.
- Indicates the AC fuse status (via LED) for easy diagnostics.

TX-I/O Island Bus Expansion Module (TXA1.IBE)

The TX-I/O Island Bus Expansion (IBE) module increases the distance between the primary field panel and expansion field panels without affecting the TX-I/O island bus maximum distance.

- An LED provides an indication of island bus communication.
- The IBE converts the TX-I/O island bus signal on the self-forming rail to an RS-485 signal level on the connector.
  - Each IBE module supports a maximum of two RS-485 segments.
  - Each segment may extend up to 200 ft (61 m) from the primary enclosure.
  - The island bus length extended from the primary field panel is added to island bus length extended from any expansion panel. RS-485 segment length between the IBEs does not add to the island bus length.
- The IBE does not transfer power over the RS-485 segment.
- Switches set the IBE as the TX-I/O island bus master (BM) or an RS-485 end-of-line terminator.
- A programming tool is not required.
- A maximum of 5 IBEs may be installed on the island bus: one IBE in the primary enclosure plus one in each expansion enclosure (maximum of 4).
- Only one Island Bus Expansion (IBE) module per enclosure is permitted.
- Expansion enclosures must be supplied using a separate TX-I/O Power Supply. Loss of this power does not affect the primary enclosure.

P1 Bus Interface Module (TXB1.P1 and TXB1.P1-4)



The P1 Bus Interface Module (P1 BIM) provides P1 FLN communication and power for TX-I/O modules. It does not contain application or control for the TX-I/O modules.

The P1 BIM provides the following features:

- Communication on the P1 FLN or MEC Expansion Bus.
- 24 Vac input.
- Generation of 24 Vdc at 600 mA to power TX-I/O modules and peripheral devices.
- Plug-in screw terminals.
- Isolates the peripheral device supply in case of overload or short-circuit with Class 2 distribution. The replaceable AC fuse can be accessed from an installed module.
- Separate LEDs for module operation, FLN communication activity, 24 Vdc present on the TX-I/O island bus, and monitoring of the 24 Vac fuse.

TXB1.P1

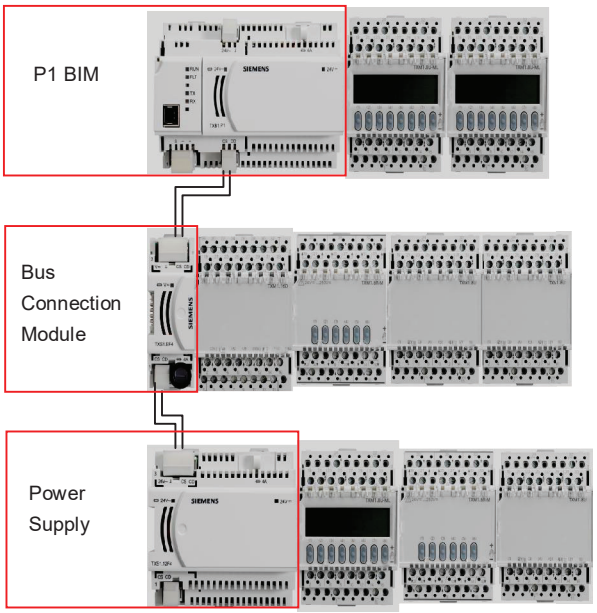
- Support for 80 TX-I/O points.
- Support for up to 10 I/O modules.
- Transfer of 24 Vac at a maximum of 4A to power peripheral devices.
- Up to three TX-I/O Power Supplies can be operated in parallel, max of 2 per DIN.

TXB1.P1-4

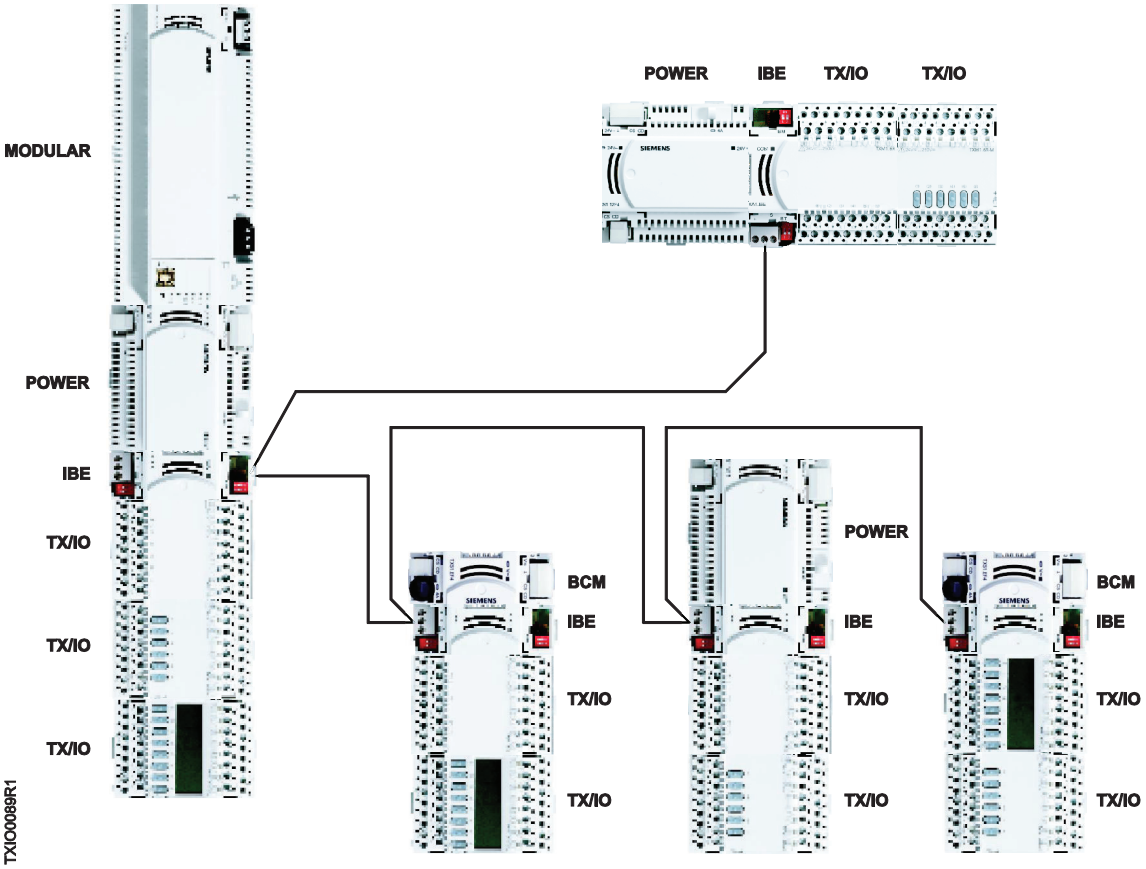
- Support for 64 TX-I/O points.
- Support for up to 4 I/O modules.

TX-I/O island bus Extension

The following picture shows the TX-I/O island bus extended using a Bus Connection Module and TX-I/O Power Supply. This configuration allows the TX-I/O island bus to extend a maximum of 164 feet (50 meters), and may extend outside an enclosure.



The following picture shows the TX-I/O island bus expanded using five Island Bus Expansion modules.



I/O Functions by Module

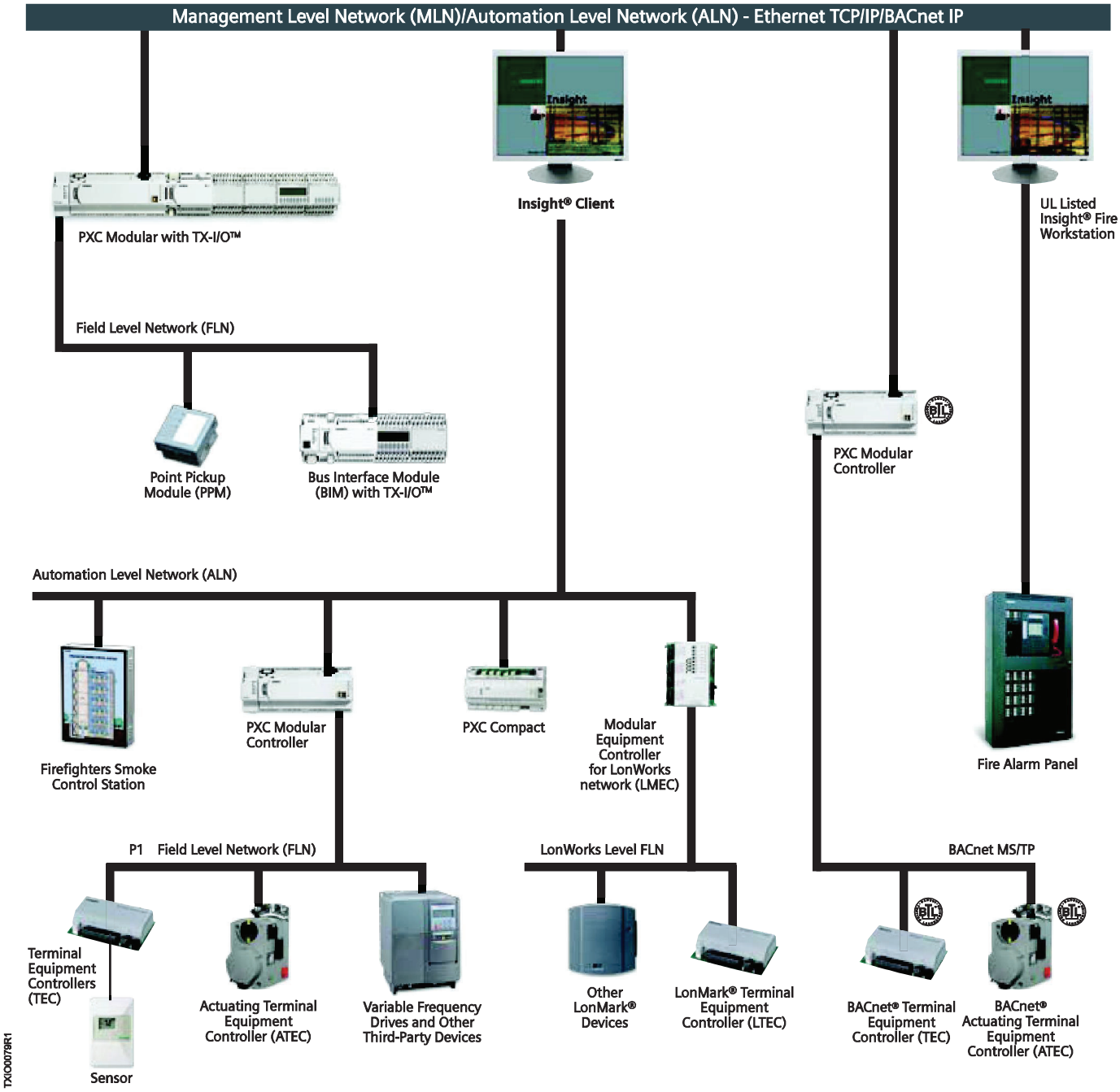
TX-I/O™ function	Description	Module type							
		TXM1.8D	TXM1.16D	TXM1.8U	TXM1.8U-ML	TXM1.8X	TXM1.8X-ML	TXM1.6R	TXM1.6R-M
		Maximum number of functions per module							
Digital inputs									
Binary Input	Status indication, voltage-free/dry contact	8	16	8	8	8	8		
Counter	Count/accumulator, voltage-free/dry pulse contact	8	8	8	8	8	8		
Analog Inputs									
	Temperature LG-Ni1000			8	8	8	8		
	Temperature Pt 1000 375			8	8	8	8		
	Temperature Pt 1000 385			8	8	8	8		
	Temperature (NTC) 10 K			8	8	8	8		
	Temperature (NTC) 100 K			8	8	8	8		
	Voltage, DC 0, 10V *			8	8	8	8		
	Current DC 4, 20 mA *					8	8		
Digital outputs									
BO OnOff	Latched contact, AC/DC 250V, 4A							6	6
BO Pulse	Pulse							6	6
Analog Outputs									
	DC 0..10 V *			8	8	8	8		
	DC 4 ... 20 mA *					4	4		

* Active inputs and active outputs (0-10V and 4-20 mA) must be located on different modules if sensors are externally powered.

TX-I/O Network Architecture Example

The following architecture picture shows TX-I/O modules connected to:

- A P1 BIM located on the Field Level Network.
- A PXC Modular on Ethernet TCP/IP.



Specifications:

Dimensions (L × W × D)	
TX-I/O Modules	2.52” × 3.54” × 2.75” (64 mm × 90 mm × 70 mm)
TX-I/O P1 BIM	5” × 3.54” × 2.75” (128 mm × 90 mm × 70 mm)
TX-I/O Power Supply	3.78” × 3.54” × 2.75” (96 mm × 90 mm × 70 mm)
TX-I/O Bus Connection Module	1.26” × 3.54” × 2.75” (32 mm × 90 mm × 70 mm)
TX-I/O Island Bus Expansion (IBE) Module	1.26” × 3.54” × 2.75” (32 mm × 90 mm × 70 mm)
Electrical	
Power Requirements	24 Vac +/-20% input @ 50 or 60 Hz
Power Consumption	
Power Supply	35 VA with 96 VA pass-thru
Bus Connection Module	0 VA with 96 VA pass-thru
TX-I/O P1 BIM	20 VA with 96 VA pass-thru
With the above power consumption, the Power Supply produces 28.8 W (1.2A at 24 Vdc) and the P1 BIM provides 14.4 W (0.6A at 24 Vdc) to be used by the following:	
TXM1.8D	1.1 W
TXM1.16D	1.4 W
TXM1.8U	1.5 W
TXM1.8U-ML	1.8 W
TXM1.8X	2.2 W
TXM1.8X-ML	2.3 W
TXM1.6R	1.7 W
TXM1.6R-M	1.9 W
Island Bus Expansion Module	1.2 W
Terminations	
I/O Terminals	20-12 AWG Solid 20-14 AWG Stranded
Power Supply, BCM, P1 BIM, and IBE	2-, 3-, or 4-position screw terminal pluggable blocks
Operating Environment	32°F to 122°F (0°C to 50°C), 5 to 95% rh, non-condensing
Agency Listings	UL 864 UUKL Smoke Control Equipment ULC/ORD-C100-1992 UUKL7 Smoke Control Equipment UL 916 PAZX CSA 22.2 No. 205 PAZX7
Agency Compliance	FCC Compliance Australian EMC Framework (C-Tick) European EMC Directive (CE) European Low Voltage Directive (LVD) RoHS Compliant

Ordering Information

TX-I/O I/O Modules

Product Number	Description
TXM1.8D	TX-I/O Module, 8 DI points
TXM1.16D	TX-I/O Module, 16 DI points
TXM1.8U	TX-I/O Module, 8 Universal points
TXM1.8U-ML	TX-I/O Module, 8 Universal points with LOID
TXM1.8X	TX-I/O Module, 8 Super Universal points
TXM1.8X-ML	TX-I/O Module, 8 Super Universal points with LOID
TXM1.6R	TX-I/O Module, 6 DO with Relay points
TXM1.6R-M	TX-I/O Module, 6 DO with Relay points with manual override

TX-I/O Power Supply and Bus Modules

Product Number	Description
TXS1.12F4	TX-I/O Power Supply, 1.2 A, 4A Fuse
TXS1.EF4	TX-I/O Bus Connection Module, 4A Fuse
TXA1.IBE	TX-I/O Island Bus Expansion Module with RS-485 connection.
TXB1.P1	TX-I/O Bus Interface Module, P1, 10-module
TXB1.P1-4	TX-I/O Bus Interface Module, P1, 4-module

Accessories

Product Number	Description
TXA1.K12	One set of address keys, numbers 1-12
TXA1.K24	One set of address keys, numbers 1-24
TXA1.K-48	One set of address keys, numbers 25-48
TXA1.K-72	One set of address keys, numbers 49-72
TXA1.LLT-P100	Labels for TX-I/O 100 sheets/pack Letter format
TXA1.LH	Replacement label holders

Regions where this Product is Sold

(US, Asia Pacific, Canada, Latin America, UK)

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Document No. 149-476
Printed in the USA

AFB24-SR Technical Data Sheet

Modulating, Spring Return, AC 24 V/DC, for DC 2…10 V or 4…20 mA Control Signal

Torque min. 180 in-lb, Control DC 2…10 V, Feedback DC 2…10 V

Application

For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. The actuator operates in response to a DC 2...10 Vor, with the addition of a 500Ω resistor, a 4...20 mA control input from an electronic controller or positioner. A DC 2...10 V feedback signal is provided for position indication.

A common installation technique for control of multi-section dampers is to use the U5 position feedback of one actuator (Master) to control multiple actuators (Slaves). Belimo refers to this as Master/Slave control. The only requirement is that the actuators are installed on MECHANICALLY SEPARATE damper shafts.

Operation

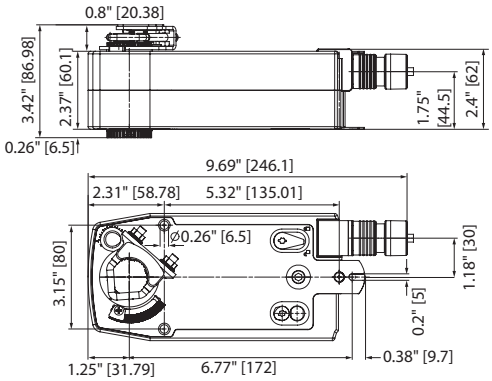
The AF..24-SR series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The AF..24-SR series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The AF..24-SR uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The AF..24-SR actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

ATTENTION: AF..24-SR cannot be tandem mounted on the same damper or valve shaft. Only On/Off and MFT AF.. models can be used for tandem mount applications.

Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	5.5 W
Power consumption in rest position	3 W
Transformer sizing	8.5 VA (class 2 power source)
Shaft Diameter	1/2...1.05" round, centers on 1/2" and 3/4" with insert, 1.05" without insert
Electrical Connection	18 GA appliance cable, 3 ft [1 m], with 1/2" conduit connector
Overload Protection	electronic throughout 0...95° rotation
Electrical Protection	actuators are double insulated
Operating Range	2...10 V, 4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
Position Feedback	2...10 V, Max. 0.5 mA
Angle of rotation	95°, adjustable with mechanical end stop, 35...95°
Torque motor	180 in-lb [20 Nm]
Direction of motion motor	selectable with switch 0/1
Direction of motion fail-safe	reversible with cw/ccw mounting
Position indication	Mechanical
Manual override	5 mm hex crank (3/16" Allen), supplied
Running Time (Motor)	95 s
Running time fail-safe	<20 s @ -4...122°F [-20...50°C], <60 s @ -22°F [-30°C]
Ambient humidity	max. 95% r.H., non-condensing
Ambient temperature	-22...122°F [-30...50°C]
Storage temperature	-40...176°F [-40...80°C]
Degree of Protection	IP54, NEMA 2, UL Enclosure Type 2
Housing material	Galvanized steel and plastic housing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
Noise level, motor	40 dB(A)
Noise level, fail-safe	62 dB(A)
Servicing	maintenance-free
Quality Standard	ISO 9001
Weight	4.1 lb [1.9 kg]

†Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 3

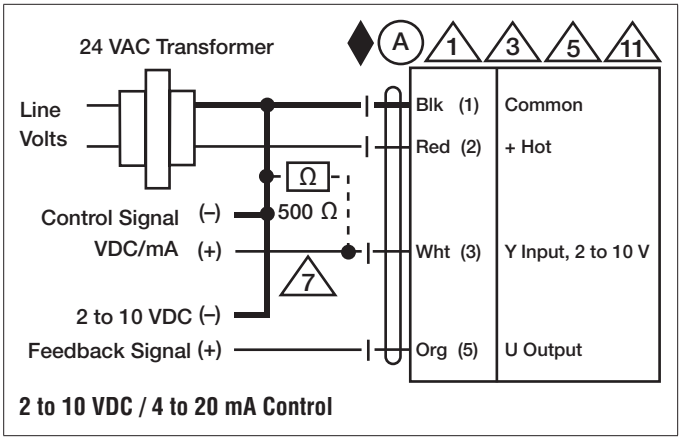
Dimensions (Inches[mm])



AFB24-SR Technical Data Sheet

Modulating, Spring Return, AC 24 V/DC, for DC 2...10 V or 4...20 mA Control Signal

Accessories	
AF-P	Anti-rotation bracket AF/NF.
AV8-25	Shaft extension
IND-AFB	End stop indicator
K7-2	Shaft clamp reversible
KG10A	Ball joint
KG8	Ball joint
KH10	Damper crank arm
KH8	Damper crank arm
KH-AFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
ZG-100	Univ. right angle bracket 17"x11-1/8"x6" (HxWxbase).
ZG-101	Univ. right angle bracket 13x11x7-7/16" (HxWxbase).
ZG-109	Right angle bracket for ZS-260.
ZG-110	Stand-off bracket for ZS-260.
ZG-118	AFB(X)/NFB(X) U bracket 5-7/8x5-1/2x2-19/32" (HxWxD).
ZG-120	Jackshaft mounting bracket.
ZG-AFB	Mounting kit for linkage operation
ZG-AFB118	AFB(X)/NFB(X) crankarm adaptor kit.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-JSA-1	1" diameter jackshaft adaptor (11" L).
ZG-JSA-2	1-5/16" diameter jackshaft adaptor (12" L).
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
ZS-100	Weather shield - galvaneal 13x8x6" (LxWxD).
ZS-101	Base plate for ZS-100.
ZS-150	Weather shield - PC w/ foam seal 16x8-3/8x4" (LxWxD).
ZS-260	Explosion proof housing.
ZS-300	NEMA 4X, 304 stainless steel enclosure.
ZS-300-5	NEMA 4X, 316L stainless steel enclosure.
Z-SF	Base plate extension
IRM-100	Input rescaling module for modulating actuators.
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Low voltage and control signal simulator.
PTA-250	Pulse width modulation interface for modulating actuators.
SGA24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
SGF24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
TF-CC US	Cable conduit connector, 1/2".
ZG-R01	4 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.
ZG-SGF	Mounting plate for SGF.
ZG-X40	120 to 24 VAC, 40 VA transformer.



2 to 10 VDC / 4 to 20 mA Control

Typical Specification

Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Wiring Diagrams

WARNING! LIVE ELECTRICAL COMPONENTS!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Meets cULus requirements without the need of an electrical ground connection.

A Actuators with appliance cables are numbered.

1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4 to 20 mA control signal to 2 to 10 VDC.

11 Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.

LMB24-SR Technical Data Sheet

Modulating, Non-Spring Return, 24 V, for DC 2…10 V or 4…20 mA

Torque min. 45 in-lb, for control of damper surfaces up to 11 sq. ft.

Application

For proportional modulation of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. The actuator is mounted directly to a damper shaft from 1/4" up to 5/8" in diameter by means of its universal clamp. Shafts up to 3/4" diameter can be accommodated by an accessory clamp. The actuator operates in response to a 2 to 10 VDC, or with the addition of a 500 Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication or master-slave applications.

Operation

The actuator is not provided with and does not require any limit switches, but is electronically protected against overload. The anti-rotation strap supplied with the actuator will prevent lateral movement.

The LMB series provides 95° of rotation and a visual indicator indicates position of the actuator. When reaching the damper or actuator end position, the actuator automatically stops. The gears can be manually disengaged with a button on the actuator cover.

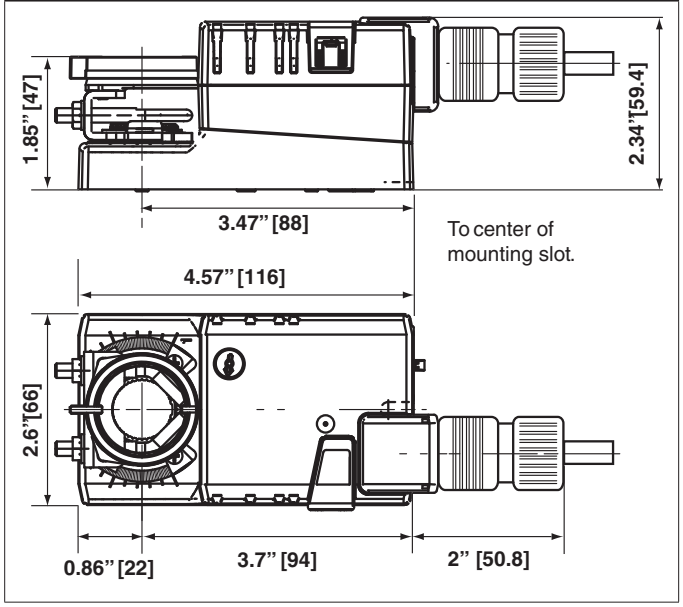
The LMB24-SR… actuators use a sensorless brushless DC motor, which is controlled by an Application Specific Integrated Circuit (ASIC). The ASIC monitors and controls the actuator's rotation and provides a digital rotation sensing (DRS) function to prevent damage to the actuator in a stall condition. Power consumption is reduced in holding mode.

Add-on auxiliary switches or feedback potentiometers are easily fastened directly onto the actuator body for signaling and switching functions.

Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, ±10%
Power consumption in operation	1.5 W
Power consumption in rest position	0.4 W
Transformer sizing	3 VA (class 2 power source)
Shaft Diameter	1/4...5/8" round, centers on 5/8", 3/4" clamp available
Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
Overload Protection	electronic throughout 0...95° rotation
Operating Range	2...10 V, 4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
Position Feedback	2...10 V, Max. 0.5 mA
Angle of rotation	Max. 95°, adjustable with mechanical stop
Torque motor	45 in-lb [5 Nm]
Direction of motion motor	selectable with switch 0/1
Position indication	Mechanically, 30...65 mm stroke
Manual override	external push button
Running Time (Motor)	95 s, constant, independent of load
Ambient humidity	max. 95% r.H., non-condensing
Ambient temperature	-22...122°F [-30...50°C]
Storage temperature	-40...176°F [-40...80°C]
Degree of Protection	IP54, NEMA 2, UL Enclosure Type 2
Housing material	UL94-5VA
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU
Noise level, motor	35 dB(A)
Servicing	maintenance-free
Quality Standard	ISO 9001
Weight	1.2 lb [0.55 kg]

†Rated Impulse Voltage 800V, Type action 1, Control Pollution Degree 3.

Dimensions (Inches[mm])



LMB24-SR Technical Data Sheet

Modulating, Non-Spring Return, 24 V, for DC 2...10 V or 4...20 mA

Typical Specification

Proportional control damper actuators shall be electronic direct-coupled type, which require no crank arm and linkage and be capable of direct mounting to a shaft from 1/4" to 5/8". Actuators must provide control in response to a control input from an electronic controller or positioner. Actuators shall have brushless DC motor technology and be protected from overload at all angles of rotation. Actuators shall have reversing switch and manual override on the cover. Run time shall be constant and independent of torque. Actuators shall be cULus listed, have a 5-year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Wiring Diagrams

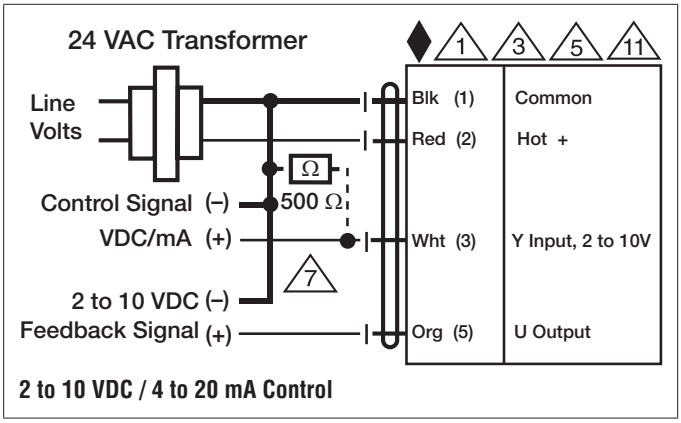
1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4 to 20 mA control signal to 2 to 10 VDC.

11 Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.



2 to 10 VDC / 4 to 20 mA Control

BELIMO

Technical data sheet LMB24-SR

Modulating, Non-Spring Return, 24 V, for DC 2...10 V or 4...20 mA

Proportional, Non-Spring Return, 24 V, for 2 to 10 VDC or 4 to 20 mA, Torque min. 45 in-lb for control of damper surfaces up to 11 sq ft.

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	1.5 W
	Power consumption in rest position	0.4 W
	Transformer sizing	3 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
	Overload Protection	electronic throughout 0...95° rotation
Functional data	Torque motor	45 in-lb [5 Nm]
	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	Max. 95°, adjustable with mechanical stop
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	95 s, constant, independent of load
	Running time motor note	constant, independent of load
	Noise level, motor	35 dB(A)
	Shaft Diameter	1/4...5/8" round, centers on 5/8", 3/4" clamp available
	Position indication	Mechanically, 30...65 mm stroke
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	1.2 lb [0.55 kg]

Materials	Housing material	UL94-5VA

Product features

Application

For proportional modulation of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. The actuator is mounted directly to a damper shaft from 1/4" up to 5/8" in diameter by means of its universal clamp. Shafts up to 3/4" diameter can be accommodated by an accessory clamp. The actuator operates in response to a 2 to 10 VDC, or with the addition of a 500 Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication or master-slave applications.

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Typical specification

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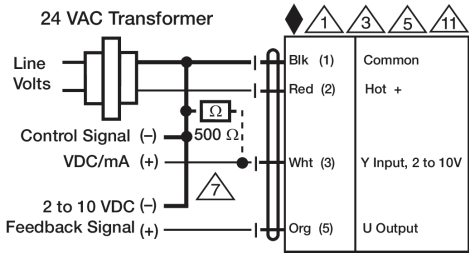
Accessories

Electrical accessories

Description	Type
Auxiliary switch 2 x SPDT add-on	S2A

Electrical installation

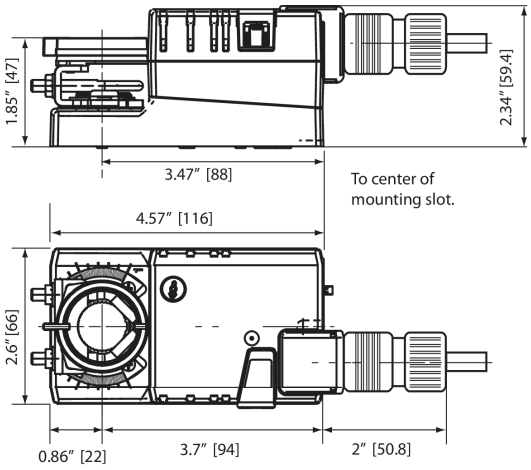
1 Provide overload protection and disconnect as required.
3 Actuators may also be powered by 24 VDC.
5 Only connect common to negative (-) leg of control circuits.
7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.
11 Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.



2...10 V / 4...20 mA Control

Dimensions

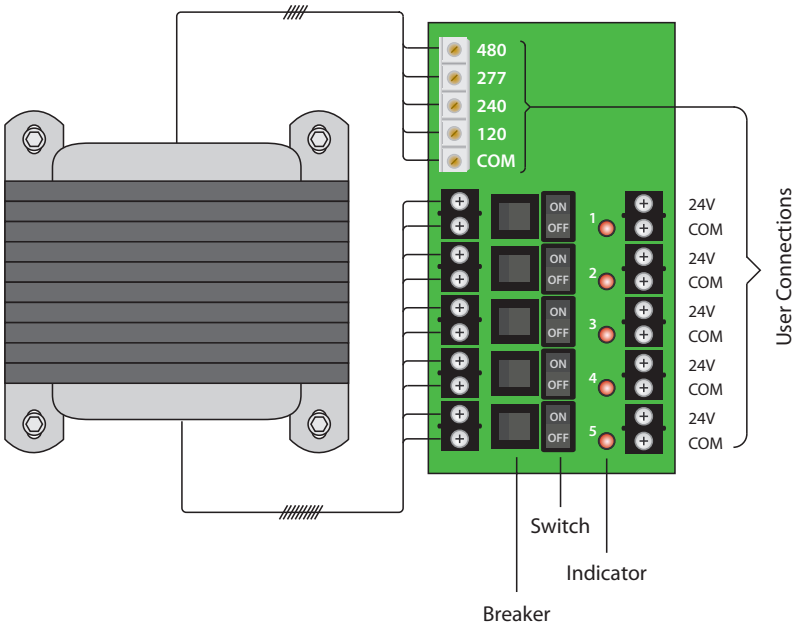
Dimensional drawings



Functional Devices, Inc. • p: 800.888.5538 • f: 765.883.7505 • www.functionaldevices.com • sales@functionaldevices.com

PSH500A-LVC

Enclosed 500VA Power Supply, High/Low Voltage Separation with Five 100VA Class 2 Outputs, 480/277/240/120 Vac to 24 Vac



AC Power Supply

PSH500A-LVC
Shown Without High Voltage Cover & Low Voltage Access Plate

PSH500A-LVC
Shown Without Low Voltage Access Plate

PSH500A-LVC
Shown With Full Cover & Access Plate

c UL us LISTED Class 2

CE

RoHS

Made in USA
Meets "Buy American" of ARRA 2009

Specifications

Transformer: One (1) 500 VA
Over Current Protection: Circuit Breaker
Primary: 480/277/240/120 Vac
Frequency: 50/60 Hz
Dimensions: 12.125˝ x 12.125˝ x 6.000˝
Approvals: Class 2 (UL Approved UL5085-3), UL916, C-UL, CE, RoHS, Special Seismic Certification of Equipment and Components: OSP-0201-10^
Housing: NEMA1 Metal Enclosure with high/low separation
Weight: 32.30 lbs.

5 Secondaries:
24 Vac, with LED Indicators
4 Amp breaker for each output

24 Vac ON/OFF:
On / Off Switch & Breaker

Input:
480/277/240/120 Vac Finger-Safe Terminals, 8-18 AWG

Output:
5 Ungrounded, Isolated, 100 VA Class 2, 24 Vac Outputs. Removable Terminals accept16-22 AWG wire.

Ambient Temperature Derating:
4A up to 40˚ C ; 3A up to 50˚ C ; 2A up to 55˚ C
(When All 5 Outputs Operated Simultaneously)

Notes:
^Design is in accordance with ASCE 7-05 Chapter 13: www.oshpd.ca.gov/FDD/Pre-Approval/OSP-0201-10.pdf

Standby Wattage:
48.515 W @ 120 Vac
48.699 W @ 240 Vac
49.564 W @ 277 Vac
48.255 W @ 480 Vac

Full Load Primary Current:
4.66 A @ 120 Vac
2.41 A @ 240 Vac
2.06 A @ 277 Vac
1.17 A @ 480 Vac

Secondary Output Voltage vs. Load:
24.0 V @ 1 Amp
23.0 V @ 2 Amp
21.8 V @ 3 Amp
21.1 V @ 4 Amp

- With 240 Vac primary input voltage
- When all 5 outputs operated simultaneously, at room temperature

“The safest, most cost-effective proof of flow for fans and pumps is with Senva Sensors.”

Reduce the risk of arc flash with Senva.

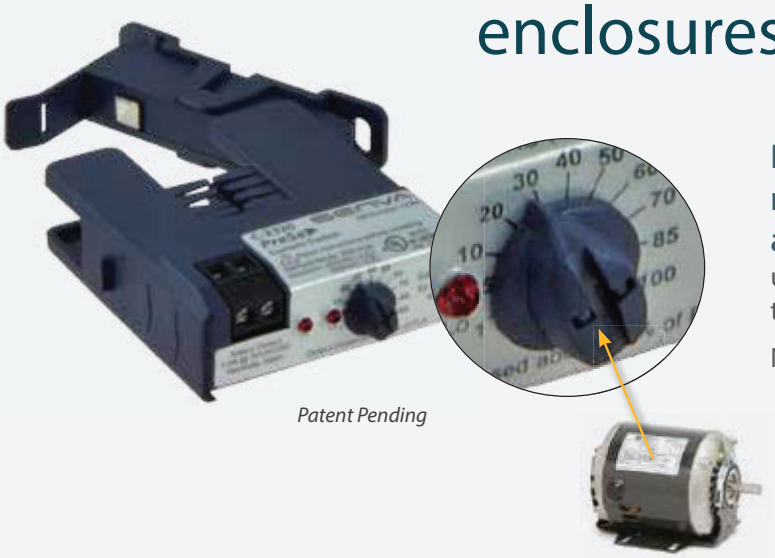
No guesswork. Multi-turn adjustments are a thing of the past.

Save over 1/2 hour per sensor install.

If you’re calibrating current sensors in energized enclosures, you’re wasting time and money.

Worse, you should be suiting up for arc flash protection (yes, it’s OSHA code). If you’re not, you’re exposed to injury and liability. Senva makes it safe, simple, and profitable.

Thanks to PRESET™ you’ll never calibrate in live enclosures again!



Patent Pending

Preset™ sensors let you set the dial to the motor amperage. You can install the sensor and never return back to calibrate. Installers tell us they save over ½ hour per sensor. Plus, they’re safe. You do the math.

Never calibrate live again!

PreSet™

Set the sensor to motor full load amps—never return to calibrate!

PreSet™ Current Switches

Scaled calibration for proof of flow set-point
Split and solid core models to 150A
N.O. 30VAC/DC or 120VAC output
Optional command relay

Patent Pending

DESCRIPTION

PreSet™ allows for matching sensor set-point to the motor nameplate, eliminating the need to calibrate in energized enclosures and reducing installation time . It will detect motor undercurrent conditions such as belt loss, coupling shear, and mechanical failure on fans and pumps.

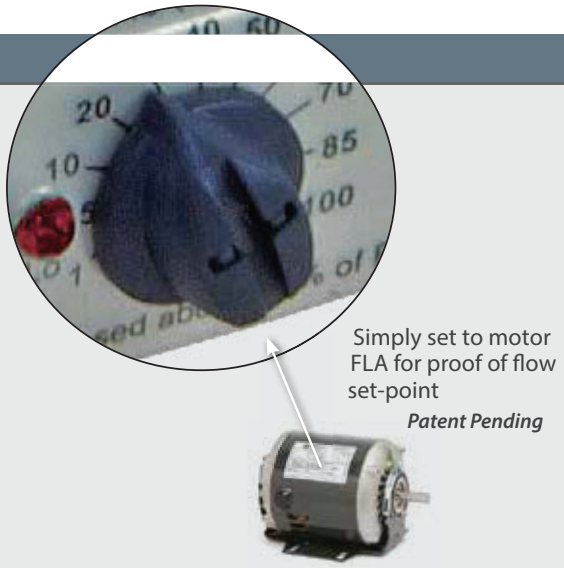
APPLICATIONS

- Detecting belt loss, coupling shear, and mechanical failure on fans and pumps
- Monitoring status of industrial processes
- Monitoring status of critical motors

FEATURES

Save time and money while eliminating calibration inside energized enclosures

- Preset™ scaled calibration enables set-point adjustment for proof of flow by simply matching dial to motor full load amps (FLA) nameplate
- Safer: Eliminates calibration in energized enclosures,
- reduces arc flash hazard
- No need to return to calibrate—saves time and money
- Super low turn-on

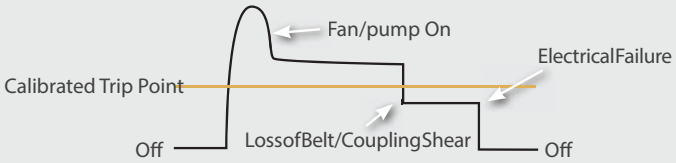


Maintenance-free—no call backs

- Superior to traditional adjustable CTs and pressure switches
- Industry leading 7 year warranty

SET-POINT OPERATION

Detects Belt Loss/Coupling Shear!



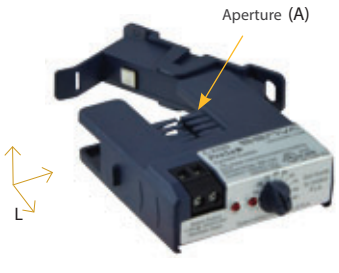
Now you can easily detect when drive belts slip, break, or pump coupling shear. In fact, a typical HVAC motor that loses its load has a reduction of current draw of up to 50%. That's why our sensors are the industry standard for status.

No hazardous guesswork. Multi-turn adjustments are a thing of the past.

Reduce the risk of arc flash because sensor is calibrated to motor FLA nameplate

Save over 1/2 hour per sensor install—based on field productivity tests.

SPLIT CORE
C-2320



L: 2.5" H: 0.57" W: 2.23"
A: 0.75"x 0.75"

- Mount sensor without removing conductor for installation savings
- Clamp on conductor with iris, or use detachable base to screw or DIN mount
- Larger 0.75" aperture accomodates oversize conductors

OPTIONAL RELAY
for additional labor savings

L: .84" H: .72" W: 2.06"

- Add to 2320 series to get start/stop/status in a single device
- Reduces the number of installed components... saves time and space
- Removable relay facilitates service

SPLIT CORE - MINI
C-2220

L: 2.02" H: 0.76" W: 1.62"
A: 0.42"x 0.35

- Mount sensor without removing conductor for installation savings
- Fits in small enclosures
- Clamp on conductor with iris, or screw mount detachable base

SOLID CORE
C-1320

L: 2.26" H: 0.97" W: 1.6"
A: 0.51" diameter

- Compact design
- Aperture accomodates spade terminals

SOLID CORE - MINI
C-1220

L: 1.91" H: .88" W: 1.31"
A: .23" diameter

- Super small—fits anywhere
- Low cost

Detailed dimensions, see page 20
CADdrawingsseewww.senvainc.com/cad

ORDERING INFORMATION

SPLIT CORE	Min (on)	Max A	N.O. Output*	Trip LED	Power LED
C-2320L	1.25A	50A	1.0A@30VAC/DC	•	•
C-2320	1.25A	100A	1.0A@30VAC/DC	•	•
C-2320H	1.25A	150A	1.0A@30VAC/DC	•	•
C-2320HV	1.25A	100A	0.2A@120VAC	•	•
C-2320HV-L	1.25A	50A	0.2A@120VAC	•	•
SPLIT CORE - MINI					
C-2220	1.00A	50 A	1.0A@30VAC/DC	•	
SOLID CORE					
C-1320	0.75A	50 A	1.0A@30VAC/DC	•	
SOLID CORE - MINI					
C-1220L	0.75A	5 A	1.0A@30VAC/DC	•	
C-1220	0.75A	50 A	1.0A@30VAC/DC	•	
C-1220HV-L	0.75A	5 A	0.2A@120VAC	•	
C-1220HV	0.75A	50 A	0.2A@120VAC	•	

COMMAND RELAY	Contact rating	Coil
CR3-24	N.O. 10(5)@250VAC	24VAC/DC 10mA
CR4-24	N.C. 10(5)@250VAC	24VAC/DC 10mA
CR3-12	N.O. 10(5)@250VAC	12VDC 25mA
CR4-12	N.C. 10(5)@250VAC	12VDC 25mA

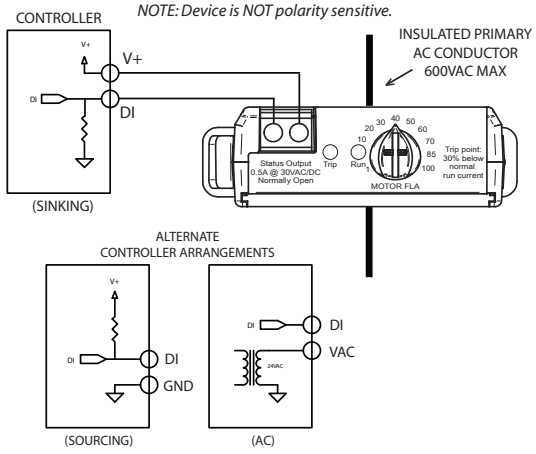
Other coil voltages available—consult factory

Ordering tip: For best resolution, choose the sensor lowest maximum amperage which accomodates your motor (e.g. 0-50A us -L, 50-100A use standard, 100 to 150A use -H

SPECIFICATIONS

Standard Output Rating	1.0A@30VAC/DC
Line Voltage Output Rating	0.2A@120VAC (-HV ONLY)
Output Type	NO, solid-state FET
Temperature Rating	-15-60 ° C
Insulation Class	600V RMS. For use on insulated conductors only! Use minimum 75 ° C insulated conductor
Sensor Power	Induced
Frequency Range	50/60Hz

TYPICAL WIRING



Warning: Refer to installation instructions that accompany product and heed all safety instructions. Do not rely on current status LED to indicate presence of power.

LOOP POWER LCD

Wall Display for 4-20 mA Devices

The A/LCD-R-4-20MA is a low power, high accuracy, 3.5 digit LCD display module that is available in an attractive wall mount enclosure. The A/LCD-R-4-20MA may be used with any 4 to 20 mA loop powered Temperature, Relative Humidity, Current, and Differential or Gage Pressure transmitter. The display can be calibrated for any range between (-) 1999 and 1999 and has factory set descriptors which include C, F, and a decimal point. A great solution for remote monitoring of any 4-20 mA loop powered device, these units are designed to be mounted over a single gang junction box or hole in the wall using drywall anchors. Screw terminal blocks are available for making all connections to your building management system (network). An optional 1/8" Black foam pad with pressure sensitive adhesive is available to insulate the sensor from thermal drafts within the wall or wall surface. A 1/16" Hex driver is needed to secure the cover from being easily removed.

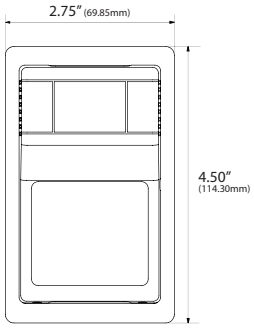
Applications: Remote Monitoring of any 4-20 mA Output Device

ACI's LCD-R series is covered by ACI's Five (5) Year Limited Warranty. The warranty can be found in the front of ACI's Sensors & Transmitters catalog, as well as on ACI's website, www.workaci.com

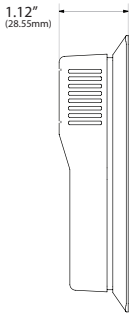
PRODUCT SPECIFICATIONS

Input:	2 Wire, 4-20 mA current loop
Maximum Voltage Drop:	+7 VDC for LCD Display
Display Accuracy:	+/- 0.5% of span
LCD Resolution | Descriptors:	3 ½ Digit LCD (-199.9 to 199.9) | F (Fahrenheit), C (Centigrade) or No Descriptor
Override Contact Type | Contact Ratings:	Dry Contact "N/O" Contact | Minimum: 10 uA @ 1 VDC; Maximum: 50 mA @ 24 VDC
Override Contact Resistance | Life Expectancy:	0.1 Ohms maximum | 100,000 Cycles
Set Point Accuracy:	+/- 10% | 4-20 mA: 4 mA (Far Left) | 20 mA Far Right (DA- Direct Acting (Default) 20 mA (Far Left / 4 mA Far Right (RA- Reverse Acting (Optional)
Setpoint Indication:	Cool/Warm
Setpoint Supply Voltage: (4 to 20 mA Only):	+24 VDC +/-10%
Operating Temperature Range:	35 to 131ºF (1.5 to 55ºC)
Storage Temperature Range:	-40 to 160ºF (-40 to 71ºC)
Operating Relative Humidity Range:	5 to 95% non-condensing
Enclosure Color:	Beige (Standard)
Enclosure Material | UL Flammability Rating:	ABS Plastic | UL94-HB
Connections | Wire Size:	Screw Terminal Blocks | 16 (1.31 mm²) to 26 AWG (0.129 mm²)
Terminal Block Torque Rating:	0.5 Nm (Minimum); 0.6 Nm (Maximum)
Product Dimensions:	(L) 4.50" (1.00 mm) x (W) 2.78" (70.6 mm) x (H) 1.00" (25.4 mm)
Product Weight:	"-R/RS/RO" Series: 0.17 lbs (0.375 kg) | "-RSO" Series: 0.21 lbs (0.46 kg)
Agency Approvals:	RoHS2, WEEE

DIMENSIONAL DRAWING



Front View



Right View

Top View

STANDARD ORDERING

Model # Example: A/LCD-R-420 -OR- 122451

Model #	Item #	Description
A/LCD-R-420	122451	Room with Display, 4-20 mA Loop Power
A/LCD-RO-420	139485	Room with Display, Override, 4-20 mA Loop Power
A/LCD-RS-420*	122454	Room with Display, Setpoint, 4-20 mA Loop Power
A/LCD-RSO-420*	122463	Room with Display, Override, Setpoint, 4-20 mA Loop Power

Note*: Must specify a Temperature Span in ºF, ºC or Descriptor

ACCESSORIES ORDERING

Model # Example: LOCKING COVER -OR- 107370

Model #	Item #	Description
A/MOUNTING PLATE BEIGE R	106821	Wall Mounting Back Plate, Plastic, Beige ("R")
A/MOUNTING PLATE WHITE R	143369	Wall Mounting Back Plate, Plastic, White ("R")
LOCKING COVER	107370	Clear Thermostat Guard, Locking Cover, Low Profile
A/ROOM-FOAM-PAD	125690	1/8" Foam Insulation Pad with Adhesive (3" x 2", Black)

SIEMENS

Technical Instructions
Document No. 155-052P25
SW 141-1
June 17, 2010

Powers™ Controls

SW 141 Differential Static Airflow Switches

141-0518

Description

The SW 141 Airflow Switch senses static differential pressure and the diaphragm operated snap switches actuate electrical circuits. Auto reset and manual reset models are available.

Application

Auto reset switches (141-0518 and 141-0574) should be used for applications requiring positive proof of airflow (or fan operation) or to detect high differential pressures associated with dirty air filters or similar maintenance alarms not requiring safety lock-out (shut down) of the fan.

The manual reset switch (141-0575) should be used for applications requiring safety lock out (shut down) of the fan. The switch can be used on the fan discharge (positive pressure), fan inlet (negative pressure), or across the fan (differential pressure) to detect excessively high positive pressures or low negative pressures, and turn off the fan before damage occurs to ducts or dampers.

Product Numbers

Table 1.

Product Number	Setpoint Range (Field Adjustable)	Setpoint * Accuracy	Switching * Differential	Switching Action
141-0518	1” to 12” WC (250 Pa to 3000 Pa)	@ 12” ± 1.5” WC (3000 Pa ± **375** Pa)	Approx. 0.6” to 1.5” WC **(150 Pa to 375 Pa)**	SPDT/ Auto Reset
141-0575	1” to 12” WC (250 Pa to 3000 Pa)	@ 12” ± 1.5” WC (3000 Pa ± **375** Pa)	Not Applicable	SPST/ Manual Reset
141-0574	0.05” to 1.0” WC (12.5 Pa to 250 Pa)	@ 1”±0.2“ WC (250 Pa ± 50 Pa)	Approx. 0.06**"** to 0.6” WC **(15 Pa to 150 Pa)**	SPDT/ Auto Reset

***** Setpoint accuracy **tolerance** and switching differential decrease proportional to setpoint decrease.

Specifications

	Measured media	Air
	Switch action	
Operating	Auto reset	See Table 1
	Manual reset	Switch is Normally Closed (N.C.) and only opens on increasing pressure signal. Switch must be manually reset by operator
	Ambient temperature range	–40°F to 180°F (–40°C to 82°C)
	Maximum overpressure	0.5 psi (3.4 kPa)
	Mounting position	Diaphragm in any vertical plane
Physical	Electrical ratings	Non inductive - 15 amps @ 120-277 Vac Pilot Duty - 300 VA @ 120-277 Vac
	Conduit opening	One, conduit size 1/2-inch
	Sample line connectors	Two connectors, complete with nuts and ferrules, which accept 1/4-inch OD (6.4 mm) copper or poly tubing
	Material	Aluminized steel
	Agency certification	
	U.L.	MFHX File MH9888
	CSA	1811M25
	Weight	1 lb (0.45 kg)
	Dimensions	See Figure 9

Accessories

High accuracy static pressure sensor	269-062
Static pressure sensing kit	189-142

Operation

The diaphragm operates a spring lever to actuate the snap switch. The manual reset switch keeps the electrical contact open until pushed to reset. Turning the adjustment knob clockwise increases the setpoint.

Installation

Mount the unit with the diaphragm in any vertical plane. Connect the static pressure line(s) as shown in Figure 1.

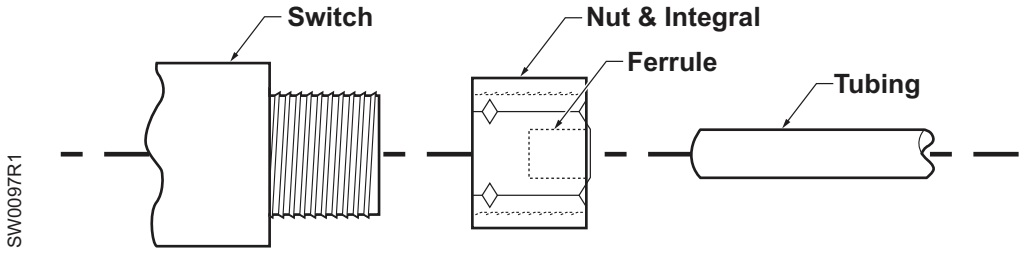


Figure 1. Connecting the Static Pressure Line.

Installation, Continued

For use as a negative pressure switch:

Connect the static pressure line to the low inlet (marked on the case and Figure 2) and leave the high inlet open to the atmosphere.

For use as a positive pressure switch:

Connect the static pressure line to the high inlet (marked on the case and Figure 2) and leave the low inlet open to the atmosphere.

For use as a differential pressure switch:

Connect the highest static pressure line to the high inlet and the lowest static pressure line to the low inlet (marked on the case and Figure 2.)

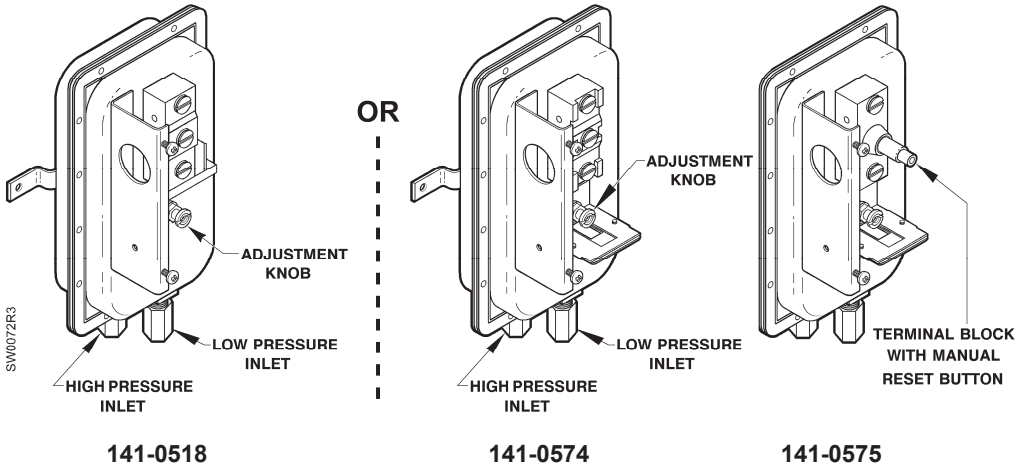


Figure 2. Switches with Covers Removed.

Setpoint Adjustment

Each switch is factory set at the minimum setpoint. See Table 1.

1. To increase the setpoint, turn the adjustment screw clockwise as shown in Figure 2 and Figure 3. From the lowest setpoint, several turns are necessary to engage the adjusting mechanism.

2. Adjust the setpoint until switching occurs at the required point.

3. Check the setpoint for accuracy with a magnahelic gauge.

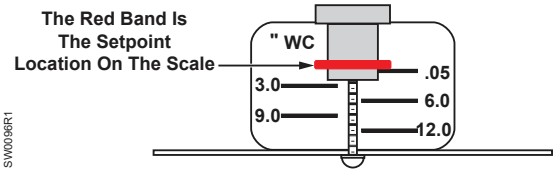


Figure 3. Adjusting the Setpoint.

Pressure Sensors

Pressure sensor selection is based on the medium to be measured, the measurement type (static or velocity), and the required range and accuracy.

Pressure sensors measure the difference between two sensing ports usually labeled high and low. This provides a pressure measurement against a reference. Measuring the pressure inside a pipe or duct and comparing it to the air outside (ambient) the pipe or duct is an example of static pressure measurement. A sensor measuring the pressure differential across a pump or chiller measures velocity pressure.

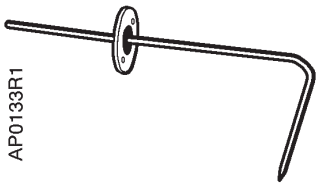


Figure 4. Pitot Tube (Part Number 269-062).

Wiring Diagrams

Before setpoint pressure is applied to the diaphragm, the switch contact is in a normally closed position as shown in Figures 5 and 6.

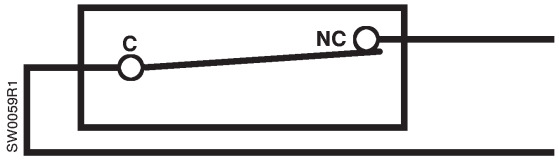


Figure 5. Manual Reset Switch 141-0575.

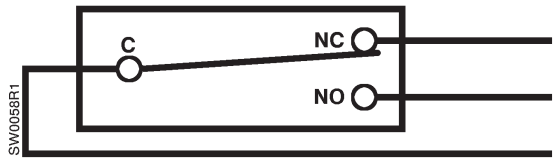


Figure 6. Auto Reset Switches 141-0518 and 141-0574.

SPDT terminals are marked Common (C), Normally Open (NO), and Normally Closed (NC).

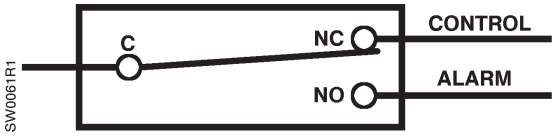


Figure 7. Auto Reset Switches to Prove Excessive Airflow or Pressure.

Wiring Diagrams, Continued

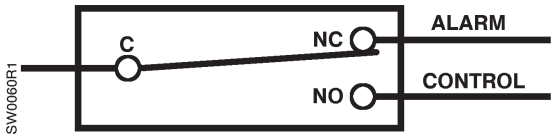


Figure 8. Auto Reset Switches to Prove Insufficient Airflow or Pressure.

Dimensions

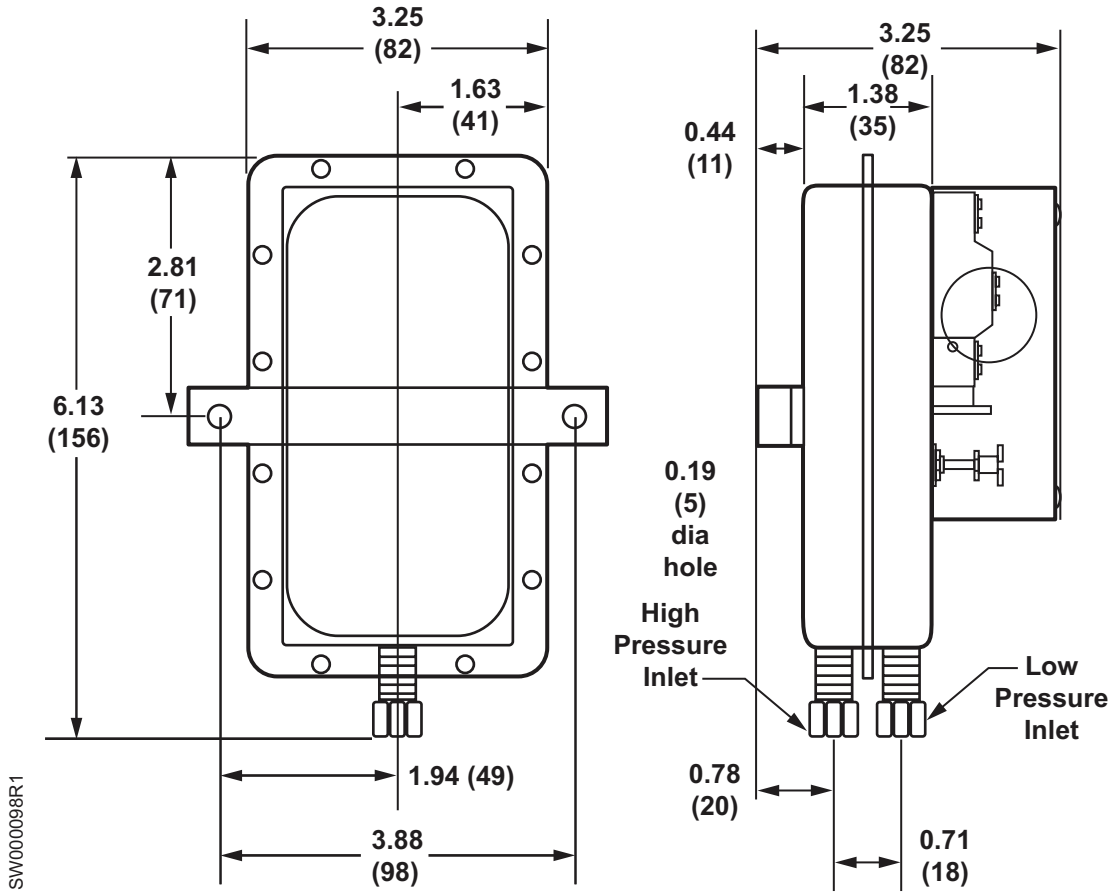


Figure 9. Dimensions in Inches (Millimeters).

P5 Series
Universal Pressure Sensor

5", 10", and 25" versions with four selectable sub-ranges
1250, 2500, 6250 Pa versions with four selectable sub-ranges
Optional LCD display and LED indicator
Dual 0-5/10VDC, 4-20mA (loop and 3-wire)

Versatile probe for duct or remote mount included. Save on probe expense.

DESCRIPTION

The P5 universal dry media pressure transmitter accurately measures multiple ranges optimized for building (zone) pressure, filter measurement, and static duct applications. Selectable outputs and uni/bi directional readings reduce inventory. Innovative static probe integrates with unit or can be mouted remotely for static pressue. Optional LCD for panel mount readings and set up.

APPLICATIONS

- Building (zone) pressure
- Filter condition measurement
- Duct/static

FEATURES

Reduce inventory and ordering errors with universal unit

- Selectable 4-20 mA loop powered, 4-20 mA 3-wire, 0-5VDC, 0-10VDC for compatibility
- Zero calibration push button and remote contact input
- Designed for duct, filter, and remote probe applications in a single universal unit
- Probe is compatible with both 1/8" and 1/4" ID hose

Time & money saving installation for contractors and OEMs

- Non-position sensitive for easy placement
- Dual DIN mount: Side mount for high density OEM applications, flat panel mount for LCD viewable panel mount.
- Conduit ready for for 3/8" flex connectors
- Post mountable with mounting tab indents and wire ties

LED visual status indications of operation

- LED: Power heartbeat, ,momentary rapid flash = auto-zero complete, continual rapid flash = 110% over pressure
- LED facilitates locating sensor in ductwork

PROUDLY MADE IN USA

7 year limited warranty

Conduit ready...no additional parts to buy

Integrated high density mount or flat mount saves valuable panel space.

ORDERING

P5 - [ ] - [ ] [ ] [ ]

Pressure Range

0500 = 0-5" w.c. (w/subranges)
1000 = 0-10"w.c. (w/subranges)
2500 = 0-25"w.c. (w/subranges)
1250Pa = 0-1250Pa (w/subranges)
2500Pa = 0-2500Pa (w/subranges)
6250Pa = 0-6250Pa (w/subranges)

Accuracy

1 = 1% of selected range

Display

L = LCD
X = No Display

Duct Probe

P = Duct Probe
X = No Probe

Example part number P5-0500-1LP is universal pressure sensor, 0-5" full scale range (selectable sub-ranges) with LCD and Duct Probe.

Additional Remote probe

RP-6 Remote/duct probe, 6"

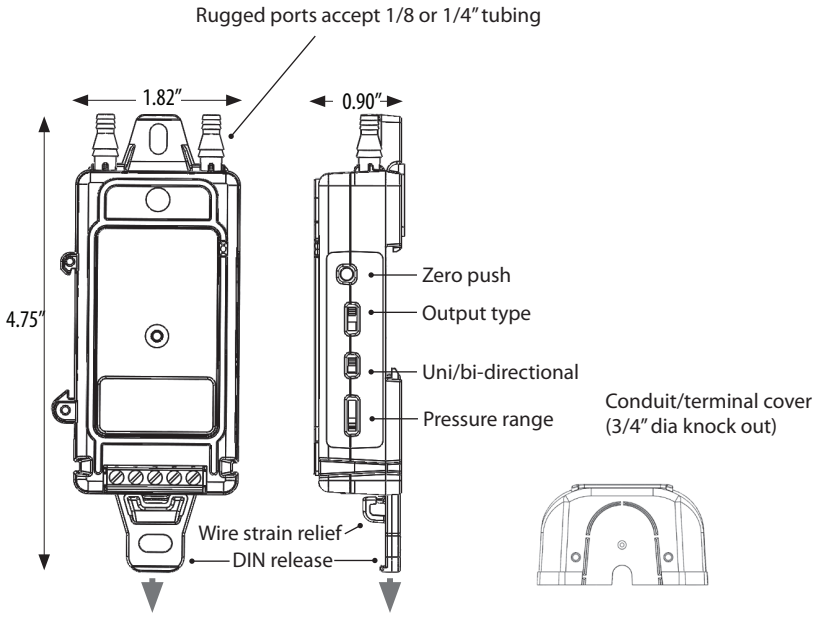
- RP-6 remote probe with integrated dampener for accurate measurements.
- Accepts both 1/8" and 1/4" tubing.
- Note: One probe is standard with product

Integrated dampener for stable readings

SPECIFICATIONS

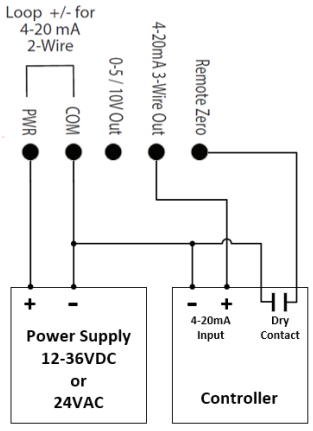
Power Supply		12-30VDC/24VAC(1), 30mA max
Output type	Selectable outputs	4-20mA loop powered, 4-20 mA 3-wire, 0-5VDC, 0-10VDC
Output scaling	P5-0500	0-5" (Selectable 0.1, 0.25, 2.5, 5.0"WC)
	P5-1000	0-10" (selectable 1.0, 2.5 ,5.0, 10"WC)
	P5-2500	0-25" (selectable 5.0, 10, 15, 25"WC)
	P5-1250Pa	0-1250 Pa (selectable 25, 50, 625, 1250 Pa)
	P5-2500Pa	0-2500 Pa (selectable 250,625, 1250, 2500 Pa)
	P5-6250Pa	0-6250 Pa (selectable 1250, 2500, 3750, 6250 Pa)
Operating Temperature	Operating range	-4 to 185F (-20 to 85C)
	Compensated range	32 to 122F (0 to 50C)
Media compatibility		Dry, oil-free air, N2
Sensor Type		MEMS silicon piezoresistive; precision calibrated
Sensor Performance	Accuracy	+/- 1.0% of selected range (combined linearity and hysterisis) Non-position sensitive
	Zero Drift (1 year)	1% max
	Auto-zero input	Push-button and contact closure

(1) One side of transformer secondary is connected to signal common. Dedicated transformer is recommended.

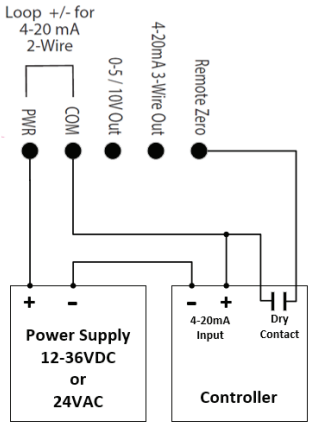


TYPICAL WIRING

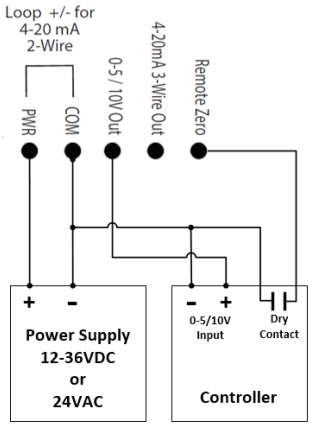
3 – Wire 4 – 20mA



2 – Wire 4 – 20mA



Selectable 0-5V and 0-10V



SIEMENS

Technical Specification Sheet
Document No. 149-929
June 21, 2012

Wet Differential Pressure Sensor with Optional Manifold Assembly

Description

The Siemens QBE Series Wet Differential Pressure Sensors utilize a well-proven ceramic technology making them an ideal choice across a broad spectrum of applications. These sensors can be ordered individually or pre-assembled with an optional three-valve manifold.

Features

- Supply voltage 7.5 to 33 Vdc
- Loop powered 4 to 20 mA output signal
- 1/4-inch NPT process connections
- 1/2-inch conduit connection with adapters for installations not using conduit
- Compatible with water and water/glycol mixtures

Applications

The QBE Sensor is particularly suitable for use in HVAC systems where continuous monitoring of flow rate or differential pressure across a control valve is required.

Compatibility

The QBE Series Differential Pressure Sensors are compatible with most devices or systems capable of powering and processing a DC 4 to 20 mA output signal.

Technology

The pressure to be monitored acts on a ceramic sensor element. The ceramic element has the following significant advantages

- Very low susceptibility to temperature
- Resistance to high temperature
- No mechanical aging or creepage

The sensor signal is linearized, temperature-compensated and amplified by the sensor electronics.

Product Number	Description	Operating Differential Pressure Rating (psi)	Max. Differential pressure between high and low ports (psi)	Burst Pressure (psi)
QBE3190UD25	Wet Differential Pressure Sensor, with Manifold	0 to 25	72	250 (Limited by manifold rating)
QBE3190UD50		0 to 50	116	
QBE3190UD100		0 to 100	290	
QBE3100UD25	Wet Differential Pressure Sensor	0 to 25	72	540
QBE3100UD50		0 to 50	116	
QBE3100UD100		0 to 100	290	

CAUTION:

- The maximum manifold pressure rating is 250 psi.
- Exceeding the maximum differential pressure will damage the sensor.

Specifications

Electrical Data	Input power	7.5V to 33 Vdc
	Output signal	4 to 20 mA Short-circuit and polarity reversal protected
Performance Characteristics	Long-term stability (Per DIN EN 60770)	±0.5% Full Scale
	Resolution	0.1% Full Scale
	Sum of linearity, hysteresis and repeatability	<±0.5% Full Scale
	Zero point	<±0.4% Full Scale
	TC zero point	<±0.4% Full Scale/K
	TC sensitivity	<±0.015% Full Scale/K
	Response time	<5 ms
	Load alternation	<50 Hz
Environmental Conditions	Suitable process media	Air, water, water and glycol mixtures
	Process temperature Sensor only Sensor with manifold	 5°F to 185°F (-15°C to 85°C) 40°F to 185°F (5°C to 85°C)
	Ambient operating temperature	5°F to 185°F (-15°C to 85°C)
	Ambient storage temperature	-40°F to 185°F (-40°C to 85°C)
	Ambient humidity	0 to 90% rh (non-condensing
Installation Considerations	Enclosure	IP65/NEMA 4
	Electrical connections	1/2" FNPT conduit (kit included for non-conduit installations)
	Process connections	1/4" FNPT
	Mounting orientation	Any orientation is allowable (avoid orientations that may be susceptible to air pockets)

Specifications, Continued

Materials of Construction, Sensor	Enclosure	Aluminum (AlMgSi1)
	Wetted parts	Stainless steel (303)
	Sealant	FPM (fluorelastomer)
	Mounting bracket	Stainless steel (303)
	Measuring element	Ceramic
Materials of Construction, Manifold	Manifold	Aluminum (6061-T6511)
	Tubing	Copper (UNS C12200)
	Fitting	Brass (C36000)
	Valve stem	Polyphenylene Sulfide (PPS) High-performance thermoplastic polymer
	O-rings	Ethylene Propylene Rubber (EPS, EPDM)
Directives and Standards	Electromagnetic compatibility for electric measuring, control and laboratory devices	EN 61326-2-3
	Electromagnetic immunity	EN 61 000-6-2, EN 61326-1
	Electromagnetic emissions	EN 61 000-6-3, EN 61326-1
	CE conformity to EMC directive	2004/108/EC
Environmental compatibility	Environmental product declaration CE1E1922en provides information on environmentally compatible product design and assessment (RoHS compliance, composition of substances, packaging, environmental benefit, and disposal).	ISO 14001 (environment) ISO 9001 (quality) SN 36350 (environ. compatible products) RL 2002/95/EG (RoHS)

Ordering Information

Part Number	Description
QBE3190UD25	Wet Differential Pressure Sensor with 3-valve manifold, 0 to 25 psi differential pressure rating, 72 psi differential pmax.
QBE3190UD50	Wet Differential Pressure Sensor with 3-valve manifold, 0 to 50 psi differential pressure rating, 116 psi differential pmax.
QBE3190UD100	Wet Differential Pressure Sensor with 3-valve manifold, 0 to 100 psi differential pressure rating, 290 psi differential pmax.
QBE3100UD25	Wet Differential Pressure Sensor, 0 to 25 psi differential pressure rating, 72 psi differential pmax.
QBE3100UD50	Wet Differential Pressure Sensor, 0 to 50 psi differential pressure rating, 116 psi differential pmax.
QBE3100UD100	Wet Differential Pressure Sensor, 0 to 100 psi differential pressure rating, 290 psi differential pmax.

Wiring

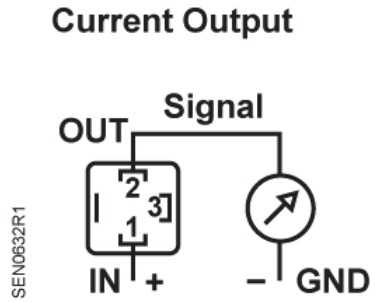


Figure 1. Wiring Schematic.

Dimensions

Dimensions in Inches (Millimeters)

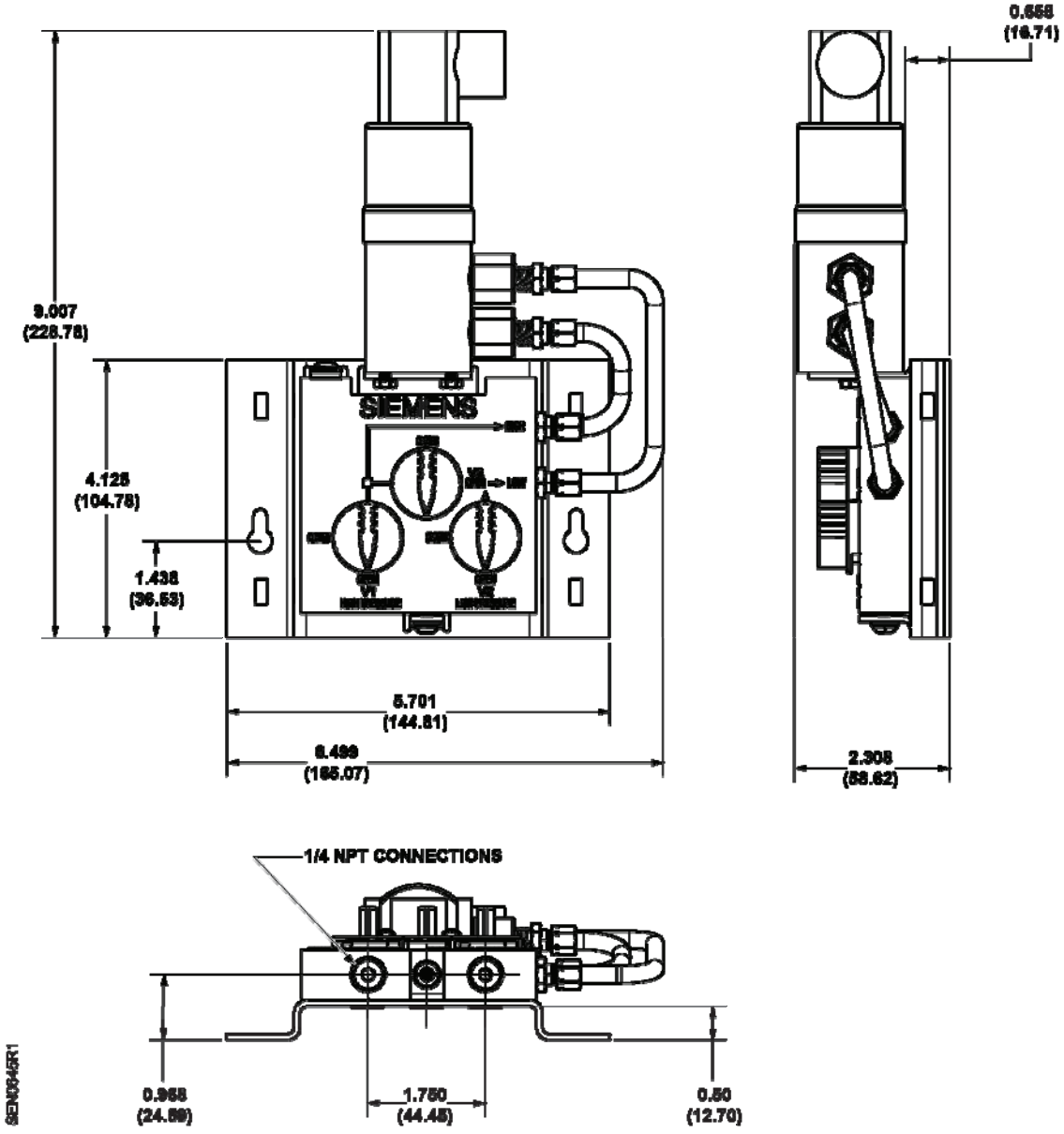


Figure 2. Differential Pressure Sensor with Manifold Dimensions.

Dimension, Continued

Dimensions in Inches (Millimeters)

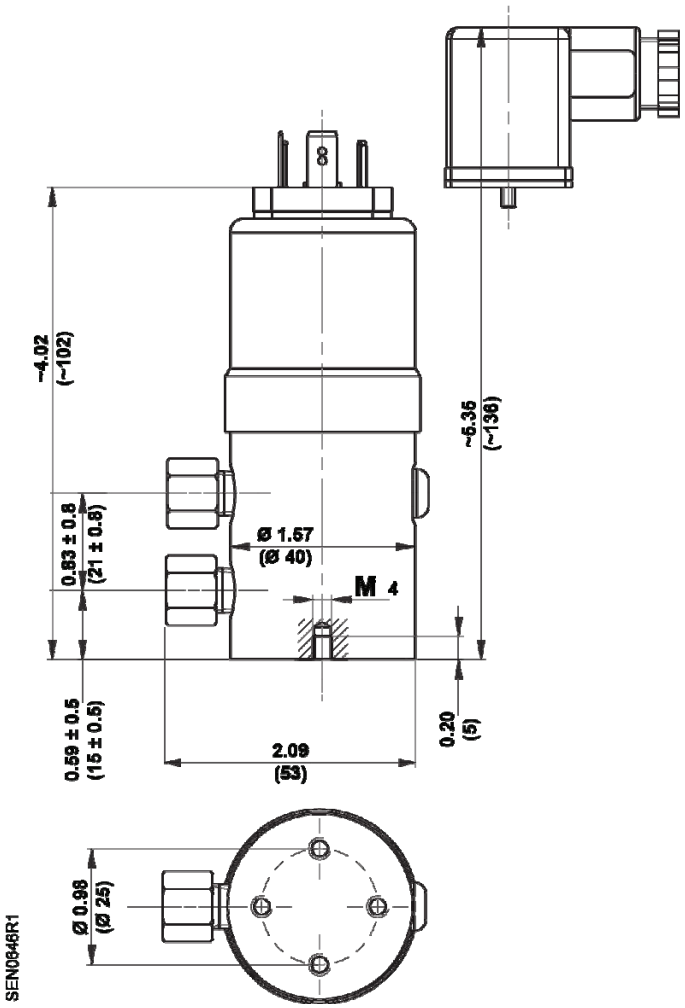


Figure 3. Differential Pressure Sensor Dimensions.

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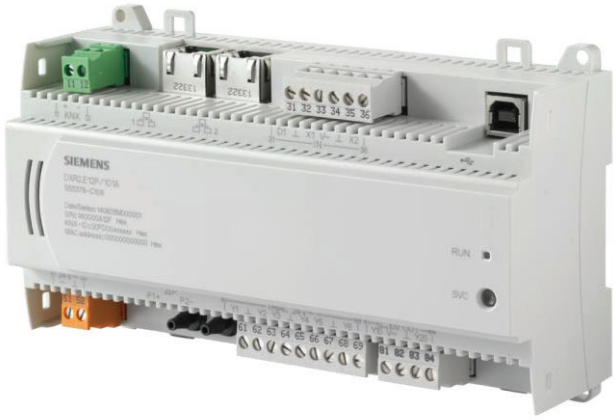
SIEMENS

Desigo™ DXR

Room Automation Stations

DXR2.E12P



Automation station with increased functionality and flexibility to support the demands for standard control of terminal HVAC equipment and Total Room Automation (TRA) applications. TRA offers the highest level of flexibility for energy-optimized solutions without sacrificing comfort.

- Compact, programmable room automation stations for HVAC, lighting, and shading.
- BACnet IP Ethernet Communication (BTL certified).
- 2 port Ethernet switch.
- KNX PL-Link bus to connect sensors, actuators, and operator units (including bus power).
- USB interface.
- Operating voltage AC 24V.
- Mounted on standard DIN rails or on the wall.
- Plug-in terminal blocks.

Features

- Total Room Automation applications combining multiple disciplines (HVAC, lighting, shading) into one comprehensive solution.
- BTL Listed as a B-ASC device.
- Fully programmable using block programming.
- Proven, pre-loaded applications.
- Extendable application for lighting and blinds.
- Operational modes (Comfort, Standby, Economy, Protection, and so on).

Preconfigured applications

Variable Air Volume (VAV) or Constant Volume (CV)

- VAV Cooling Only
- VAV with staged Electric Heat
- VAV with Hot Water
- VAV with Hot Water and Supply Temp Control

VAV with Fan Powered Boxes (FPB)

- VAV Series FPB with staged Electric Heat
- VAV Series FPB with Hot Water
- VAV Series FPB with Hot Water and Supply Temp Control
- VAV Parallel FPB with staged Electric Heat
- VAV Parallel FPB and Hot Water
- VAV Parallel FPB with Hot Water and Supply Temp Control

Chilled Beam

- Chilled Beam Passive Heating and Cooling with How Water Radiator
- Chilled Beam Active Heating and Cooling VAV with Hot Water Radiator
- Chilled Beam Active Heating and Cooling VAV with Electric 1-Stage Radiator

Additional Applications

- Radiator/Baseboard: chilled water, hot water, steam or electric
- Lighting – up to four separated or overlapping zones
  - Manual switching and dimming
  - Occupancy control and Vacancy control
  - Automatic Daylight Harvesting - step or constant level control
  - Stairwell lighting
  - Scene control
- Blinds one or two separate zones
  - Manual control: Up, Down, Predefined positions
  - Occupancy control and Vacancy control
  - Glare Protection
  - Energy efficiency functions including solar radiation optimization
  - Slat angle
  - Scene control

Pre-loaded Application Options

- Single, multiple or variable speed terminal fan control (Fan Powered Boxes).
- Exhaust air flow tracking and control.
- Demand Control Ventilation (DCV) with separate OAD flow setpoints for each operational mode.
- Optional terminal chilled water and hot water valve (2-pipe or 4-pipe).
- Lighting/Shading, Chilled beams and Radiator control.
- Greenleaf determination and display.
- Configurable operating modes (heating, cooling, warm up, cool down, flush/purge, and so on).

Functions

The selected application and its parameters as well as input and output configuration determine the room automation station's functionality.

A detailed description of functionality is available in the ABT (Automation Building Tool) online help.

Communication

- 2-Port Ethernet switch for cost-effective cabling via line topology.
- USB connection for service and commissioning, firmware download, and LAN access.
- The following functions are available with the KNX PL-Link bus:
  - Communication with room operator units, switches, sensors, actuators, and luminaires.
  - Plug-and-play connection of Siemens field devices with KNX PL-Link.
  - Integration of common devices using KNX S-Mode (ETS engineering required).

Type summary

Product Number	SSN	Description	Inputs	Outputs
DXR2.E12P-102B (Version with 30 data points)	S55376-C126	DXR2.E12P Room Automation Station	1 DI, 2 UI, 1 ΔP sensor	6 DO Triacs, 2 AO 0 to 10V
DXR2.E12PX-102B (Version with 60 data points*)	S55374-C252	DXR2.E12PX Room Automation Station	1 DI, 2 UI, ΔP sensor	6 DO Triacs, 2 AO 0 to 10V

* 60 data point DXRs are typically used for Desigo Total Room Automation projects.

Accessories

Product Number	Designation
985-124	499 ohm Resistor Kit

Product Documentation

Topic	Title	Document ID
Installation and mounting	DXR Installation Instructions	A6V10550039
Global datasheet*	DXR2 24V IP DXR2 24V MS/TP	N9205 N9207
Setup and commissioning	DXR VAV Start-up Procedures DXR FPB Start-up Procedures DXR FCU Start-up Procedures Balancing Procedures	A6V10665935 A6V10665938 A6V10665941 A6V10665943
Room Unit Datasheet	Wall mounted	A6V10394781
BTL listing	DXR PIC Statement	A6V10665948

* Please see the Global datasheets for additional information not found in this submittal sheet.

Technical data

Dimensions	180 mm (7.09 in) x 104.5 mm (4.11 in) x 59.5 mm (2.34 in)
Weight	approx. 1.35 kg (3 lbs)

Power data

Power supply	
Operating voltage	AC 24V -15%/+20%
Frequency	50/60 Hz

Apparent power (VA) for transformer design						
Base Model	Base load	Max. load Triac output AC 24V~ 0.25 A each	Max. load all Aux. outputs AC 24V~	Max. load KNX PL-Link (at 50 mA)	Max. load DC 24V+ (2.4 W))	Max. Allowed Power consumption including connected field devices
DXR2.E12P	8	6 x 6 = 36	12	4	-	60

NOTE:
To calculate the total VA, add the Base Load + the number of Triacs + field supplies+ KNX PL-Link devices.
This cannot exceed the maximum power consumption. See the *Wiring Guidelines* for more information.

Inputs

Analog Inputs		
Resistance sensor	**Temperature measurement**	**Voltage measurement**
AI 1000 Ω	AI PT1K 375 (NA)*)	AI 0 to 10V
AI 2500 Ω	AI PT1K 385 (EU)*)	AI 0 to 10V (0 to 100%)
AI 10 KΩ	AI (LG-)Ni1000*)	
AI 100 KΩ	AI Ni1000 DIN*)	
	AI T1 (PTC)*)	
	AI NTC3K	
	AI NTC10K**)	
	AI NTC100K**)	

* A fixed value of 1 Ω is calibrated to correct line resistance.

** Configurable default.

Digital Inputs	
Contact voltage	Universal input: 18V Digital input: 21V
Contact current	Universal input: 1.2 mA; 7.4 mA initial current Digital input: 1.6 mA; 9.4 mA initial current
Contact resistance for closed contacts	Max. 100 Ω
Contact resistance for open contacts	Min. 50 kΩ

Differential pressure sensor	
Connections (nipple diameter)	Dia. 5.2 mm (0.20 in)
Measuring range	0 to 500 Pa (0 - 2.01 in WC)
Overload range	0 to 100 kPa (0 - 402 in WC)

Outputs

Analog Outputs	
0 to 10V	Max. 1 mA

Digital Outputs	
Type (Switching outputs triacs)	High side The Triac closes the contact to AC 24V
Switching voltage	AC 24V
Permissible load	250 mA/6 VA per output (cos phi 0.35) (500 mA/12 VA per output with PWM*)
Protection	Short-circuit proof

AC 24V outputs for field devices (2: V~)	
Output voltage	AC 24V
Permissible load	500 mA/12 VA overall
Protection against overload	Short-circuit proof

Connections

Interfaces	
Ethernet	Plugs: 2 x RJ45, screened Interface type: 10Base-T/100BASE-TX, IEEE 802.3 compatible Bitrates: 10/100 Mbps, autosensing Protocol: BACnet over UDP/IP
USB (2.0)	Plug: Type B Data rate: 12 Mbps
KNX	Type: KNX TP1 PL-Link, galvanic isolation Baud rate: 9.6 Kbps Bus power: 50 mA Short-circuit proof Protection against faulty wiring at max. AC 24V

Wiring connections	
Pluggable screw terminals	Copper wire or copper strands with ferrules 1 x 0.6 mm dia. to 2.5 mm^2 (22 to 14 AWG) or 2 x 0.5 mm dia. to 1 mm^2 (24 to 18 AWG) Copper strands without ferrules 1 x 0.6 mm dia. to 2.5 mm^2 (22 to 14 AWG) or 2 x 0.5 mm dia. to 1.5 mm^2 (24 to 16 AWG)
Slotted screws	Small 1/8” blade, tightening torque 0.6 Nm (0.44 lb-ft)
Wiring lengths for signals	KNX PL-Link 80 m (260 ft) with internal bus power or 300 m (990 ft) with external power supply Ethernet 100 m (330 ft) Signal lines 80 m (260 ft) For inputs AI 100 kohm, AI NTC10K, AI NTC100K, AI NTC3K: 30 m (100 ft) or 80 m (260 ft), if shielded.

KNX/PL-Link Network and Power Wriring.*	
Cable configuration	1 or 2 twisted pair - Pair 1 red/black - Pair 2 yellow/white
Gauge	20 AWG (solid bare copper)
Twists per foot	4 Minimum
Capacitance	30 pF/foot or less
Shields	100% foil with drain wire
UL type	300Vrms, CMP (75 °C or higher)
CSA type	300Vrms, FT6 (75 °C or higher)

* Alternative 18 AWG STP CMP (Belden 6320FE 8771000)

Conformity

⚠ CAUTION

National safety regulations

Failure to comply with national safety regulations may result in personal injury and property damage.
Observe national provisions and comply with the appropriate safety regulations.

Ambient conditions and protection classification	
Climatic ambient conditions	
• Transport and Storage	• Temperature -25 to 70°C (-13 to 158°F) Air humidity 5 to 95% rh.
• Operation	• Temperature -5 to 45°C (23 to 113°F)/ -5 to 50 °C (23 to 122°F) Air humidity 5 to 95% rh.

Standards, directives and approvals	
UL Listing	UL916
Federal Communications Commission	FCC CFR 47 Part 15 Class B
CSA Compliance	C22.2 No. 205
Environmental compatibility - RoHS Compliant	The product environmental declaration contains data on environmentally compatible product design and assessments (composition, packaging, environmental benefit, disposal).
BACnet BTL Listing	BTL-ASC
CEC Title 24 Supported	
ASHRAE 90.1 Supported	
Quality	ISO 9001 (Quality).

Issued by
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SIEMENS

Desigo™ Room Automation

Room Automation Station, BACnet/IP, AC 24 V

DXR2.E17C...

For buildings with room pressurization and fume hood control applications, leveraging the functionality and flexibility of Desigo Room Automation applications.

- Compact, programmable room automation stations for pressurized room or fume hood control, lighting, and shading
- BACnet/IP communications
- KNX PL-Link bus to connect sensors, actuators, and operator units (including bus power)
- 2-port Ethernet switch
- USB interface
- Operating voltage AC 24 V
- Mounted on standard rails or on the wall
- Plug-in terminal blocks
- Dedicated SCOM communication for fast and high resolution sensor input

Features

Programmable

The DXR2... automation stations provide the infrastructure for system and application-specific functions and can be programmed.

Compact series

The compact build permits mounting in narrow spaces and on standardized DIN rails, and is particularly well suited for compact panels or plants with integrated panel.

Plug-in terminal blocks

Plug-in terminal blocks to easily exchange room automation stations.

Use

- Desigo Room Automation applications combine multiple disciplines (HVAC for pressurized rooms and fume hoods, lighting and shading) into one comprehensive solution.
- Desigo Room Automation offers the highest level of flexibility for energy-optimized solutions while satisfying requirements for pressurization, ventilation and comfort using standard tools and established workflows.
- Desigo Room Automation applications can be enhanced with lighting and blinds via KNX PL-Link.

Preloaded applications

- Pressurized rooms and fume hoods
  - Application works self-contained or distributed across multiple automation stations.
  - 1 room segment control (30 data points)
    - operates one supply and one extract terminal or one fume hood, as well as coordinates operation between multiple room segments.
  - 2 room segment control in single automation station (60 data points)
    - operates two supply and two extract terminals or one fume hood, as well as coordinates operation between multiple room segments.
- Variable (VAV) and constant volume flow
  - with 2-stage electric heating
  - with hot water
  - with hot water and flow temperature control
  - with hot water and thermal power control
- Chilled beam active or passive cooling (2-pipe) or cooling/heating (2-pipe) or cooling/heating (4-pipe)
- Radiant ceiling: Cooling, cooling and heating (2-pipe), or cooling/heating (4-pipe)
- Radiator: Hot water, steam (2 or 4-pipe) or electric stepped controlled
- Light: Up to 4 separate zones
- Blinds: 1 or 2 motors
- Fume hood

Application options

- Separate temperature and volume setpoints for all 4 operating modes.
- Supply and extract air flow tracking
- Room pressure cascade control
- Accepts external demand control ventilation signal
- Chilled water and hot water valve

Functions

The selected application and its parameters as well as input and output configuration determine the room automation station's functionality.

A detailed description of functionality is available in the ABT (Automation Building Tool) online help.

Communication

- In pressurized rooms with fume hood control the automation stations have to use only one port with star topology to one industrial Ethernet switch
- In pressurized rooms without fume hood control the second port can be used with line topology
- USB connection for service and commissioning, firmware download, and LAN access
- SCOM (sensor communication) for fast and high resolution communication with a pressure sensor and sash open area module (SOAM). Up to 5 devices are supported
- The following functions are available with the KNX PL-Link bus:
  - Communication with room operator units, operator display panels, switches, sensors, actuators, and luminaires
  - Plug-and-play connection of Siemens field devices with KNX PL-Link
  - Integration of KNX S-Mode devices (ETS engineering required)

User Interface	Color	LED function	Status
RUN	Green	Steady ON	Device is ready for operation
		Steady OFF	Device is not powered
		Regular flashing	Start-up or the program is stopped
	Red	Steady OFF	OK
		Steady ON	Program error Communications error (KNX PL-Link) Hardware fault
		Rapid flashing	Wrong or corrupt software No application loaded
		Blinking per wink command	Physical device identification
SCOM		OFF	No application configured
	Green	Steady ON	Application configured, no devices connected or communicating
		Flashing	Communication with at least one device

Service button (SVC)

Physical identification on the network.

Technical design

Voltage supply

The supply provides controlled voltages for inputs and outputs. The room automation stations also supply AC 24 V and DC 24 V field supply. The supply is located in the device to simplify wiring and diagnostics.

The processor controls voltage supply. This ensures clean conditions for the field devices connected to the I/Os during startup, shutdown, and undervoltage.

Bus power supply

The room automation station includes the bus power for KNX PL-Link. The bus power is switched on by default, but can be switched off via a web interface or configuration in the Automation Building Tool (ABT).

The internal KNX PL-Link supply cannot be operated parallel to external power supplies. The internal KNX PL-Link power must be switched off during the engineering phase for external power. This is typically the case if the 50 mA from the internal supply is not enough to supply all devices connected on the KNX PL-Link bus.

Type summary

Order numbers Worldwide (without US and Canada)

Type	Stock number	Applications	Inputs	Outputs
DXR2.E17C-103A (Version with 30 data points)	S55376-C134	Variable airflow, pressurized room control, radiant ceiling, radiator, 4 luminaires & 2 blinds or fume hood control, 1 luminaire	3 DI, 4 UI, 2 resistive inputs, SCOM	4 triacs, 4 AO
DXR2.E17CX-103A (Version with 60 data points)	S55376-C150	Variable airflow, pressurized room control with 2 segments, radiant ceiling, radiator, 4 luminaires & 2 blinds or fume hood control, 1 luminaire	3 DI, 4 UI, 2 resistive inputs, SCOM	4 triacs, 4 AO

Order numbers USA and Canada

Type	Stock number	Applications	Inputs	Outputs
DXR2.E17C-103B (Version with 30 data points)	S55376-C136	Variable airflow, pressurized room control, radiant ceiling, radiator, 4 luminaires & 2 blinds or fume hood control, 1 luminaire	3 DI, 4 UI, 2 resistive inputs, SCOM	4 triacs, 4 AO
DXR2.E17CX-103B (Version with 60 data points)	S55376-C149	Variable airflow, pressurized room control with 2 segments, radiant ceiling, radiator, 4 luminaires & 2 blinds or fume hood control, 1 luminaire	3 DI, 4 UI, 2 resistive inputs, SCOM	4 triacs, 4 AO

Accessories, lab specific

Type	Stock number	Designation	Datapoint count
DXA.S04P1	S55376-C139	Airflow Pressure Sensor	1
DXA.S04P1-B	S55376-C140	Airflow Pressure Sensor with IP54 enclosure	1
QMX3.P87-1WSC	S55624-H111	Fume Hood Operating Display (QMX3.P87)	3
QMX3.P88-1WSC	S55624-H112	Fume Hood Operating Display (QMX3.P88)	3
DXA.S12C	S55376-C138	Sash Open Area Module	1
DXA.B130	S55376-C158	Cable Sash Sensor (1300mm/50in)	1
DXA.B200	S55376-C159	Cable Sash Sensor (2000mm/80in)	1
DXA.H180	S55376-C120	Terminal cover for DXR.. 180 mm, 2 pieces	n/a

Product documentation

Topic	Title	Document ID:
Installation, cable length, topology	Desigo TRA installation guide	CM111043
Engineering and commissioning, workflow	ABT online help	n/a
Commissioning	Desigo TRA - Setup and Service Assistant	CA111050
Product environmental declaration	Product environmental declaration	CM1E9205

Related documents such as environmental declarations, CE declarations, etc., can be downloaded at the following Internet address:

http://siemens.com/bt/download

Notes

Safety

⚠ CAUTION

National safety regulations

Failure to comply with national safety regulations may result in personal injury and property damage

- Observe national provisions and comply with the appropriate safety regulations.

Engineering

Identification

Each device has a unique serial number to ensure efficient commissioning. It is provided on the adhesive barcode label. The serial number can be read directly into the engineering tool using a barcode reader.

Wiring

Wiring must be sufficiently insulated to the available rated voltage. Sizing and fusing of the wiring depends on the connected load.

Triac outputs AC 24 V

Individual triac outputs may have a max. load of 12 VA, 24 V*0.5 A=12 VA. The following possibilities are permitted:

- Slow floating control actuators.
- Multiple motorized actuators with a total of max. 12 VA.
- 1 thermal actuator with 6 VA start load in a cold state.
- 2 thermal actuators with 12 VA start load each in a cold state.

For transformer design (voltage drop), each thermal actuator must be counted at the full start load, since the triac outputs can be freely controlled.

The heating sequence and cooling sequence are not normally active at the same time (Exception: Downdraft compensation).

The sum total of the base load, bus power, field supply, and triacs will not exceed 66 VA at AC 24 V.

See Section **Power data**.

DC 0…10 V outputs

The DC 0…10 V outputs supply max. 1 mA.

AC 24 V supply for field devices (V~)

Actuators (valves, dampers) and active sensors are supplied directly by the device. Separate AC 24 V power supply is only required if field devices consume more than 5 VA.

DC 24 V power supply for field devices (V+)

Actuators (valves, dampers) and active sensors are supplied directly by the device. A separate DC 24 V field supply is only required if field devices use more than 2.4 W.

Digital inputs

Digital inputs are not suitable for operating lighting or blinds. Use the KNX PL-Link pushbutton.

Mounting

The room automation stations can be snapped onto standard DIN rails or screwed onto a flat surface.

⚠ CAUTION

Risk of overheating for failure to comply with ambient temperature

Burning and damage to the device

- Ensure sufficient ventilation to comply with the permissible ambient temperature within the panel or installation box. The temperature must be 10° C (18° F) lower outside the installation box.

Mounting position

Ambient temperature -5...45 °C (23...113°F)	Ambient temperature -5...50 °C (23...122°F)
1. Overhead 2. Wall, vertically – From top to bottom – From bottom to top 3. On a horizontal surface	• Wall, horizontal – From left to right – From right to left

Installation

⚠ WARNING

Risk of fire and injury due to short circuits!

- Adapt as per local regulations the wiring cross section to the rated value of the installed fuse.

Strain relief

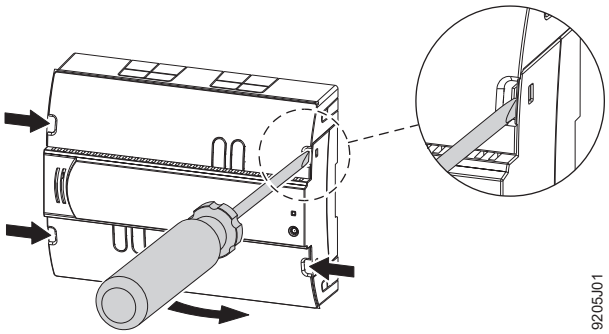
Strain relief protects flexible electrical wiring against mechanical stress.

The wiring must be fixed using cable binders to the tabs on the housing base.

Terminal cover

Break off the cable inlets to insert the cables to the room automation station.

To take off the terminal cover:

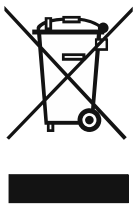


Operation

The outputs have no electricity when power fails.

USB communications that does not work points to improper grounding of AC 24 V operating voltage (connection ⊥ must be grounded).

Disposal



The device is considered an electronic device for disposal in accordance with the European Guidelines and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

Warranty

Technical data on specific applications are valid only together with Siemens products listed under **Accessories, lab specific**. Siemens rejects any and all warranties in the event that third-party products are used.

Technical data

Housing

Color	RAL 7035 (light-gray)
Dimensions	See Dimensions
Weight DXR2.E17C.. Terminal cover Packaging	 ca. 350 g ca. 80 g ca. 40 g

Function data

Processor	Texas Instruments AM3352, 600 MHz
RAM Flash	512 MB SDRAM (DDR3) 512 MB NAND Flash
A/D and D/A Resolution Analog inputs X Analog inputs B (resistance) Analog Outputs (Y10-Y40)	 16 bit 14 bit 10 bit

Power data

Power supply	
Operating voltage	AC 24 V -15%/+20%
Frequency	50/60 Hz
Power consumption including connected field devices DXR2.E17C DXR2.E17CX	Max. 66 VA at AC 24 V 30 data points 60 data points
Internal fuse	4 A irreversible
Transformer with secondary current limitation of max. 10 A or external secondary current fuse Non-renewable fuse Circuit breakers	 Max. 10 A, (Class 2, 4A) Max. 13 A, characteristic B, C, D as per EN 60898

Apparent power (VA) for transformer design						
	Base load including I/O without load by field devices	Max. output load triac at 500 mA each	Max. load for AC 24 V field supply at 200 mA	Max. load KNX PL-Link at 50 mA	Max. load for DC 24 V field supply at 100 mA	Power consumption including connected field devices
DXR2.E17C	8 VA	4 x 12 = 48	5	2	3	66
DXR2.E17CX	8 VA	4 x 12 = 48	5	2	3	66

Inputs

The inputs are protected against incorrect wiring AC 24 V.

Inputs: Overview	
Type	**Inputs**
DXR2.E17C…	3 DI, 4 UI, 2 resistive inputs, SCOM

Resistance sensor, analog (inputs X...)		
Type	**Range (over range)**	**Resolution**
AI 1000 Ohm *)	1 kΩ (0...1.05 kΩ)	10 Ω

Resistance sensor, analog (inputs B...)		
Type	**Range (over range)**	**Resolution**
AI 10 kOhm *)	10 kΩ (0...10.5 kΩ)	50 Ω

Temperature measurement, analog (inputs R1K...)		
Type	**Range (over range)**	**Resolution**
AI PT1K 375 *)	-40...70 °C (-45...75 °C) -40...158 °F (-49...167 °F)	25 mK 0.045 °F
AI PT1K 385 *)	-40...70 °C (-45...75 °C) -40...158 °F (-49...167 °F)	25 mK 0.045 °F
AI Ni1000 *)	-40...70 °C (-45...75 °C) -40...158 °F (-49...167 °F)	25 mK 0.045 °F
AI Ni1000 DIN *)	-40...70 °C (-45...75 °C) -40...158 °F (-49...167 °F)	25 mK 0.045 °F
AI T1 (PTC) *)	-40...70 °C (-45...75 °C) -40...158 °F (-49...167 °F)	10 mK 0.18 °F
AI NTC10K	-40...70 °C (-45...75 °C) -40...158 °F (-49...167 °F)	10 mK (25 °C) 0.045 °F (77 °F)
AI NTC100K	-40...70 °C (-40...158 °C) -40...158 °F (-40...316°F)	25 mK (25 °C) 0.045 °F (77 °F)

*) A fixed value of 1 Ω is calibrated to correct line resistance.

Voltage measurement, analog (inputs X...)		
Type	**Range (over range)**	**Resolution**
AI 0...10 V	0...10 V (-1...11 V)	1 mV
AI 0...10 V standard	0...100% (-10...110%)	1 mV
Open connection: Negative voltage -3.0 V,108 µA (line failure detection)		

Current measurement, analog inputs (inputs X...)		
Type	**Range (over range)**	**Resolution**
AI 120	4...20 mA (-1...11 V)	13 µA
Open connection can be detected. Supports 0…20 mA input range, with signal voltages >10 V. Use AI type U10 instead with an external resistor.		

Digital input (inputs X...)	
Contact query voltage	Universal input: 18 V Digital input: 21 V
Contact query current	Universal input: 1.2 mA; 7.4 mA initial current Digital input: 1.6 mA; 9.4 mA initial current
Contact resistance for closed contacts	Max. 100 Ω
Contact resistance for open contacts	Min. 50 kΩ

Outputs

The outputs are protected against short circuiting and incorrect wiring AC 24 V.

Outputs: Overview	
Type	**Outputs**
DXR2.E17C…	4 triacs, 4 AO

Analog (outputs Y10...Y40)			
Type	**Range (over range)**	**Resolution**	**Output current**
AO 0-10 V	0...10 V (0…10.5 V)	11 mV	Max. 1 mA
AO 0-10 V standard	0...100% 0% = 0 V, 100% = 10 V (0...10.5 V)	2 mV	Max. 1 mA

Switching outputs triac (outputs Y1...Y4)	
Type	High side The triac closes the contact to AC 24 V
Switching voltage	AC 24 V
Permissible load	500 mA / 12 VA per output (cos phi 0.4)
Protection	Short-circuit proof

Power supply for field devices (outputs V~)	
Output voltage	AC 24 V
Permissible load DXR2.x17C...	200 mA / 5 VA overall
Protection against overload	Short-circuit proof

Power supply for field devices (output V+)	
Output voltage	DC 24 V
Permissible load	100 mA / 2.4 W
Protection against overload	Short-circuit proof

Connections

Interfaces	
Ethernet	Plugs: 2 x RJ45, screened Interface type: 10Base-T/100BASE-TX, IEEE 802.3 compatible Bitrates: 10/100 Mbps, autosensing Protocol: BACnet over UDP/IP
USB (2.0)	Plug: Type B Data rate: 12 Mbps
KNX	Type: KNX TP1 PL-Link, galvanic isolation Baud rate: 9.6 kbps Bus power: 50 mA Short-circuit proof protection against faulty wiring at max. AC 24 V
SCOM	Interface type: RS485 Baud rate: 115200 Short-circuit proof protection against faulty wiring at max. AC 24 V

Wiring connections	
Pluggable screw terminals	Copper wire or copper stranded wire with connector sleeves 1 x 0.6 mm ø to 2.5 mm^2 (22 to 14 AWG) or 2 x 0.6 mm ø to 1 mm^2 (22 to 18 AWG) Copper stranded wire without connector sleeves 1 x 0.6 mm ø to 2.5 mm^2 (22 to 14 AWG) or 2 x 0.6 mm ø to 1.5 mm^2 (22 to 16 AWG)
Stripping length	6...7.5 mm (0.24...0.29 in)
Slotted screws	Size 1, tightening torque 0.6 Nm (0.44 lb-ft)
Wiring lengths for signals	KNX PL-Link 80 m (260 ft) with internal bus power or 300 m (990 ft) with external power supply Ethernet 100 m (330 ft) SCOM RS-485 80 m (262 ft) Termination 120 Ω required > 30 m (100 ft) Signal lines 80 m (260 ft) For inputs AI 100 kOhm, AI NTC10K, AI NTC100K, AI NTC3K: 30 m (100 ft) or 80 m (260 ft), if shielded

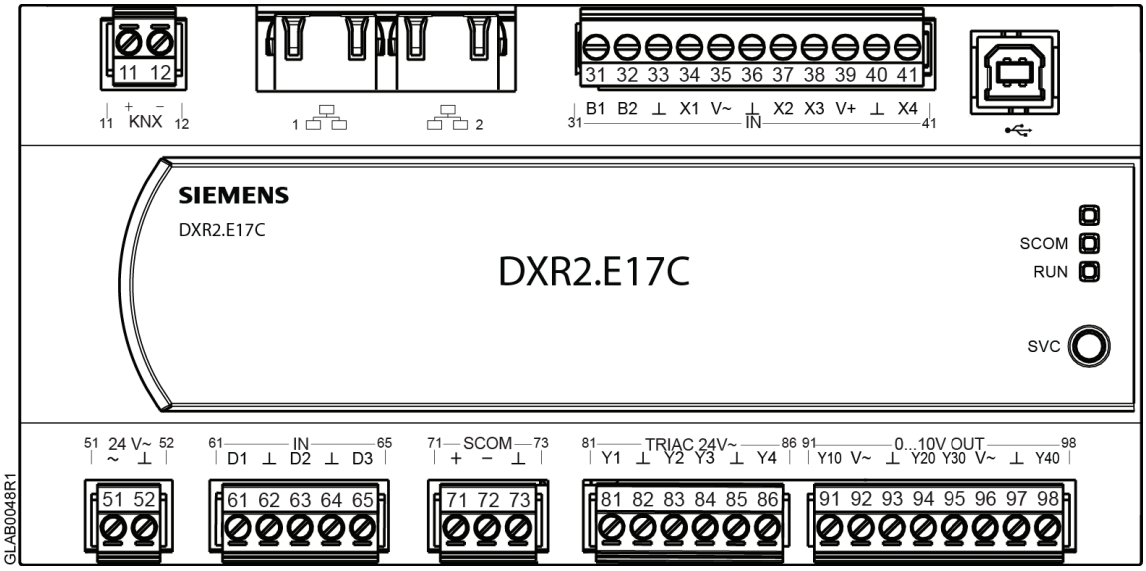
Conformity

Ambient conditions and protection classification	
Classification per IEC/EN 60730 Function of automatic control devices Pollution degree Overvoltage category	 Type 1 2 III
Design type	Device suited for use with equipment of safety classes I and II
Degree of protection of housing to IEC EN 60529 Room automation station With terminal cover	 IP20 IP30
Enclosure rating	NEMA Type I
Climatic ambient conditions • Transport (packaged for transport) as per IEC EN 60721-3-2 • Operation as per IEC/EN 60721-3-3	 • Class 2K3 Temperature -25...70 °C (-13... 158 °F) Air humidity 5...95% (non-condensing) • Class 3K5 Temperature -5...45 °C (23... 113 °F)/ -5...50 °C (23... 122 F) See Mounting Air humidity 5...95% (non-condensing)
Mechanical ambient conditions Transport as per IEC/EN 60721-3-2 Operation as per IEC/EN 60721-3-3	 Class 2M2 Class 3M2
Operation in trains	Class 5M2, 5C1
Operation on ships	Class 6M2, 6C1

Standards, directives and approvals	
Product standard	IEC/EN 60730-1 Automatic electronic controls for household and similar use
Product family standard	EN 50491-2, EN 50491-3, EN 50491-5 General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS)
Electromagnetic compatibility	For residential, commercial, and industrial environments
EU conformity (CE)	EU declaration of conformance DXR2... AC 24 V, see CM1T9204xx_2
RCM conformity	RCM declaration of conformance DXR2... see CM1T9204xx_C1
EAC compliance	Eurasian compliance for all DXR2.xxx-xxxA variants
UL Approbation Federal Communications Commission	UL as per UL916, http://ul.com/database cUL as per CSA – C22.2 No. 205 FCC CFR 47 Part 15 Class B
Environmental compatibility	The product environmental declaration contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal). See Section **Product documentation**.
Quality	ISO 9001 (Quality)

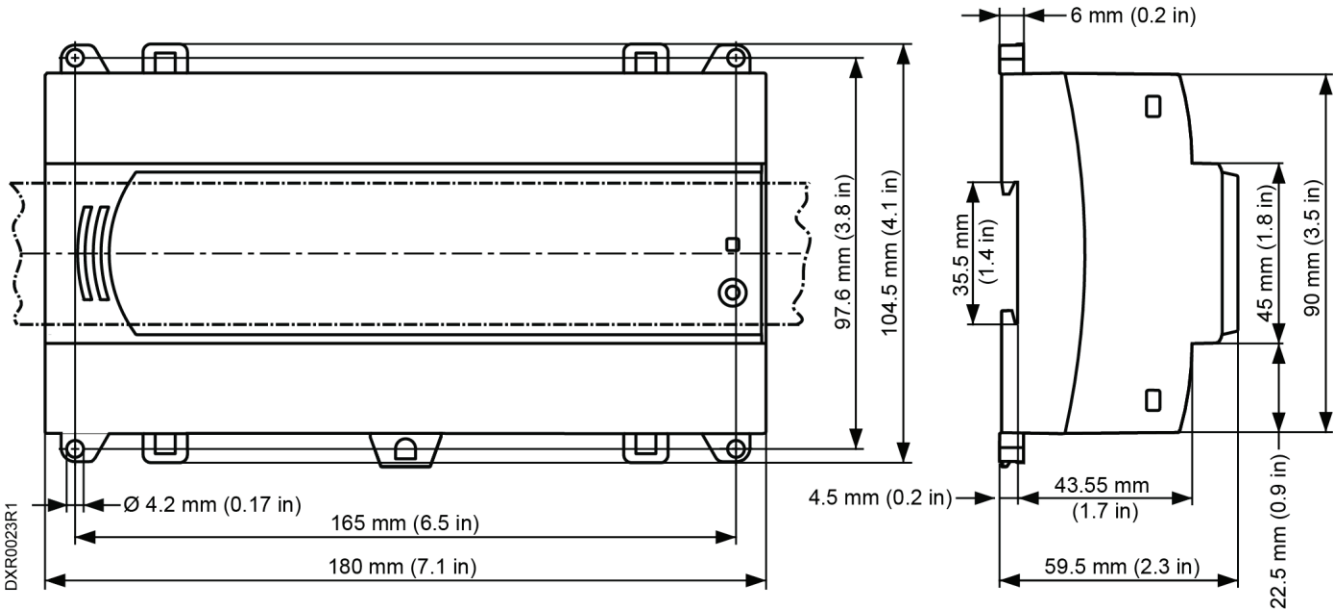
Connection terminals

DXR2.E17C and DXR2.E17CX



Pin	Description	Terminal	Module	Channel
1, 2 Ethernet	2 x RJ45 interface for 2-port Ethernet switch			
11, 12 KNX	KNX connection	+, -		
31...41 inputs	10K Resistance input	B1, B2	1	9…10
	Universal input	X1...X4	1	5…8
	System neutral	⊥		
	Field supply AC 24 V for active sensors	V~		
	Field supply DC 24 V for active sensors	V+		
USB	USB interface			
51...52 power 24V~	Power supply SELV / PELV AC 24 V	V~		
	System neutral	⊥		
61...65 inputs	Digital input	D1, D2, D3	1	1…3
	System neutral	⊥		
71...73	SCOM	+, -		
	System neutral	⊥		
81...86 triacs	Switching output AC 24 V	Y1...Y4	11	1…4
	System neutral	⊥		
91...98 analog outputs	Positioning output DC 0...10 V	Y10...Y40	21	1…4
	System neutral	⊥		
	Field supply AC 24 V	V~		
Service	Service button	SVC		
Display	Operation LED	RUN		
	Active communication LED	SCOM		

Dimensions



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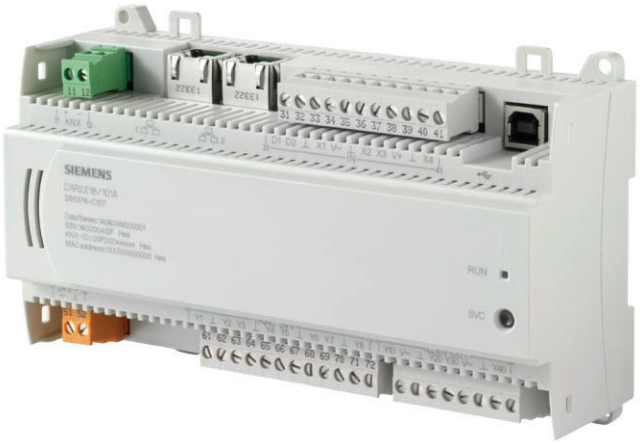
SIEMENS

Desigo™ DXR

Room Automation Stations

DXR2.E18



Automation station with increased functionality and flexibility to support the demands for standard control of terminal HVAC equipment and Total Room Automation (TRA) applications. TRA offers the highest level of flexibility for energy-optimized solutions without sacrificing comfort.

- Compact, programmable room automation stations for HVAC, lighting, and shading.
- BACnet IP Ethernet Communication (BTL certified).
- 2 port Ethernet switch.
- KNX PL-Link bus to connect sensors, actuators, and operator units (including bus power).
- USB interface.
- Operating voltage AC 24V.
- Mounted on standard DIN rails or on the wall.
- Plug-in terminal blocks.

Features

- Total Room Automation applications combining multiple disciplines (HVAC, lighting, shading) into one comprehensive solution.
- BTL Listed as a B-ASC device.
- Fully programmable using block programming.
- Proven, pre-loaded applications.
- Extendable application for lighting and blinds.
- Operational modes (Comfort, Standby, Economy, Protection, and so on).

Preconfigured applications

Fan Coil Unit (FCU)

- FAN COIL 2-Pipe CW/HW and HW Valves
- FAN COIL 4-Pipe CW and HW Valves
- FAN COIL staged DX Cooling and staged Heating
- FAN COIL with CW and staged Electric Heat
- FAN COIL–UNIT VENT with CW, HW and Outside Air Damper (OAD) control
- FAN COIL–UNIT VENT with CW, ELEC and OAD control
- FAN-COIL-UNIT VENT with DX, HW and OAD control
- FAN COIL-UNIT VENT with DX, ELEC and OAD control

Chilled Beam

- Chilled Beam Passive 2 Pipe Heating/Cooling and Radiator 1-Stage Electric

Additional Applications

- Radiator/Baseboard: chilled water, hot water, steam or electric
- Lighting – up to four separated or overlapping zones
  - Manual switching and dimming
  - Occupancy control and Vacancy control
  - Automatic Daylight Harvesting - step or constant level control
  - Stairwell lighting
  - Scene control
- Blinds one or two separate zones
  - Manual control: Up, Down, Predefined positions
  - Occupancy control and Vacancy control
  - Glare Protection
  - Energy efficiency functions including solar radiation optimization
  - Slat angle
  - Scene control

Pre-loaded Application Options

- Single, multiple or variable speed fan control.
- Demand Control Ventilation (DCV) with separate OAD setpoints for each operational mode.
- Optional terminal chilled water and hot water valve (2-pipe or 4-pipe).
- Lighting/Shading, Chilled beams and Radiator control.
- Greenleaf determination and display.
- Configurable operating modes (heating, cooling, warm up, cool down, flush/purge, and so on).

Functions

The selected application and its parameters as well as input and output configuration determine the room automation station's functionality.

A detailed description of functionality is available in the ABT (Automation Building Tool) online help.

Communication

- 2-Port Ethernet switch for cost-effective cabling via line topology.
- USB connection for service and commissioning, firmware download, and LAN access.
- The following functions are available with the KNX PL-Link bus:
  - Communication with room operator units, switches, sensors, actuators, and luminaires.
  - Plug-and-play connection of Siemens field devices with KNX PL-Link.
  - Integration of common devices using KNX S-Mode (ETS engineering required).

Type summary

Product Number	SSN	Description	Inputs	Outputs
DXR2.E18-101B	S55376-C125	DXR2.E18 Room Automation Station	2 DI, 4 UI	8 DO Triacs, 4 AO 0 to 10V

* 60 data point DXRs are typically used for Desigo Total Room Automation projects.

Accessories

Product Number	Designation
985-124	499 ohm Resistor Kit

Product Documentation

Topic	Title	Document ID
Installation and mounting	DXR Installation Instructions	A6V10550039
Global datasheet*	DXR2 24V IP DXR2 24V MS/TP	N9205 N9207
Setup and commissioning	DXR VAV Start-up Procedures DXR FPB Start-up Procedures DXR FCU Start-up Procedures Balancing Procedures	A6V10665935 A6V10665938 A6V10665941 A6V10665943
Room Unit Datasheet	Wall mounted	A6V10394781
BTL listing	DXR PIC Statement	A6V10665948

* Please see the Global datasheets for additional information not found in this submittal sheet.

Technical data

Dimensions	180 mm (7.09 in) x 104.5 mm (4.11 in) x 59.5 mm (2.34 in)
Weight	approx. 1.35 kg (3 lbs)

Power data

Power supply	
Operating voltage	AC 24V -15%/+20%
Frequency	50/60 Hz

Apparent power (VA) for transformer design						
Base Model	Base load	Max. load Triac output AC 24V~ 0.25 A each	Max. load all Aux. outputs AC 24V~	Max. load KNX PL-Link (at 50 mA)	Max. load DC 24V+ (2.4 W))	Max. Allowed Power consumption including connected field devices
DXR2.E18	8	8 x 6 = 48	18	4	6	72

Power for the Triac outputs must be reduced if the maximum load of 18 VA is required for AC 24V field supply on the DXR2.x18...

NOTE:
To calculate the total VA, add the Base Load + the number of Triacs + field supplies+ KNX PL-Link devices.
This cannot exceed the maximum power consumption. See the *Wiring Guidelines* for more information.

Inputs

Analog Inputs		
Resistance sensor	Temperature measurement	Voltage measurement
AI 1000 Ω	AI PT1K 375 (NA)*)	AI 0 to 10V
AI 2500 Ω	AI PT1K 385 (EU)*)	AI 0 to 10V (0 to 100%)
AI 10 KΩ	AI (LG-)Ni1000*)	
AI 100 KΩ	AI Ni1000 DIN*)	
	AI T1 (PTC)*)	
	AI NTC3K	
	AI NTC10K**)	
	AI NTC100K**)	

A fixed value of 1 Ω is calibrated to correct line resistance.

** Configurable default.

Digital Inputs	
Contact voltage	Universal input: 18V Digital input: 21V
Contact current	Universal input: 1.2 mA; 7.4 mA initial current Digital input: 1.6 mA; 9.4 mA initial current
Contact resistance for closed contacts	Max. 100 Ω
Contact resistance for open contacts	Min. 50 kΩ

Outputs

Analog Outputs	
0 to 10V	Max. 1 mA

Digital Outputs	
Type (Switching outputs triacs)	High side The Triac closes the contact to AC 24V
Switching voltage	AC 24V
Permissible load	250 mA/6 VA per output (cos phi 0.35) (500 mA/12 VA per output with PWM*)
Protection	Short-circuit proof

DC 24V output for field devices (1: V+)	
Output voltage	DC 24V
Permissible load	100 mA/2.4 W
Protection against overload	Short-circuit proof

Connections

Interfaces	
Ethernet	Plugs: 2 x RJ45, screened Interface type: 10Base-T/100BASE-TX, IEEE 802.3 compatible Bitrates: 10/100 Mbps, autosensing Protocol: BACnet over UDP/IP
USB (2.0)	Plug: Type B Data rate: 12 Mbps
KNX	Type: KNX TP1 PL-Link, galvanic isolation Baud rate: 9.6 Kbps Bus power: 50 mA Short-circuit proof Protection against faulty wiring at max. AC 24V

Wiring connections	
Pluggable screw terminals	Copper wire or copper strands with ferrules 1 x 0.6 mm dia. to 2.5 mm^2 (22 to 14 AWG) or 2 x 0.5 mm dia. to 1 mm^2 (24 to 18 AWG) Copper strands without ferrules 1 x 0.6 mm dia. to 2.5 mm^2 (22 to 14 AWG) or 2 x 0.5 mm dia. to 1.5 mm^2 (24 to 16 AWG)
Slotted screws	Small 1/8” blade, tightening torque 0.6 Nm (0.44 lb-ft)
Wiring lengths for signals	KNX PL-Link 80 m (260 ft) with internal bus power or 300 m (990 ft) with external power supply Ethernet 100 m (330 ft) Signal lines 80 m (260 ft) For inputs AI 100 kohm, AI NTC10K, AI NTC100K, AI NTC3K: 30 m (100 ft) or 80 m (260 ft), if shielded.

KNX/PL-Link Network and Power Wriring.*	
Cable configuration	1 or 2 twisted pair - Pair 1 red/black - Pair 2 yellow/white
Gauge	20 AWG (solid bare copper)
Twists per foot	4 Minimum
Capacitance	30 pF/foot or less
Shields	100% foil with drain wire
UL type	300Vrms, CMP (75 °C or higher)
CSA type	300Vrms, FT6 (75 °C or higher)

* Alternative 18 AWG STP CMP (Belden 6320FE 8771000)

Conformity

⚠ CAUTION

National safety regulations

Failure to comply with national safety regulations may result in personal injury and property damage.
Observe national provisions and comply with the appropriate safety regulations.

Ambient conditions and protection classification	
Climatic ambient conditions	
• Transport and Storage	• Temperature -25 to 70°C (-13 to 158°F) Air humidity 5 to 95% rh.
• Operation	• Temperature -5 to 45°C (23 to 113°F)/ -5 to 50 °C (23 to 122°F) Air humidity 5 to 95% rh.

Standards, directives and approvals	
UL Listing	UL916
Federal Communications Commission	FCC CFR 47 Part 15 Class B
CSA Compliance	C22.2 No. 205
Environmental compatibility - RoHS Compliant	The product environmental declaration contains data on environmentally compatible product design and assessments (composition, packaging, environmental benefit, disposal).
BACnet BTL Listing	BTL-ASC
CEC Title 24 Supported	
ASHRAE 90.1 Supported	
Quality	ISO 9001 (Quality).

Issued by
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SIEMENS

Installation Instructions
Document No. 550-196
December 15, 2004

Terminal Equipment Controller Enclosure

Product Description

A Terminal Equipment Controller enclosure is a general-purpose metal cabinet with a removable cover that houses an electronic output Terminal Equipment Controller (TEC). It is available in two versions: one to enclose a short platform TEC, and a larger multi-purpose model designed to enclose any of the following:

- Short platform TEC with or without actuator
- Long platform TEC
- TEC Actuator Package
- TEC Plug-in Relay Module (either direct or remote mounted)

Product Number

540-155	Enclosure for short platform TEC
550-002	Multi-purpose enclosure for short or long platform TEC and/or other components listed above

Agency Approvals

- UL listed as an industrial control panel enclosure per UL 508
- cUL certified as an industrial control panel enclosure per Canadian standard C22.2 No.14–95

Required Tools

- 1/4-inch hex nut driver
- If supplied screws are not used: electric drill and appropriate size bit
- Medium flat-blade screwdriver

Prerequisites

The mounting screws provided are designed for common sheet-metal duct surfaces. Have appropriate mounting hardware on hand if another surface is used.

Instructions

1. Remove enclosure cover.

   NOTE: Enclosure 540-155 has cover screws that should be loosened but not removed. Enclosure 550-002 has no cover screws; see Figure 5 for tip on removing cover.

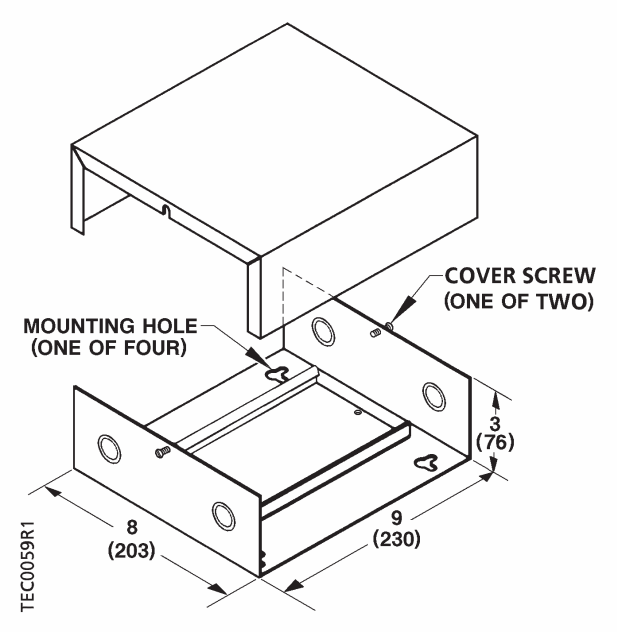
2. Remove appropriate knockouts.
3. Align the enclosure on the mounting surface and mark the position of the mounting holes (Figure 1 or Figure 2).
4. Mount the enclosure with the self-tapping screws provided or drill pilot holes and mount with other screws.
5. Do one of the following:

   - If the controller will not be installed at this time, replace the cover.
   - If the controller will be installed now, then snap it into the mounting rail and replace enclosure cover. (For enclosure 550-002, see Figure 4 for how to secure the mounting rail, and Figure 6 for how to replace the cover.)

The enclosure is installed.

Expected Installation Time

20 minutes



Dimensions in Inches (Millimeters)

Figure 1. Enclosure 540-155.

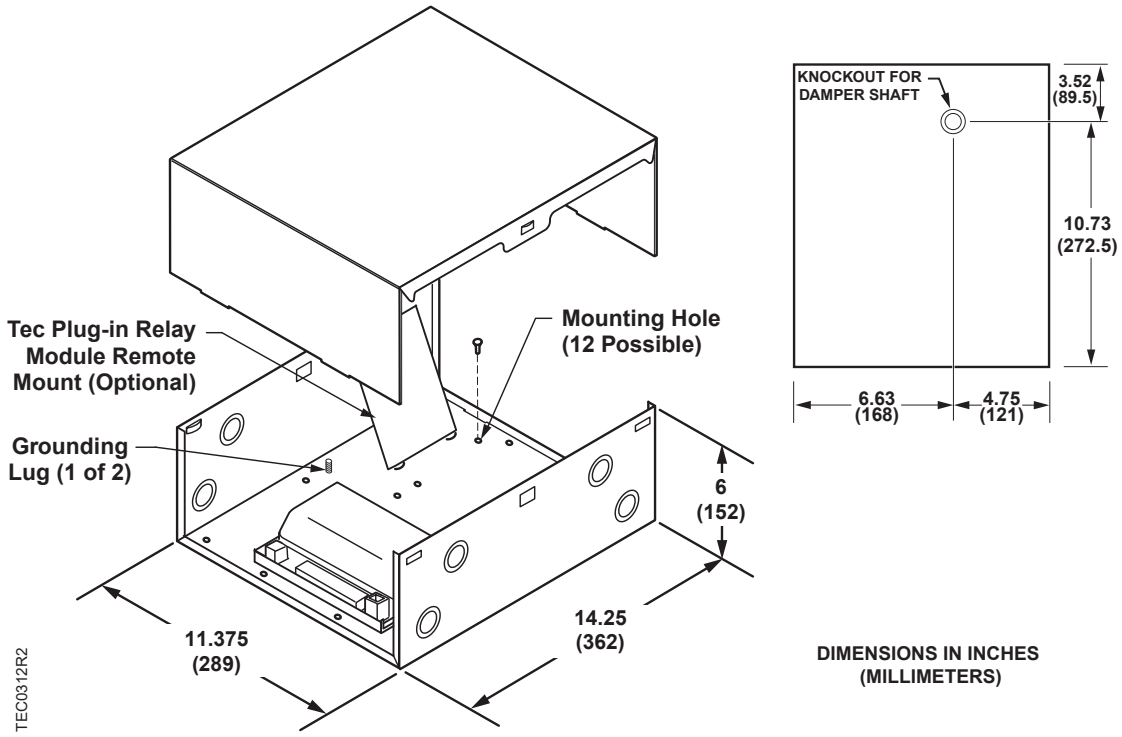
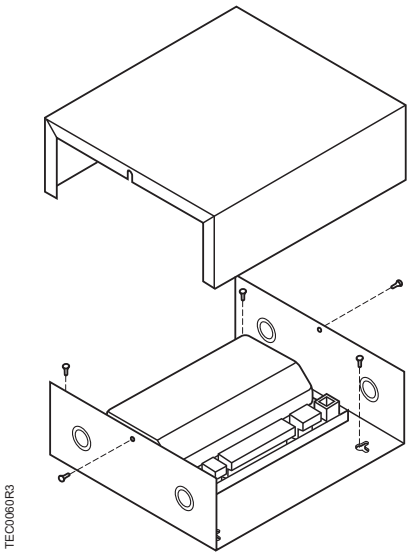
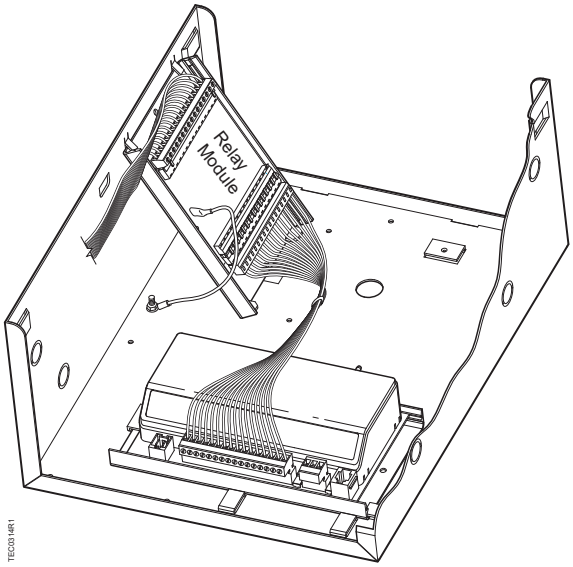


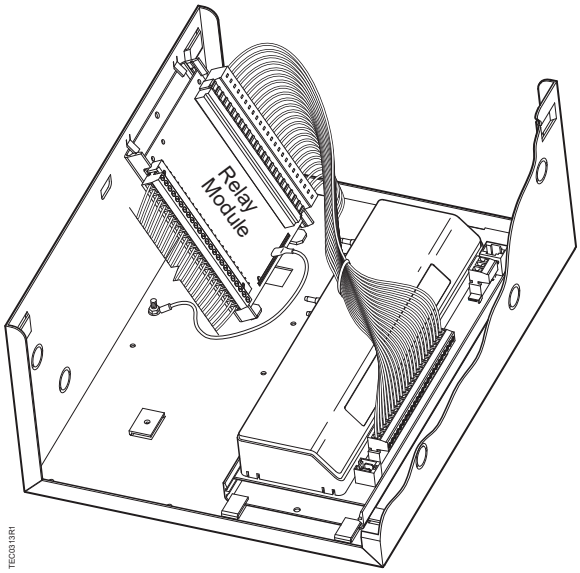
Figure 2. Enclosure 550-002.



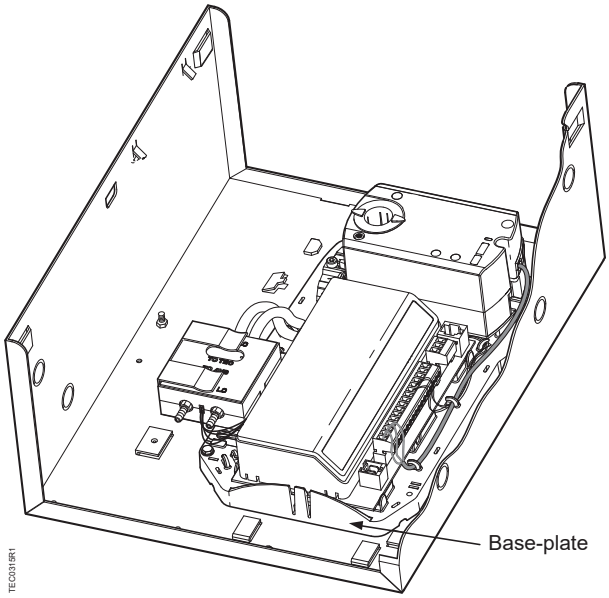
Enclosure 540-155 with Short Platform Controller



Enclosure 550-002 with Short Platform Controller and optional TEC Plug-in Relay Module (remotely mounted)



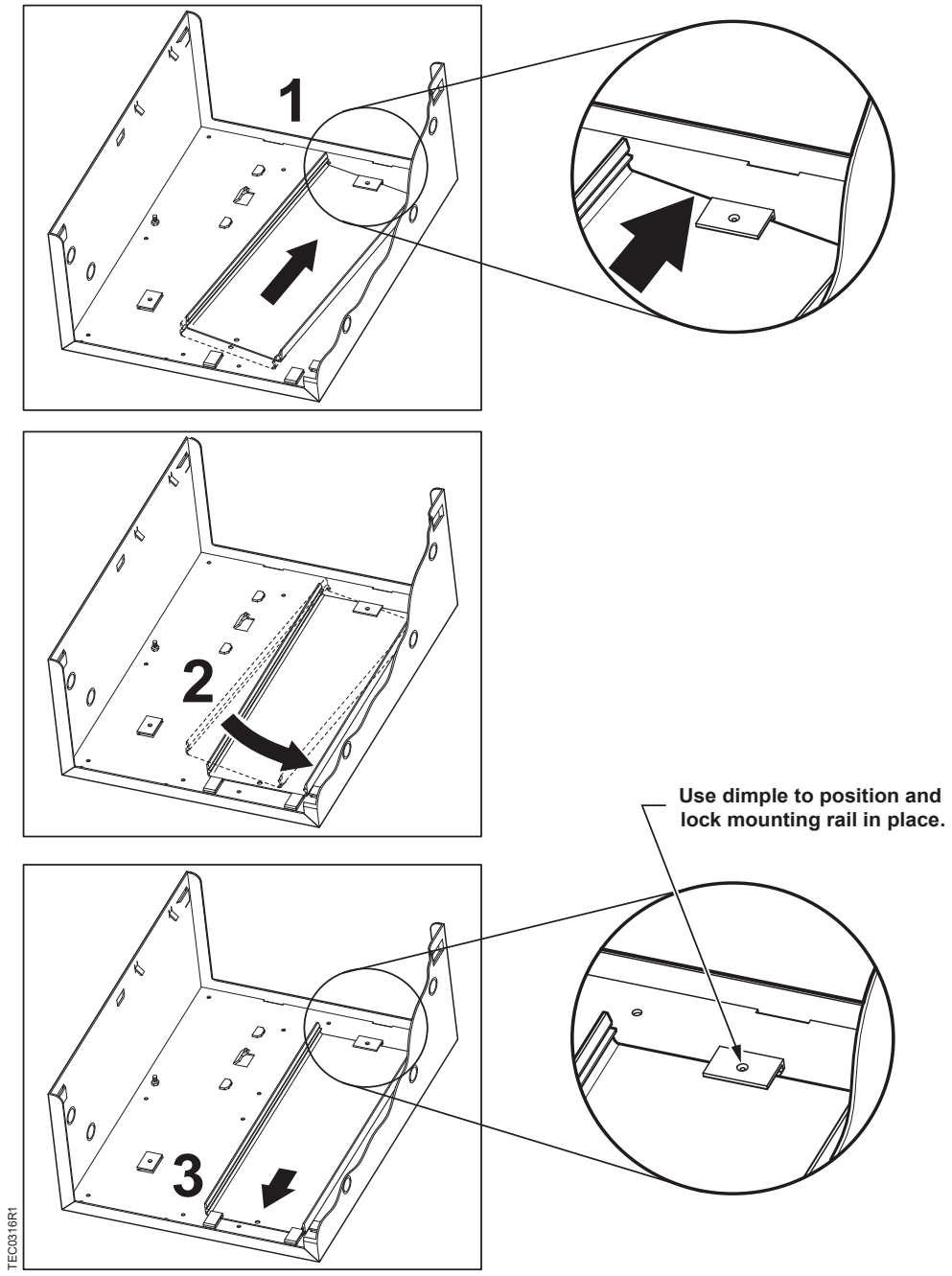
Enclosure 550-002 with Long Platform Controller and optional TEC Plug-in Relay Module (remotely mounted)



Note: TEC Plug-in Relay Module (optional) is not shown but is available with this configuration.

Enclosure 550-002 with TEC Actuator Package (shown with optional Autozero Module)

Figure 3. Enclosures with Controllers and Optional Components Installed.



With enclosure 550-002, the mounting rail does not mount with screws. Instead, it slides under and is secured by mounting flanges. **Exception:** TEC Actuator Package (P/N comes pre-assembled on a common base-plate that must be screwed in place.
Short platform mounting rail mounts in same manner as long platform mounting rail, but at right angle.

Figure 4. Enclosure 550-002, Method of Securing Mounting Rails.

NOTE: Long platform mounting rail shown above. Short platform mounting rail mounts in same manner but at right angle.

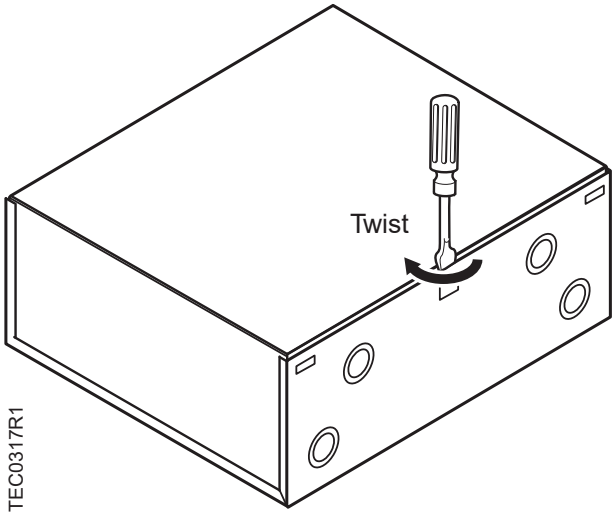


Figure 5. Enclosure 550-002 — First Step of Removing Cover (do both sides).

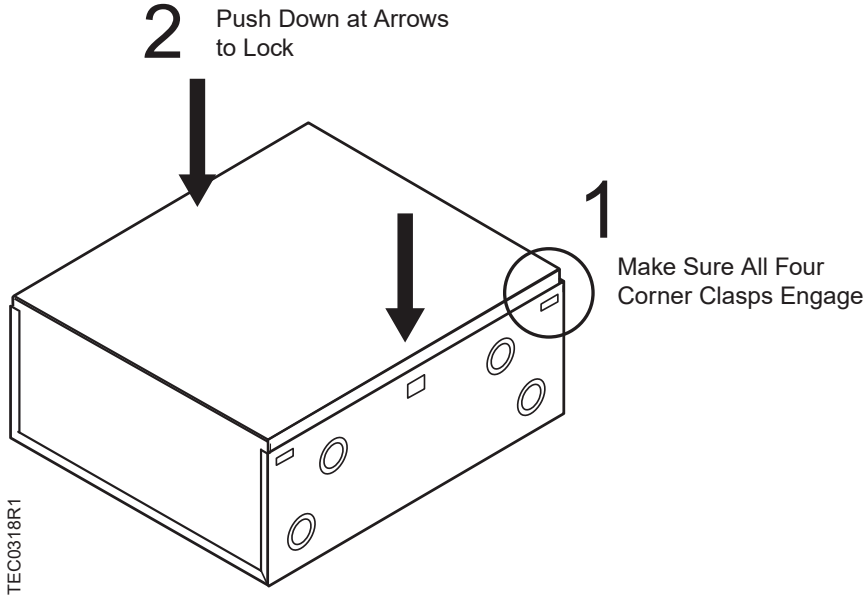


Figure 6. Enclosure 550-002 — Replacing Cover.

SIEMENS

Technical Specification Sheet
Document No.149-478
January 5, 2015

PXC Modular Series

Figure 1. PXC Modular.

Description

The PXC Modular (Programmable Controller - Modular) is an integral part of the APOGEE® Automation System. It is a high performance, modular Direct Digital Control (DDC) supervisory field panel.

The field panel operates stand-alone or networked to perform complex control, monitoring, and energy management functions without relying on a higher level processor.

- Up to 100 modular field panels communicate on a peer-to-peer network.
- With the addition of TX-I/O modules and a TX-I/O Power Supply on a self-forming bus, the PXC Modular can directly control up to 500 points.

With the addition of an Expansion Module, the PXC Modular also provides central monitoring and control for distributed Field Level Network (FLN) devices.

Features

- Modular hardware components match initial control requirements while providing for future expansion.
- DIN rail mounting and removable terminal blocks simplify installation and servicing.
- Proven program sequences to match equipment control applications.
- Sophisticated Adaptive Control, a closed loop control algorithm that auto-adjusts to compensate for load/seasonal changes.
- Built-in energy management applications and DDC programs for complete facility management.
- Comprehensive alarm management, historical data trend collection, operator control and monitoring functions.
- Support for peer-to-peer communications over Industry standard 10/100Base-T TCP/IP networks.
- PXM10T and PXM10S support: Optional LCD Local user interface with HOA (Hand-off-auto) capability and point commanding and monitoring features.

Hardware

PXC Modular

- The PXC Modular is a microprocessor-based multi-tasking platform for program execution and communication with other field panels. It scans field data, optimizes control parameters, and manages operator requests for data in seconds.
- The program and database information stored in the PXC Modular memory is battery-backed. This eliminates the need for time-consuming program and database re-entry in the event of an extended power failure. When battery replacement is necessary, the PXC Modular illuminates a “battery low” status LED and can send an alarm message to selected printers or terminals.
- The PXC Modular firmware, including the operating system, is stored in non-volatile flash memory.
- The PXC Modular provides both an Ethernet port as well as an RS-485 port for communication on Automation Level Networks using either TCP/IP or RS-485.
- An HMI RS-232 port is provided as a connection to a laptop computer for local operation and engineering.
- LEDs provide instant visual indication of overall operation, network communication, and low battery warning.
- Two self-forming buses are an integral part of the flexibility of the PXC Modular. A self-forming bus to the right of the controller supports up to 500 points through TX-I/O™ modules. Another self-forming bus to the left of the controller supports hardware connection to subsystems through Expansion Modules.

TX-I/O Modules

TX-I/O Modules are modular expansion I/O consisting of an electronics module and terminal base. The electronics modules perform A/D or D/A conversion, signal processing, and point monitoring and command output through communication with the PXC Modular. The terminal bases provide for termination of field wiring and connection of a self-forming bus. For more information, see *TX-I/O Technical Specification Sheet* (149-476).

The TX-I/O Power Supply provides power for TX-I/O modules and peripheral devices. Multiple Power Modules can be used in parallel to meet the power needs of large concentrations of I/O points (Figure 2 and Figure 3). For more information, see *TX-I/O Power Supplies Technical Specification Sheet* (149-476).

Figure 2. TX-I/O Power Supply and TX-I/O Modules.

Figure 3. PXC Modular, TX-I/O Power Supply, and TX-I/O Modules.

PXC Modular Expansion Module

The PXC Modular Expansion Module (see Figure 4) provides the hardware connection for Field Level Network (FLN) devices. Using the Triple RS-485 Expansion Module, the PXC Modular supports up to three RS-485 networks of Field Level Network devices (see Figure 5).

Figure 4. RS-485 Expansion Module.

Figure 5. RS-485 Expansion Module and PXC Modular.

Modular Control Panels with Application Flexibility

The PXC Modular is a high performance controller with extensive flexibility to customize each field panel with the exact hardware and program for the application. As a result, the user only purchases what is needed.

For example, in monitoring applications, the control panel can be customized with the number and type of

points to match the sensor devices. For monitoring and controlling a large number of (on-off) fans or motors, more digital points can be added (see Figure 6).

Figure 6. PXC Modular, TX-I/O Power Supply, and TX-I/O Modules.

Alternately, if no local point control is required, the PXC Modular can be used to monitor and control Field Level Network devices using the Expansion Modules (see Figure 7).

Figure 7. RS-485 Expansion Module and PXC Modular.

Of course, the PXC Modular can be used for both direct point monitoring and control **and** as a system controller for Field Level Network devices (see Figure 8).

Figure 8. RS-485 Expansion Module, PXC Modular, TX-I/O Power Supply, and TX-I/O Modules.

The control program for each field panel is customized to exactly match the application. Proven Powers Process Control Language (PPCL), a “BASIC” type programming language, provides direct digital control and energy management sequences to precisely control equipment and optimize energy usage.

In a stand-alone configuration, the PXC Modular can fulfill all requirements of a supervisory network coordinator by managing operation schedules and alarms and communicating for the connected devices.

Global Information Access

Each PXC Modular is equipped with an RS-232 port. This port supports the connection of a computer. Devices connected to the terminal port gain global information access.

Multiple Operator Access

Multiple operators can access the network simultaneously. When using the Ethernet ALN option, multiple operators may access the controller through concurrent Telnet sessions and/or local operator terminal ports.

Menu Prompted, English Language Operator Interface

The PXC Modular field panel includes a simple, yet powerful menu driven English Language Operator Interface that provides, among other things:

- Point monitoring and display
- Point commanding
- Historical trend collection and display for multiple points
- Equipment scheduling
- Program editing and modification via Powers Process Control Language (PPCL)
- Alarm reporting and acknowledgment
- Continual display of dynamic information

Built-in Direct Digital Control Routines

The PXC Modular provides stand-alone Direct Digital Control (DDC) to deliver precise HVAC control and comprehensive information about system operation. It receives information from sensors in the building, processes the information, and directly controls the equipment. The following functions are available in the PXC Modular:

- Adaptive Control, an auto-adjusting closed loop control algorithm. Provides more efficient, adaptive, robust, fast, and stable control than the traditional PID control algorithm. Superior in terms of response time, holding steady state, and minimizing error, oscillations, and actuator repositioning.
- Closed Loop Proportional, Integral and Derivative (PID) control.
- Logical sequencing.
- Alarm detection and reporting.
- Reset schedules.

Built-in Energy Management Applications

The following applications are programmed in the PXC Modular and require simple parameter input for implementation:

- Peak demand limiting
- Start-Stop time optimization
- Equipment scheduling, optimization and sequencing
- Duty cycling
- Economizer control

Licensable Options

The following features are available on the PXC Modular P2 controllers and require a license for implementation:

- Field Panel GO
- Virtual AEM

Specifications

Dimensions

PXC Modular Series	7.56 in. L × 3.54 in. W × 2.76 in. D (192 mm L × 90 mm W × 70 mm D)
Expansion Module with three P1 RS-485 FLN connections	1.26 in. L × 3.54 in. W × 2.76 in. D (32 mm L × 90 mm W × 70 mm D)

Electrical, Processor, Battery, and Memory

Power Consumption	24 VA @ 24 Vac
Processor	MPC885 (PowerPC®)
Processor Clock Speed	133 MHz
Memory	72 MB (64 MB SDRAM, 8 MB Flash ROM)
Secure Digital Input/Output (SDIO) card	Expandable or removable non-volatile memory
Battery backup of SDRAM	30 days (accumulated) AA (LR6) 1.5 Volt Alkaline (non-rechargeable)
Battery backup of Real Time Clock	12 months (accumulated) Cell coin 3 Volt lithium

Communication

Ethernet Automation Level Network (EALN) port BACnet I/P Ethernet Automation Level Network port	10Base-T or 100Base-TX compliant
RS-485 Automation Level Network (ALN) port	1200 bps to 115.2 Kbps
Expansion Bus for support of sub-system networks	1200 bps to 115.2 Kbps
TX-I/O Self forming bus connection	115.2 Kbps
Human-Machine Interface (HMI) port	RS-232 compliant
USB Device Port	Standard 1.1 and 2.0 USB device port, full speed 12 Mbps, low speed 1.5 Mbps, Type B connector
USB Host port	Standard 1.1 and 2.0 USB host port, full speed 12 Mbps, low speed 1.5 Mbps, Type A connector

Electrical Rating

AC Power	NEC Class 2
Communication	NEC Class 2

Operating Environment

Ambient operating temperature	32°F to 122°F (0°C to 50°C), <95% rh, non-condensing
Ambient operating environment	Operate in a dry location, which is protected from exposure to salt spray or other corrosive elements. Exposure to flammable or explosive vapors must be prevented.
Shipping and Storage environment	-40°F to +185°F (-40°C to +85°C) <95% rh, non-condensing
Shipping environment	-13°F to 158°F (-25°C to 70°C), 5% to 95% rh, non-condensing
Mounting Surface	Building wall or structural member

Agency Listings

UL	UL 864 UUKL Smoke Control Equipment UL 864 UUKL7 Smoke Control Equipment CAN/ULC-S527-M8 UL 916 PAZX UL 916 PAZX7
Agency Compliance	FCC Compliant Australian EMC Framework European EMC Directive (CE) – with enclosure RoHS Compliant
OSHPD Seismic Certification	Product meets OSHPD Special Seismic Preapproval certification (OSH-0217-10) under California Building Code 2010 (CBC2010) and International Building Code 2009 (IBC2009) when installed within the following Siemens enclosure part numbers: PXA-ENC18, PXA-ENC19, or PXA-ENC34.

Product Ordering Information

Description	Product Number
PXC MOD, P2, 96 NODE, APOGEE	PXC00-PE96.A
PXC MOD, P2, TX-I/O, 96 NODE, APOGEE	PXC100-PE96.A
PXC MOD, BACnet, 96 NODE, APOGEE	PXC00-E96.A
PXC MOD, BACnet, TX-I/O, 96 NODE, APOGEE	PXC100-E96.A
Add support for TX-I/O	PXF-TXIO.A
Virtual AEM License	LSM-VAEM
Field Panel GO License	LSM-FPGO
Expansion Module, three RS-485 connections	PXX-485.3

Accessories

Product Number	Description
PXM10S	Controller mounted Operator Display module with point monitor and optional blue backlight
PXM10T	Controller mounted Operator Display module
PXA-HMI.CABLEP5	Serial cable required for PXM10T/S connection to PXC Series controllers

Document Ordering Information

Description	Document Number
PXC Modular Series Owner’s Manual	125-3582
Powers Process Control Language (PPCL) User’s Manual	125-1896

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Your feedback is important to us. If you have comments about this document, please send them to SBT_technical.editor.us.sbt@siemens.com

Document No. 149-478
Printed in the USA

SIEMENS

Technical Specification Sheet
Document No. 149-919
August 26, 2009

Immersion Well Temperature Sensors

Description

The Immersion Well Temperature Sensors monitor and transmit changes in temperature to the building control system. Specific devices within the range are compatible with whatever North American manufactured building automation system you may be installing. They thread into a well in a pipe and sense the medium temperature in the pipe. All sensors incorporate precision temperature sensing elements to accurately and reliably measure temperature.

Features

- Variety of sensing elements
- Suitable for hot or chilled medium
- Responsive to temperature change
- Accurate and reliable indication of temperature
- Familiar installation requires no special tools

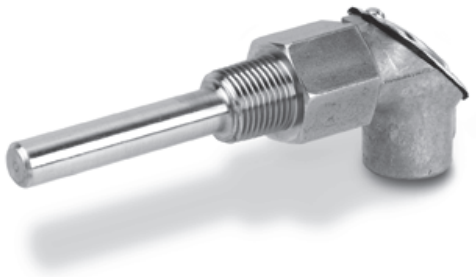

Figure 1. Immersion Well Temperature Sensor.

Specifications

Temperature Range	Controller dependent
Output Signals	Changing resistance
Sensing Element Type	NTC Thermistor, Platinum RTD, or Nickel RTD
Accuracy	
NTC Thermistors, mid-range	±1.0°F (±0.5°C)
Pt RTD and Ni RTD, mid-range	±0.75°F (±0.4°C)
Installation	
Wiring	2-conductor: 18 to 22 AWG twisted pair (per code requirements)
Calibration Adjustments	NTC: None required RTD: Adjust for increased temperature offset (a constant) as required, related to added resistance of the field wiring
External Installation Threads	1/2-inch – 14 NPT
Conduit Connection Threads	1/2-inch – 14 NPSMI
Housing Material	Cast zinc
Immersion Well Material	300 Series Stainless Steel

Immersion Well Temperature Sensor Product Numbers

Product Number	Description
QAE2012.005	Immersion Temperature Sensor, Metal Housing, Platinum 1000 Ohm, 385 Alpha, 2.5" Probe
QAE2012.010	Immersion Temperature Sensor, Metal Housing, Platinum 1000 Ohm, 385 Alpha, 4" Probe
QAE2012.015	Immersion Temperature Sensor, Metal Housing, Platinum 1000 Ohm, 385 Alpha, 6" Probe
QAE2020.005	Immersion Temperature Sensor, Metal Housing, Nickel 1000 Ohm, SIEMENS, 2.5" Probe
QAE2020.010	Immersion Temperature Sensor, Metal Housing, Nickel 1000 Ohm, SIEMENS, 4" Probe
QAE2020.015	Immersion Temperature Sensor, Metal Housing, Nickel 1000 Ohm, SIEMENS, 6" Probe
QAE2021.005	Immersion Temperature Sensor, Metal Housing, Nickel 1000 Ohm, JCI, 2.5" Probe
QAE2021.010	Immersion Temperature Sensor, Metal Housing, Nickel 1000 Ohm, JCI, 4" Probe
QAE2021.015	Immersion Temperature Sensor, Metal Housing, Nickel 1000 Ohm, JCI, 6" Probe
QAE2030.005	Immersion Temperature Sensor, Metal Housing, NTC 10K Ohm TYPE 2, 2.5" Probe
QAE2030.010	Immersion Temperature Sensor, Metal Housing, NTC 10K Ohm TYPE 2, 4" Probe
QAE2030.015	Immersion Temperature Sensor, Metal Housing, NTC 10K Ohm TYPE 2, 6" Probe
QAE2032.005	Immersion Temperature Sensor, Metal Housing, NTC 10K Ohm TYPE 3, 2.5" Probe
QAE2032.010	Immersion Temperature Sensor, Metal Housing, NTC 10K Ohm TYPE 3, 4" Probe
QAE2032.015	Immersion Temperature Sensor, Metal Housing, NTC 10K Ohm TYPE 3, 6" Probe

Accessories Ordering Information

Description		Part Number
Immer-sion Wells	2.5 in. (64 mm)	AQE2000.005
	4 in. (100 mm)	AQE2000.010
	6 in. (153 mm)	AQE2000.015
Immersion Well Repair Kit	PT 1000 Ohm (385 α)	AQE2012
	Ni 1K Ohm, Siemens	AQE2020
	Ni 1000 Ohm, JCI	AQE2021
	NTC 10K Ohm Type II	AQE2030
	NTC 10K Ohm Type III	AQE2032

Repair kits have components to fill any of the three Immersion Wells offered.

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Your feedback is important to us. If you have comments about this document, please send them to SBT_technical.editor.us.sbt@siemens.com

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SIEMENS

Technical Specification Sheet
Document No. 149-206
October 8, 2015

PXC Compact Series for BACnet Networks

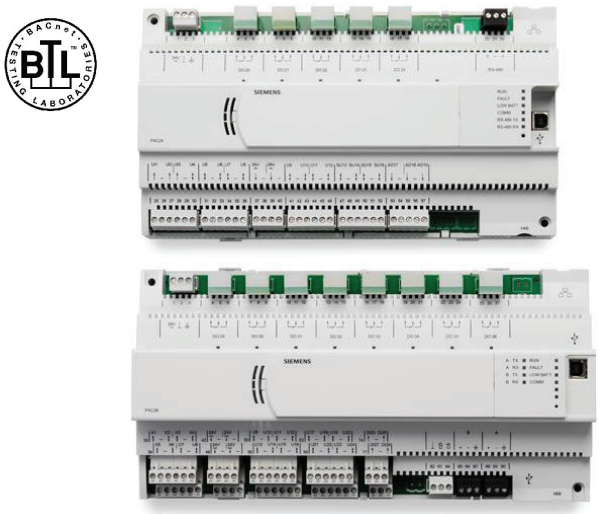

Figure 1. PXC Compact Series Controllers (PXC-24 and PXC-36 shown).

Description

The PXC Compact Series Programmable Controller Compact for BACnet networks is a high-performance Direct Digital Control DDC super isory equipment controller which is an integral part of the APO EE Automation System. The controllers are classified as either a BACnet Building Controller B-BC with support for BACnet/IP or BACnet MS/TP protocols.

The PXC Compact Series offers integrated I/O based on state-of-the-art TX-I/O Technology which pro ides superior fle ibility of point and signal types and makes it an optimal solution for Air Handling nit AH control. The PXC Compact operates stand-alone or networked to perform comple control monitoring and energy management functions without relying on a higher-le el processor.

The PXC Compact Series communicates with other field panels or workstations on a peer-to-peer Automation Le el etwork AL or on the ield Le el etwork L and supports the following communication options

- ati e BACnet/IP communications o er 10/100 MB Ethernet networks
- ati e BACnet MS/TP on S- 5

The PXC Compact is a ailable with 1 or point terminations. Selected models in the Compact Series pro ide the following options

- Super ision for L de ices.
- An e tended temperature range for the control of rooftop de ices.
- Support for Island Bus which uses TX-I/O modules to e pand the number of point terminations for high-speed loop control.

Features

- BACnet Testing Laboratories BTL certified Classified as BACnet Building Controllers B-BC using the BACnet/IP protocol and/or BACnet MS/TP.
- DI rail mounted de ice with remo able terminal blocks simplifies installation and ser icing.
- Pro en program sequences to match equipment control applications.
- Built-in energy management applications and DDC programs for complete facility management.
- Comprehensi e alarm management historical data trend collection operator control and monitoring functions.
- Sophisticated Adapti e Control a closed loop control algorithm that auto-ad usts to compensate for load/seasonal changes.
- Message control for terminals printers pagers and workstations.
- Highly configurable I/O using Siemens state-of-the-art TX-I/O Technology.
- HMI S- port which pro ides laptop connecti ity for local operation and engineering.
- E tended battery backup of eal Time Clock.
- Persistent database backup and restore within the controller.
- Optional HOA Hand/Off/Auto module for swappable and configurable HOA capability.
- Optional e tended temperature range for rooftop installation.
- Optional support for S- 5 P1 or MS/TP de ices.
- Optional P1 ireless L support.
- Auto Sa e and persistent database backup and restore within the controller.
- PXM10T and PXM10S support Optional LCD Local user interface with HOA Hand-off-auto capability and point commanding and monitoring features.
- MS/TP Point Pickup Module PPM support ni ersal Inputs can be configured for analog or digital input. Input/Output type is configured by writing to BACnet ob ect properties.
- BACnet ield Panel eb Ser er support eb-based raphical ser Interface I compatible with BACnet networks. Ideal for small or remote facilities to monitor and control the Building Automation System.
- The Simple etwork Management Protocol S MP Agent allows points in the field panel to communicate with an S MP manager o er Ethernet.

The Compact Series

In addition to building and system management functions the Compact Series includes se eral styles of controllers that fle ibly meet application needs.

PXC-16

The PXC-1 pro ides control of 1 points including software-configurable uni ersal points.

Point count includes ni ersal Input I 5 ni ersal I/O Digital Input DI Analog Output AO and Digital Output DO .

PXC-24

The PXC- pro ides control of points including 1 software-configurable uni ersal points.

Point count includes ni ersal Input I ni ersal I/O Super ni ersal I/O X Analog Output AO 5 Digital Output DO .

PXC-36

The PXC- pro ides control of local points including software-configurable uni ersal points.

Point count includes 1 ni ersal I/O Super ni ersal I/O X Digital Input DI and Digital Output DO .

The PXC- offers the fle ibility of e panding the total point count through a self-forming Island Bus. ith the addition of a TX-I/O Power Supply up to four TX-I/O modules can be supported. or more information see the *TX-I/O Product ange Technical Specification Sheet* 1 - .

Hardware

The PXC Compact Series consists of the following ma or components

- Input/Output Points
- Power Supply
- Controller Processor

Input/Output Points

- The PXC Compact input/output points perform A/D or D/A con ersion signal processing point command output and communication with the controller processor. The terminal blocks are remo able for easy termination of field wiring.
- The ni ersal and Super ni ersal points le erage TX-I/O Technology from Siemens Building Technologies to configure an e tensi e ariety of point types.
- ni ersal Input I and ni ersal Input/Output points are software-selectable to be

  0-10 input

  - 0 mA input

  Digital Input

  Pulse Accumulator inputs

  1 i TD Siemens ohnson Controls DI Standard

  1 Pt TD 5 or 5 alpha

  10 TC Thermistor Type and Type

  100 TC Thermistor Type

  0-10 Analog Output ni ersal Input/Output points only

- Super ni ersal X points PXC- and PXC- only are software-selectable to be

  0-10 input

  - 0 mA input

  Digital Input

  Pulse Accumulator inputs

  1 i TD Siemens ohnson Controls DI Standard

  1 Pt TD 5 or 5 alpha

  10 TC Thermistor Type and Type

  100 TC Thermistor Type

  0-10 Analog Output

  - 0 mA Analog Output

  Digital Output using e ternal relay

- Dedicated Digital Input DI points PXC-1 only are dry contact status sensing.
- Digital Output DO points are 110/ 0 Amp resisti e orm C relays LEDs indicate the status of each point.
- All PXC Compact Series models support 0-10 dc Analog Output circuits.

- On PXC- and PXC- models the Super ni ersal points may be defined as either 0-10 dc or - 0 mA Analog Output circuits.

Power Supply

- The olt DC power supply pro ides regulated power to the input/output points and acti e sensors. The power supply is internal to the PXC Compact housing eliminating the need for e ternal power supply and simplifying installation and troubleshooting.
- The power supply works with the processor to ensure smooth power up and power down sequences for the equipment controlled by the I/O points e en through brownout conditions.

Controller Processor

- The PXC Compact Series includes a microprocessor-based multi-tasking platform for program e ecution and communications with the I/O points and with other PXC Compacts and field panels o er the AL .
- A Human Machine Interface HMI port with a quick-connect phone ack - 5 uses S- protocol to support operator de ices such as a local user interface or simple C T terminal and a phone modem for dial-in ser ice capability.
- A SB De ice port supports a generic serial interface for an HMI or Tool connection or used for memory e pansion in select models. The SB De ice port does not support firmware flash upgrades.
- The program and database information stored in the PXC Compact AM memory is battery-backed. This eliminates the need for time-consuming program and database re-entry in the e ent of an e tended power failure.
- The firmware which includes the operating system is stored in non- olatile flash OM memory this enables firmware upgrades in the field.
- Brownout protection and power reco ery circuitry protect the controller board from power fluctuations.
- LEDs pro ide instant isual indication of o erall operation network communication and low battery warning.

Available Options

The following options are a ailable to match the application

FLN Support

- The PXC-1 and PXC- models pro ide support for up to S- 5 P1 or BACnet IP and MS/TP de ices.
- The PXC-1 and PXC- models with the addition of a L license support up to S- 5 P1 or BACnet IP and MS/TP de ices.
- The PXC- with an L license supports up to S- 5 P1 or BACnet IP and MS/TP de ices.
- A ireless L may also be used to replace the traditional P1 L cabling with wireless communication links that form a wireless mesh network. Additional hardware is required to implement the ireless L .

or more information about L support contact your local Siemens Industry representati e.

Extended Temperature Operation

PXC- models support e tended temperature operation allowing for rooftop installations.

Web Server and Web Services

The PXC Compact Series supports eb Ser er and eb Ser ices functionality. The eb Ser er license pro ides an HTML eb-based user interface for your APO EE Building Automation System. It is an ideal solution for small or remote facilities with field panels on a BACnet/IP Automation Le el etwork AL .

The eb Ser er/ eb Ser ices is a licensable option on the PXC Compact.

The eb Ser ices must be used in con unction with eb Ser er located on a PXC- or PXC Modular and pro ides eb access to database information in PXC- and PXC-1 BACnet/IP controllers.

This solution pro ides the user the following features eb-based graphics and user interface command monitor alarm trend and generate reports on BACnet ob ects within the controller database including super ised L de ice information schedule BACnet ob ects within the controller database including super ised L de ices and remote notification.

Programmable Control with Application Flexibility

The PXC Compact Series of high performance controllers pro ides complete fle ibility which allows the owner to customi e each controller with the e act program for the application.

The control program for each PXC Compact is customi ed to e actly match the application. Pro en Powers Process Control Language PPCL a te t-based programming structure like BASIC pro ides direct digital control and energy management sequences to precisely control equipment and optimi e energy usage.

Global Information Access

The HMI port supports operator de ices such as a local user interface or simple C T terminal and a phone modem for dial-in ser ice capability. De ices connected to the operator terminal port gain global information access.

Multiple Operator Access

Multiple operators can access the network simultaneously. Multiple operator access ensures that alarms are reported to an alarm printer while an operator accesses information from a local terminal. hen using the BACnet/IP AL option multiple operators may also access the controller through concurrent Telnet sessions and/or local operator terminal ports plus optional eb interface using the eb or eb Ser ices option.

Menu Prompted, English Language Operator Interface

The PXC Compact includes a simple yet powerful menu-dri en English Language Operator Interface that pro ides among other things

- Point monitoring and display
- Point commanding
- Historical trend collection and display for multiple points
- E ent scheduling
- Program editing and modification ia Powers Process Control Language PPCL
- Alarm reporting and acknowledgment
- Continual display of dynamic information

Built-in Direct Digital Control Routines

The PXC Compact pro ides stand-alone Direct Digital Control DDC to deli er precise H AC control and comprehensi e information about system operation. It recei es information from sensors in the building processes the information and directly controls the equipment. The following functions are a ailable in the PXC Compact

- Adapti e Control an auto-ad usting closed loop control algorithm which pro ides more efficient adapti e robust fast and stable control than the traditional PID control algorithm. It is superior in terms of response time and holding steady state and at minimi ing error oscillations and actuator repositioning.
- Closed Loop Proportional Integral and Deri ati e PID control.
- Logical sequencing.
- Alarm detection and reporting.
- eset schedules.

Built-in Energy Management Applications

The following applications are programmed in the PXC Compact Series and require simple parameter input for implementation

- Automatic Daylight Sa ing Time switcho er
- Calendar-based scheduling
- Duty cycling
- Economi er control
- Equipment scheduling optimi ation and sequencing including Start/Stop Time Optimi ation SSTO
- E ent scheduling
- Holiday scheduling
- ight setback control
- Peak Demand Limiting PDL
- Temperature-compensated duty cycling
- Temporary schedule o erride

BACnet Compact Series Specifications

Dimensions (L × W × D)	
PXC-1 and PXC-	10. 5. . 5 mm 150 mm mm
PXC-	11.5 5. .0 mm 150 mm mm

Processor, Battery, and Memory		
Processor and Clock Speed	PXC-1 and PXC-	reescale MPC 5 T 100 MH
	PXC-	reescale MPC 5 1 MH
Memory	PXC-1 and PXC-	MB 1 MB SD AM MB lash OM
	PXC-1 and PXC- and	0 MB MB SD AM MB lash OM
	PXC-	0 MB MB SD AM 1 MB lash OM
Battery backup of Synchronous Dynamic SD AM field replaceable	PXC-1 and PXC- on-rooftop Models	0 days accumulated
		AA L 1.5 olt Alkaline non-rechargeable
	PXC- :	days accumulated
		AA L 1.5 olt Alkaline non-rechargeable
	ooftop E tended Temperature Models	0 days accumulated
		AA L . olt Lithium non-rechargeable
Battery backup of eal Time Clock	on-rooftop Models	10 years
	Coin cell B 0	olt lithium
	ooftop E tended Temperature Models	1 months
	Coin cell B 0	olt lithium

Communication	
A/D esolution analog in	1 bits
D/A esolution analog out	10 bits

BACnet/IP Automation Le el etwork AL	10Base-T or 100Base-TX compliant
BACnet MS/TP Automation Le el etwork AL	S- 5 00 bps to 115. bps
BACnet MS/TP ield Le el etwork L *on selected models license required*	S- 5 00 bps to . bps
BACnet/IP ield Le el etwork L *on selected models license required*	10Base-T or 100Base-TX compliant
S- 5 P1 ield Le el etwork L *on selected models license required*	00 bps to . bps
Human-Machine Interface HMI	S- compliant 1 00 bps to 115. bps
SB De ice port for non-smoke control applications only	Standard 1.1 and .0 SB de ice port Type B female connector.
SB Host port *on selected models* for ancillary smoke control applications only .	Standard 1.1 and .0 SB host port Type A female connector.

Electrical	
Power equirements	ac 0 input 50/ 0 H
Power Consumption Ma imum	PXC-1 1 A ac
	PXC- 0 A ac
	PXC- 5 A ac
AC Power and Digital Outputs	EC Class 1 Power Limited
Communication and all other I/O	EC Class
Digital Input	Contact Closure Sensing
	Dry Contact/Potential ree inputs only
	Does not support counter inputs
Digital Output	Class 1 elay

Electrical	
Analog Output	0 to 10 dc
ni ersal Input I and ni ersal Input/Output	**Analog Input** oltage 0-10 dc Current - 0 mA 1 i TD 1 Pt TD 5 or 5 alpha 10 TC Type or Type Thermistor 100 TC Type Thermistor **Digital Input** Pulse Accumulator Contact Closure Sensing Dry Contact/Potential ree inputs only Supports counter inputs up to 0 H **Analog Output (Universal Input/Output (U) points only)** oltage 0-10 dc
Super ni ersal X	**Analog Input** oltage 0-10 dc Current - 0 mA 1 i TD 1 Pt TD 5 or 5 alpha 10 TC Type or Type Thermistor 100 TC Type Thermistor **Digital Input** Pulse Accumulator Contact Closure Sensing Dry Contact/Potential ree inputs only Supports counter inputs up to 0 H **Analog Output** oltage 0-10 dc Current - 0 mA **Digital Output (requires an external relay)**

Electrical

	0 to dc mA ma .

Operating Environment

Ambient operating temperature		to 1 0 C to 50 C
Ambient operating temperature *with rooftop e tended temperature option*		- 0 to 15 - 0 C to 0 C
elati e Humidity	PXC-*1* *and* PXC-	5 to 5 non-condensing
	PXC-	5 to 5 non-condensing
Mounting Surface	PXC-*1* *and* PXC-	Direct equipment mount building wall or structural member
	PXC-	Building wall or a secure structure

Agency Listings

L	L	L Smoke Control Equipment e cept rooftop models
	L	L Smoke Control Equipment e cept rooftop models
		CA / LC-S5 -M e cept rooftop models
		L 1 PA X all models
		L 1 PA X all models
CSA		CSA . o. 05-M1 SI AL E IPME T
Agency Compliance		CC Compliant C Part 15 Subpart B Class B
		Australian EMC ramework
		European EMC Directi e CE
		European Low oltage Directi e L D
		oHS Compliant
BTL		BACnet Testing Laboratories BTL Certified irmware e ision .0 and later
OSHPD Seismic Certification		Product meets OSHPD Special Seismic Preappro al certification OSH-0 1 -10 under California Building Code 010 CBC 010 and International Building Code 00 IBC 00 when installed within the following Siemens enclosure part numbers PXA-E C1 PXA-E C1 or PXA-E C .

Ordering Information

PXC Compact Series

Part Number	Description
PXC1 . -E.A	PXC Compact 1 point BACnet/IP AL
PXC1 . -M.A	PXC Compact 1 point MS/TP AL
PXC1 . -E .A	PXC Compact 1 point BACnet/IP AL P1 or MS/TP L
PXC1 . -E .A	PXC Compact 1 point BACnet/IP AL P1 or MS/TP L Enabled
PXC . -E.A	PXC Compact point BACnet/IP AL
PXC . -M.A	PXC Compact point MS/TP AL
PXC . -E .A	PXC Compact point BACnet/IP AL rooftop
PXC . -M .A	PXC Compact point MS/TP AL rooftop
PXC . -E .A	PXC Compact point BACnet/IP AL P1 or MS/TP L
PXC . -E .A	PXC Compact point BACnet/IP AL P1 or MS/TP L Enabled
PXC . -E .A	PXC Compact point BACnet/IP AL rooftop P1 or MS/TP L
PXC -E.A	PXC Compact point BACnet/IP or MS/TP AL
PXC -E .A	PXC Compact point BACnet/IP or MS/TP AL Island Bus P1 or MS/TP L

Optional Licenses

Product Number	Description
LSM- L	License to enable L support on PXC-1 or PXC- models
LSM- L .A	License to enable L support on models PXC -E.A and PXC -PE.A
LSM-IB .A	License to enable TX-I/O modules on the Island Bus on models PXC -E.A and PXC -PE.A
LSM- .A	License to enable TX-I/O modules on the Island Bus and L support on models PXC -E.A and PXC -PE.A

Product Number	Description
LSM- P EBPLHST	License enables a PXC Modular or PXC- controller to host I Builder raphics
LSM- P EBPL	License enables any BACnet IP PXC series controller to supply the graphic host controller with data for I Builder graphics
LSM- P EB	License to enable BACnet ield Panel eb Ser er PXC- or eb Ser ices PXC-1 / Option enables HTTP Change of alue needed for field panel hosted graphics.
LSM-S MP	License to enable S MP Agent License to enable S MP Agent

Accessories

Product Number	Description
PXM10S	Controller mounted Operator Display module with point monitor and optional blue backlight
PXM10T	Controller mounted Operator Display module
PXA -M	-switch HOA L
PXA1 -M	1 -switch HOA L
PXA1 -M	1 -switch HOA e tended temp L 1 with HMI cable
PXA-HMI.CABLEP5	Serial cable required for HOA or PXM10T/S connection to non-rooftop ariants of the 1 -point and -point Compact Series pack of 5
TXA1.LLT-P100	Labels for HOA and TX-I/O Modules pack of 100 letter format

Service Boxes and Enclosures

Product Number	Description
PXA-SB115 1 A	PX Series Ser ice Bo 115 ac 50/ 0 H 1 A
PXA-SB115 A	PX Series Ser ice Bo 115 ac 50/ 0 H A
PXA-SB 0 1 A	PX Series Ser ice Bo 0 ac 50/ 0 H 1 A
PXA-SB 0 A	PX Series Ser ice Bo 0 ac 50/ 0 H A
PXA-E C1	1 Enclosure tility Cabinet L Listed EMA Type 1 Enclosure

Product Number	Description
PXA-E C1	1 Enclosure L Listed EMA Type 1 Enclosure
PXA-E C	Enclosure L Listed EMA Type 1 Enclosure

Documentation

Product Number	Description
55 -10	PXC Compact Series Owner s Manual
1 5-1	APO EE Powers Process Control Language PPCL ser s Manual

Compact Series BACnet Protocol Implementation Conformance Statement

Products

Product	Model Number	Protocol Revision	Software Revision	Firmware Revision
BACnet PXC Compact Series	PXC1 . -E.A PXC1 . -E .A PXC1 . -M.A PXC1 . -E .A PXC . -E.A PXC . -E .A PXC . -E .A PXC . -E .A PXC . -M.A PXC . -M .A PXC . -E .A PXC -E.A PXC -E .A	1 5- 00	/A	.

Vendor Information

Siemens Industry Inc.

Building Technologies Di ision

1000 Deerfield Parkway

Buffalo ro e IL 00

www.buildingtechnologies.siemens.com/bt/us

Product Description

An integral member of the APO EE product family the PXC Compact for BACnet etworks is a high performance modular Direct Digital Control DDC super isory equipment and primary building controller. The PXC Compact operates stand-alone or networked to perform comple control monitoring and energy management functions without relying on a higher-le el processor. The PXC Compact communicates on a 10/100 MB Ethernet BACnet/IP or BACnet MS/TP network and optionally super ises BACnet MS/TP and

Functional Devices, Inc.
RIB®
310 South Union Street
P.O. Box 368
Russiaville, Indiana
46979-0368

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http://www.functionaldevices.com

RIBU1C

Enclosed Relay 10 Amp SPDT with 10-30 Vac/dc/120 Vac Coil

c UL us LISTED

MADE IN U.S.A.

Functional Devices, Inc. A600B 2004

GENERAL SPECIFICATIONS

 # Relays & Contact Type: One (1) SPDT Continuous Duty Coil
Expected Relay Life: 10 million cycles minimum mechanical
Operating Temperature: -30 to 140° F
Operate Time: 20mS
Relay Status: LED On = Activated
Dimensions: 1.7" x 2.8" x 1.5" with 1/2" NPT nipple
Wires: 16", 600V Rated
Approvals: UL Listed, UL916, UL864, C-UL Canada
California State Fire Marshal
Housing Rating: Plenum, NEMA 1
Gold Flash: Yes
Override Switch: No

CONTACT RATINGS

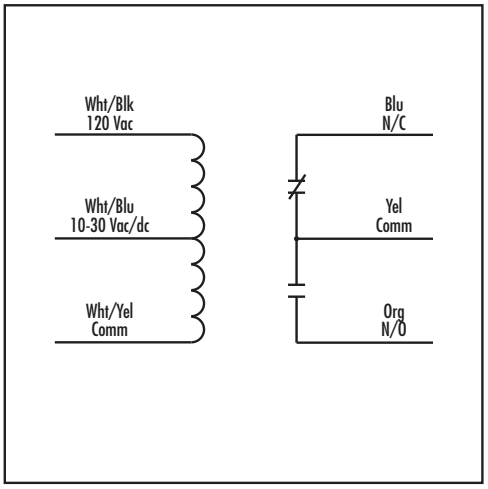
10 Amp resistive	120-277 Vac
10 Amp resistive	28 Vdc
480 VA Pilot Duty	240-277 Vac
480 VA Ballast	277 Vac
600 Watt Tungsten	120 Vac N.O.
240 Watt Tungsten	120 Vac N.C.
1/3 HP for N.O.	120-240 Vac
1/6 HP for N.C.	120-240 Vac
1/4 HP for N.O.	277 Vac
1/8 HP for N.C.	277 Vac

COIL CURRENT

30 mA @ 10 Vac	12 mA @ 10 Vdc
32 mA @ 12 Vac	14 mA @ 12 Vdc
42 mA @ 24 Vac	16 mA @ 24 Vdc
50 mA @ 30 Vac	18 mA @ 30 Vdc
25 mA @ 120 Vac	

COIL VOLTAGE INPUT

10-30 Vac/dc, 120 Vac; 50-60 Hz
DROP OUT = 2.1 Vac / 2.8 Vdc
PULL IN = 9 Vac / 10 Vdc



NOTES

- Can be ordered in a NEMA 4 enclosure by adding "-N4" to the end of the model number.
- Can be ordered in a red enclosure by adding "-RD" to the end of the model number.

NOTES:

SIEMENS

Technical Specification Sheet
Document No. 149-475
February 2009

PX Series Enclosures and Accessories

Figure 1. New PX Series Enclosures.

Enclosures

Description

PX series enclosures house both electronic and pneumatic components. The enclosures include a perforated backplane for mounting of the PXC series controllers, Power Modular Equipment Controllers, Point Expansion Modules or other electronic or pneumatic components.

Features

- Three sizes available to match installation needs.
- Sturdy construction accommodates secure conduit fittings and protects components against incidental contact and falling dirt.
- Multiple knockouts along top, sides and bottom.
- Perforated backplane extends wall-to-wall for mounting of additional equipment.
- DIN rail(s) for mounting of components.
- Spacious interior for easy routing and termination of wiring.
- Hinged door, key lock, wire tie bars, PXA series service boxes
- UL Smoke Control Listing is available on the 19” and 34” models.
- UL 916 rating is available on the 18’ enclosure
- 18” enclosure pull-box type, utility cabinet for low cost installations (see Figure 2).

Figure 2. Complete 18” Enclosure Assembly.

Accessories

Service Boxes

Description

PXA series service boxes include all of the parts necessary for installation inside a 19 inch or 34 inch PX Series Enclosure Assemblies. The 192VA service box can also be used within existing MEC enclosures. The 384VA service box may only be installed in the 34 inch PX Series Enclosure.

Figure 3. SB115V384VA service box .

Features

- Four service boxes are available to step-down line voltage to 24Vac for use by electronic components.
- Service boxes are sized for:
  - 115V to 24V at 192VA
  - 115V to 24V at 384VA
  - 230V to 24V at 192VA
  - 230V to 24V at 384VA
- 384VA models mount inside the 34” enclosures.
- 192VA models mount inside the 19” and 34” enclosures.
- Two sidewall kits cover exposed circuits for use in other NEMA Type 1 enclosures such as motor control cabinets.
- Each service box includes an on/off circuit breaker for the transformer, transient protection on both primary and secondary sides, two NEC Class 1 power limited terminations for components inside the enclosure and one NEC Class 2 termination for external components such as TX-I/O Bus expansion or actuators.
- The 115V models provide an un-switched duplex outlet to power peripheral devices such as modems, trunk interfaces and Portable Operator’s Terminals.
- UL864 Smoke Control rated when used in PXA Series Enclosure 19” or 34” or within existing MEC enclosures.

DIN Replacement Kit (PXA-DIN16KIT)

The DIN Replacement Kit can be used when additional 16” DIN rail is required.

This kit contains:

- Four 16” (406 mm) DIN rails for use when extra rails are needed
- Twelve Screws

Wire Tie Bar Kit (PXA-TIEBARKIT)

The Wire Tie Bar kit can be used when addition tie bars are needed to secure wiring within the enclosure.

This kit contains:

- Four 4.5” (114 mm) tie bars
- Four 9.5” (241 mm) tie bars
- Screws and cable ties

USB Modem Kit (PXA-USBMODEMKIT)

USB Modem kit contains everything needed for dial up modem connection using the USB Host port of the PXC Modular controller.

This kit contains:

- Sportsters Modem 56k BPS Dialup
- USB to RS232 Adapter
- Surge Suppressor Analog Telephone Line
- DB25M/F Right-Angle Adapter
- IBM 6’ PC Cable DB9F to DB25M

USB to RS232 Adapter (PXA-USBADAPTER)

USB to RS232 Adapter converts USB Host signals (Type A male connector) to RS232 signals (DB9 male connector).

This adapter may be used for connection to a RS232 printer. It is part of the PXA-USBMODEMKIT.

Specifications

Specifications	PXA-ENC18	PXA-ENC19	PXA-ENC34
UL Listed NEMA Type 1 Enclosure	X	X	X
Pull-box style	X		
Hinged Door with lock		X	X

Ambient Operating Environment			
+32°F to +120°F (0°C to +49°C) 93% RH (Non-condensing)	X	X	X

Agency Listing			
UL864 UUKL		X	X
ULC-C100 UUKL7		X	X
UL 916 PAZX		X	X
UL 508A	X		

Agency Compliance			
FCC Compliance	X	X	X
Australian EMC Framework	X	X	X
European EMC Directive (CE)	X	X	X
European Low Voltage Directive (LVD)	X	X	X
Dimensions	18”H × 14”W × 6”D (457.2 mm × 355.6 mm × 152.4 mm)	19”H × 22”W × 5.75”D (482.6 mm × 558.8 mm × 146.05 mm)	34”H × 22”W × 5.75”D (863.6 mm ×558.8 mm × 146.05 mm)

Mounting Surface			
Building Wall	X	X	X
Structural Member	X	X	X

Input Power Requirement	**115V Service Boxes**	**230V Service Boxes**
Voltage	115Vac +/- 15% @ 60 Hz +/- 5%, from 15 or 20A circuit breaker	230Vac +/- 15% @ 50/60 Hz +/- 5%, from 10A circuit breaker
Current	2A for 192VA, 4A for 384VA, 2A for 115Vac Service Outlets	1A for 192VA, 2A for 384VA

Ordering Information

Enclosure Range

Description	Product Number
18” PX Series Enclosure	PXA-ENC18
19” PX Series Enclosure	PXA-ENC19
34” PX Series Enclosure	PXA-ENC34

Accessories

Service Box 115V, 24 Vac, 192 VA	PXA-SB115V192VA
Service Box 230V, 24 Vac, 192 VA	PXA-SB230V192VA
Service Box 115V, 24 Vac, 384 VA	PXA-SB115V384VA
Service Box 230V, 24 Vac, 384 VA	PXA-SB230V384VA
Service Box Sidewall Kit, 192 VA	PXA-SW192VA
Service Box Sidewall Kit, 384 VA	PXA-SW384VA
Replacement door for 19” PX series enclosure	PXA-ENC19.REPL.DR
Replacement door for 34” PX series enclosure	PXA-ENC34.REPL.DR

Attachment E: Electrical Systems

San Bernardino County

Detailed Replace Transformer Inventory - San Bernardino County

ALLIANCE BUILDING SOLUTIONS

County of San Bernardino: Replace Old, Inefficient Transformers with New High Efficiency Transformers												
General Information					Existing Equipment Data					Proposed Equipment Data		
#	ID Tag	Site	Bldg.	Unit Location	System Type	Make	KVA	E-Star Rated (Y/N)	Replace (Y/N)	Proposed System Type	Proposed Make: Model	KVA
1	TA	Sheriff Headquarters	Main	Electrical Rm	Dry Type Transformer	Square D	225	N	Y	New High Eff. Transformer	PowerSmiths: E-Saver	225
2	No ID Tag	SHR - NARCO & SED	Bldg. 1020	Electrical Rm	Dry Type Transformer	Square D	112.5	N	Y	New High Eff. Transformer	PowerSmiths: E-Saver	112.5
3	TS	New Hall of Records	222 W Hospitality	Electrical Rm	Dry Type Transformer	Challenger	45	N	Y	New High Eff. Transformer	PowerSmiths: E-Saver	45
4	T1	412 Hospitality	412 W Hospitality	Electrical Rm	Dry Type Transformer	GE	75	N	Y	New High Eff. Transformer	PowerSmiths: E-Saver	75
5	No ID Tag	Department of Public Health	451 Vanderbilt	Downstairs Electrical Rm	Dry Type Transformer	GE	150	N	Y	New High Eff. Transformer	PowerSmiths: E-Saver	150
6	No ID Tag	Department of Public Health	451 Vanderbilt	Downstairs Electrical Rm	Dry Type Transformer	GE	150	N	Y	New High Eff. Transformer	PowerSmiths: E-Saver	150

E-SAVER OPAL-R™ Series

OPAL-R TRANSFORMERS ARE OPTIMIZED FOR RETROFIT PROJECTS DELIVERING AN AVERAGE OF 80% LESS LOSSES WHEN REPLACING OLDER UNITS

APPLICATION

The OPAL-R Series (E-Saver-80R & E-Saver-81R) are ultra-efficient dry-type isolation transformers optimized to maximize energy savings and provide the fastest payback in retrofit applications.

Powersmiths has actively measured load profiles and losses for thousands of low-voltage transformers it has retrofitted for applications from K-12 schools to college and hospital campuses, from courthouses to military bases, from general commercial and office buildings to mission critical data centers.

Powersmiths has found that the most common profile is a lightly loaded transformer that feeds predominately electronic equipment.

OPAL-R's E-Saver-80R and -81R models have been optimized specifically for this profile delivering a per project average of an 80% reduction in losses when replacing existing older transformers.

For transformers optimized to feed dedicated equipment like fans, motors, elevators, or heavy harmonic rich loads, see the rest of the OPAL Series™ as well as OPAL T1000™.

OPAL™ - OPTIMIZED DESIGNS FOR RETROFITS

There is more to a transformer retrofit than simply matching the kVA and voltages with a typical transformer from the distributor's warehouse. A transformer has much more impact in an electrical system than just efficiency because of electrical characteristics that affect fault levels, arc flash levels and inrush. Other important considerations for a retrofit should also include site conditions, footprint and internal terminal layout.

Powersmiths has developed a transformer design best practice called OPAL - Optimized Performance for the Application Load to specifically address transformer retrofit considerations.

OPAL considers the system as a whole, including goals like managing impedance, arc flash, fault level, inrush, harmonics, and more. OPAL is possible thanks to the tight feedback loop between design, onsite manufacturing, and extensive real world performance verification.

Our flexible design and manufacturing process enables us to deliver solutions for the wide variety of site conditions and transformer manufacturers including footprint and internal terminal layouts, while the result is the most savings per dollar spent.

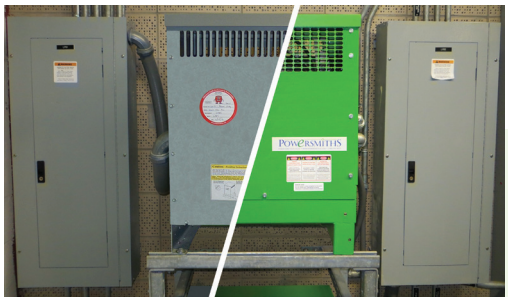
DOE IDENTIFIES BILLIONS IN SAVINGS BEYOND DOE 2016

Most manufacturers design low-voltage transformers to just meet the minimum requirement of U.S. Dept. of Energy law (DOE 2016). DOE 2016 has been set at a single 35% load point, under an ideal sine wave factory test profile, sacrificing performance elsewhere.

By exceeding the minimum efficiency, the DOE has quantified the savings potential to be in billions of dollars and that lifecycle savings can be maximized by optimizing for real-world loading. OPAL enables access to these savings – backed by real-world performance verification.

DEPARTMENT OF DEFENCE UFC COMPLIANCE

The OPAL-R with the T115 option complies with the US Department of Defense's Unified Facilities Criteria (UFC) - Interior Electrical Systems.



E-Saver OPAL-R™ Retrofits deliver maximum energy savings and follow best practices to measure & verify lifecycle savings, and ensure hassle-free transformer replacements.

RETROFITS REQUIRE A BEST PRACTICE

To replace existing transformers cost effectively, Powersmiths' professional engineers use a multi-step best practice for the entire project cycle including: vetted project savings calculations, comprehensive site audits and tagging, individualized product selection, baseline and post installation field measurements of load profiles, losses and efficiency, following IPMVP protocols, performance reports and more.

GUARANTEED PERFORMANCE FOR 32 YEARS

In a world filled with small print disclaimers and limited DOE compliance testing, you can count on Powersmiths performance. We guarantee that every transformer we manufacture meets our published technical data, and furthermore, that this performance is met over the full term of the 32-year pro-rated warranty. Trusting that savings are both real and long-term is part of why organizations choose Powersmiths.

K-RATING IS A MODERN REQUIREMENT

Typically, transformers are purchased and installed with lowest first cost in mind, however, these transformers' are UL listed on the basis of feeding only linear load. Today, most connected loads are electronic with nonlinear profiles, and in order to have a valid UL listing, a low-voltage isolation transformer needs to be appropriately K-rated for most applications

EXPANDED KVA SELECTION ENABLES RIGHT-SIZING

Powersmiths enables right-sizing of electrical infrastructure by offering a much broader selection of transformer kVA sizes. The capital cost, operating cost and footprint reductions can be dramatic - on the order of 30-50%, through smaller transformers, breakers, conductors, and distribution panels.

ENVIRONMENTAL/GREEN BUILDING/LEED®/NET ZERO

By going meaningfully beyond the DOE 2016 baseline efficiency, the E-Saver™ contributes to green building, LEED®, Net Zero and carbon footprint reduction. goals. Additional benefits include our ISO14001 certified manufacturing, integrated metering and ability to integrate with the Powersmiths WOW™ - Building Resource Management Platform.

CERTIFICATIONS & TESTING

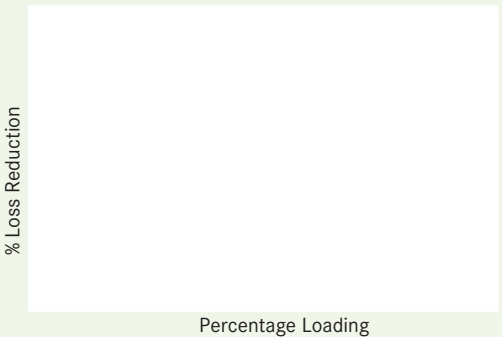
Powersmiths certifications include ISO9001 (Quality), ISO14001 (Environment) ISO17025 (Efficiency Test Lab), UL and CSA. Powersmiths has a production-integrated nonlinear load test program that enables efficiency verification under real-world conditions, as well as Certified Test Lab Profile Test Reports.

METERING & ARC FLASH OPTIONS

Integrated metering can provide information about capacity utilization, load profiles, power quality and energy use. The lockable hinged door option as well as our patented 360° Rotatable IR Port™ option enable quick and safe access to internal transformer connections, and reduces arc flash risk.

Powersmiths offers also transformers with Integrated Power Distribution, see the Energy Station TX™ brochure.

E-SAVER OPAL-R™ Loss Reduction Curves



KEY FEATURES

- Optimized for light, nonlinear loads found in most applications K-rated as required by UL to feed modern electronic equipment
- Retrofit Best Practice ensures a smooth retrofit with verified savings
- Significant savings beyond DOE 2016 legislation
- Electrical system consideration: impedance, inrush, fault & arc flash levels
- Available with a wide range of safety & performance features like integrated hinged doors, 360° Rotatable IR Port™, and Cyberhawk™ Metering and Logging
- Manufactured in a certified ISO 9001, ISO 14001 and ISO 17025 facility for quality, low environmental impact, and transformer efficiency testing

[1] U.S. Dept. of Energy 10 CFR Part 431, [Docket No. EERE–2010–BT–STD–0048] Energy Conservation Program: Energy Conservation Standards for Distribution Transformers, Final Rule April 18, 2013.

TECHNICAL SPECIFICATIONS

The E-Saver™-80R and 81R are ultra-efficient low-voltage dry-type isolation transformers that meaningfully exceed the U.S. Dept. of Energy's new minimum efficiency law, commonly referred to as DOE 2016. All E-Saver transformers carry a UL Listing and CSA Approval, with application appropriate K-factor.

The aluminum wound E-Saver-80R and the copper wound E-Saver-81R are both K-factor listed per UL 1561 and are K-7 rated per C57.110. Both models are compatible with electronic equipment all the way up to full load. The standard temperature rise is 130°C with a 115°C option available.

E-Savers have a common-core (3-phase models), 10kV BIL, 200% rated neutral, are 60Hz rated (std), built to NEMA ST-20, UL1561, IEEE C57.110 and other applicable ANSI and IEEE standards. Both primary and secondary terminals and voltage taps (typically six 2.5%) are all front-accessible. E-Savers have a 220°C class insulation system that is NOMEX-based with an Epoxy Co-polymer impregnant with technical performance characteristics that embed lower environmental impact, long term reliability and long life expectancy. E-Savers carry OSHPD and IBC Seismic Certification. The seismic bracing option provides a higher 2.28g certification. All E-Saver models come standard in a Type 2 ventilated drip-proof indoor enclosure made of heavy gauge steel finished with epoxy powder coating for durability and low environmental impact, and are UL Listed for 2" rear clearance - a significant improvement over the typical industry 6" limit. A wide variety of enclosures and options are available.

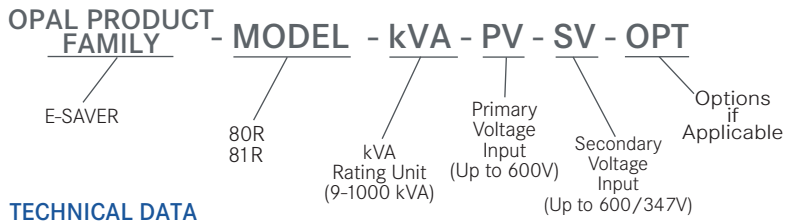
Low Noise: Keeping audible noise at a minimum is key. While the NEMA ST-20 standard sets levels referenced by industry only a type test, not a production test, is required – so transformers on actual projects may be noisy. Powersmiths builds 3dB quieter than NEMA standard values, and furthermore every unit is tested to ensure quiet operation. For very sensitive environments an additional 2dB lower noise option is available.

Management of Impedance, Inrush, Fault Level, Arc Flash: Powersmiths OPAL™ design best practice includes addressing key transformer attributes like impedance, inrush, fault level, arc flash, to ensure smooth integration into an electrical system, avoiding the negative impacts often associated with high efficiency transformers. See individual technical data sheets for comprehensive values for all parameters.

Impedance: For both the E-Saver-80R and E-Saver-81R, impedance is kept at or above 4.0% in order to manage downstream fault current and arc flash levels, and maintain compatibility with equipment interrupting capacity (kAIC) ratings. Higher impedance is available to meet specific project needs.

Inrush: Inrush currents are managed in order to avoid nuisance tripping of the primary breaker and to enable design engineers to use standard 125% rated primary protection, thereby avoiding expensive design changes that otherwise may be needed. Very low inrush designs are available as specific projects may require, for example some datacenter and medical applications.

ORDERING INFORMATION



TECHNICAL DATA

kVA	Audible Noise	80R, 81R Model Weight Range (lbs)	Standard Case Size (in)	Alternate Smaller Case Size (in)*
15	42 dB	230-300	17.5W x 17D x 27.5H	17.5W x 14.5D x 25H
20	42 dB	260-340	25.5W x 18D x 30H	23W x 15.5D x 27.5H
25	42 dB	300-380	25.5W x 18D x 30H	23W x 15.5D x 27.5H
30	42 dB	340-420	25.5W x 18D x 30H	23W x 15.5D x 27.5H
45	42 dB	400-540	25.5W x 18D x 30H	No Alternate
50	42 dB	450-600	31.5W x 21.5D x 40H	No Alternate
63	47 dB	500-650	31.5W x 21.5D x 40H	26.5W x 20D x 33H
75	47 dB	610-700	31.5W x 21.5D x 40H	26.5W x 20D x 33H
100	47 dB	675-900	31.5W x 21.5D x 40H	No Alternate
112.5	47 dB	770-990	31.5W x 21.5D x 40H	No Alternate
125	47 dB	875-1120	37.5W x 26.5D x 48H	33W x 23D x 38H
150	47 dB	1010-1230	37.5W x 26.5D x 48H	33W x 23D x 38H
175	52 dB	1100-1360	37.5W x 26.5D x 48H	34.5W x 26.5D x 42H
200	52 dB	1175-1450	37.5W x 26.5D x 48H	34.5W x 26.5D x 42H
225	52 dB	1295-1600	37.5W x 31.5D x 52H	34.5W x 26.5D x 42H
250	52 dB	1400-1800	37.5W x 31.5D x 52H	37.5W x 26.5D x 48H
300	52 dB	1575-1960	37.5W x 31.5D x 52H	37.5W x 26.5D x 48H
400	57 dB	2025-2450	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
450	57 dB	2200-2600	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
500	57 dB	2475-2900	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
600	59 dB	2725-3600	64W x 47D x 67H	51.5W x 38D x 61H
750	61 dB	3200-4300	64W x 47D x 67H	Contact Factory
850	61 dB	3600-5000	64W x 47D x 67H	Contact Factory
1000	61 dB	4200-6000	64W x 53D x 67H	Contact Factory

AVAILABLE OPTIONS

Metering: Express Logger™, SMART™ or Cyberhawk TX™ (see product cut sheets for details)
CC: Core & Coils available for OEM Integration
3R: Type 3R, sprinkler proof/outdoor ventilated enclosure
OSEC: Enclosure for outdoor public areas
SS: Painted stainless steel enclosure
NVI: Non-ventilated indoor enclosure
IRP: 360° Rotatable IR Port™
HD: Hinged Door
F50: 50 Hz design
1S: Single electrostatic shield
2S: Dual electrostatic shields
3S: Triple electrostatic shields
SPD: (120/208 V OR 277/480V)
- **PRO80:** 80kA, 7 mode, Filter
- **PRO120:** 120kA, 7 mode, Filter
- **PRO160:** 160kA, 7 mode, Filter
- **PROXX:** Where XX is custom ID

VLI: Very Low Inrush
IMP: Custom Impedance
COL: Custom color
TS: Thermal sensors at 170°C and 200°C
RTR: Routine Test Report
NLT: Nonlinear Load Test with Certificate
2016TR: DOE 2016 Test Report
CTL: ISO 17025 Certified Test Lab, load profile test
SE: Sensitive environment, extra low noise
SB: Certified Seismic bracing for 2.28g (for Certificate details contact Powersmiths)
WM: Wall-mount kit up to 75kVA is available (sold separately)
T115: 115°C Temperature Rise

NOTE: The above data applies to the standard configuration of each kVA. Selection of some options may change enclosure size and/or transformer weight. Some options may be mutually exclusive. Consult factory for detailed product data sheet for these and other configurations. Efficiencies tested according to U.S. Dept. of Energy's 10 CFR Part 431, a linear load test at 35% of nameplate capacity. Refer to technical data sheet for comprehensive information for each specific model, kVA, and option selected.

As design optimization is continuous, technical data is updated over time. Please check with Powersmiths for latest revision.

POWERSMITHS

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WWW.POWERSMITHS.COM

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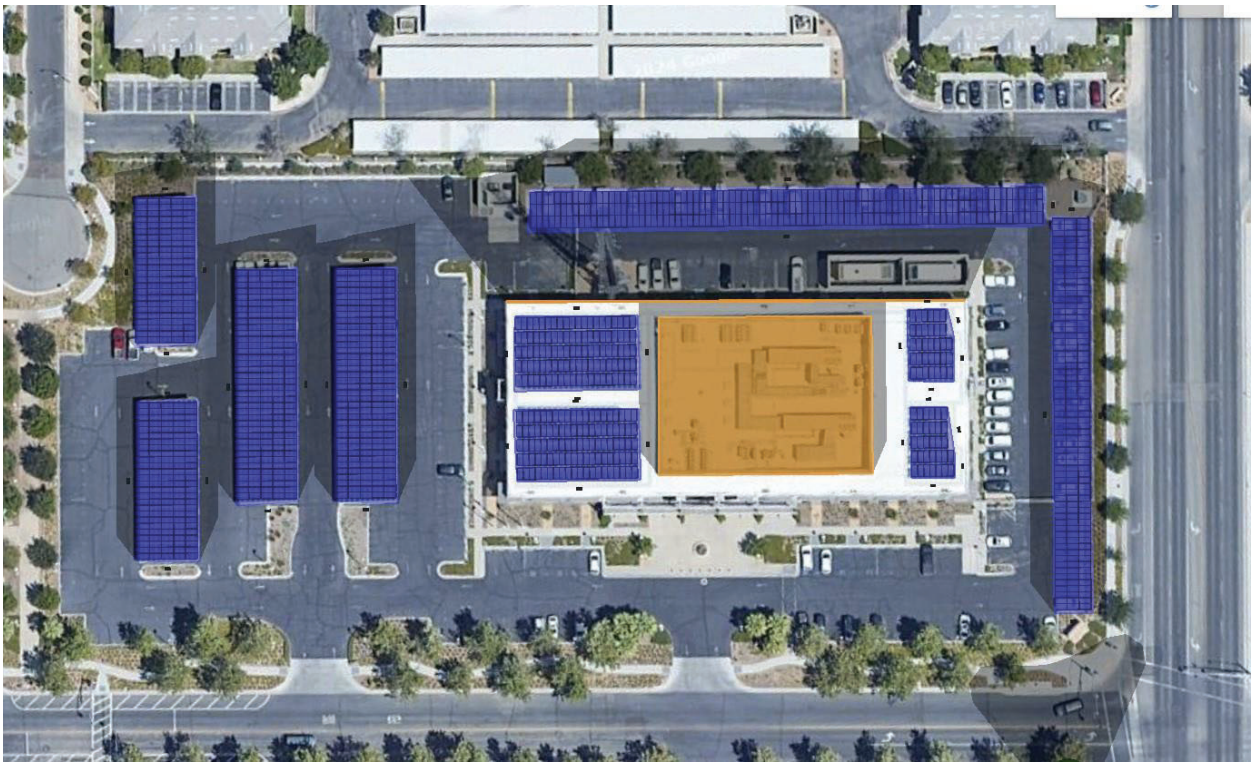
Attachment F: Renewable Energy Systems

San Bernardino County

System 1 Design

Location:	**High Desert Government Center**
Address:	15900 Smoke Tree Street, Hesperia, CA 92345
Estimated Power Rating:	732,480 W-DC
Estimated Annual Production:	1,295,286 kWh
Battery Energy Storage System:	(3) BYD CHESS 120kW / 258kWh



System 2 Design

Location:	**High Desert Detention Center**
Address:	9438 Commerce Way, Adelanto, CA 92301
Estimated Combined Power Rating:	788,070 W-DC
Estimated Annual Production:	1,505,158 kWh
Battery Energy Storage System:	(2) BYD CHESS 120kW / 258kWh

System 3 Design

Location:	**West Valley Adult Detention Center**
Address:	9500 Etiwanda, Rancho Cucamonga, CA 91739
Estimated Power Rating:	2,520,625 W-DC
Estimated Annual Production:	4,529,578 kWh
Battery Energy Storage System:	(6) BYD CHESS 120kW / 258kWh

System 4 Design

Location:	**Sheriff Training Center**
Address:	18900 Institution Rd, Devore, CA 92407
Estimated Power Rating:	226,720 W-DC
Estimated Annual Production:	401,846 kWh

System 5 Design

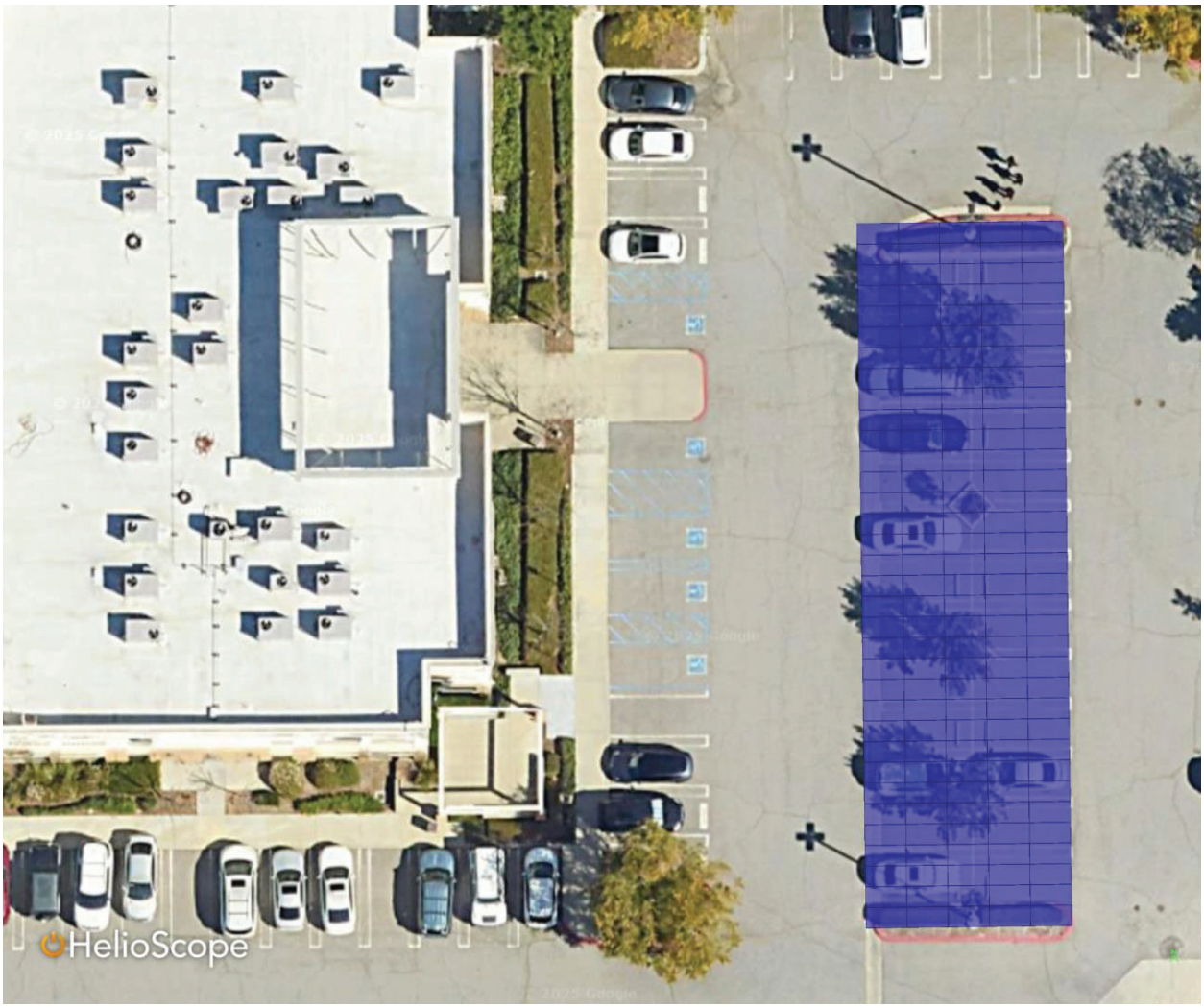
Location:	**Old Crime Lab**
Address:	200 S. Lena Rd, San Bernardino, CA 92408
Estimated Power Rating:	779,350 W-DC
Estimated Annual Production:	1,344,612 kWh
Battery Energy Storage System:	(2) BYD CHESS 120kW / 258kWh

System 6 Design

Location:	**Coroner**
Address:	175 S Lena Rd, San Bernardino, CA 92415
Estimated Power Rating:	293,210 W-DC
Estimated Annual Production:	568,672 kWh
Battery Energy Storage System:	(1) BYD CHESS 120kW / 258kWh

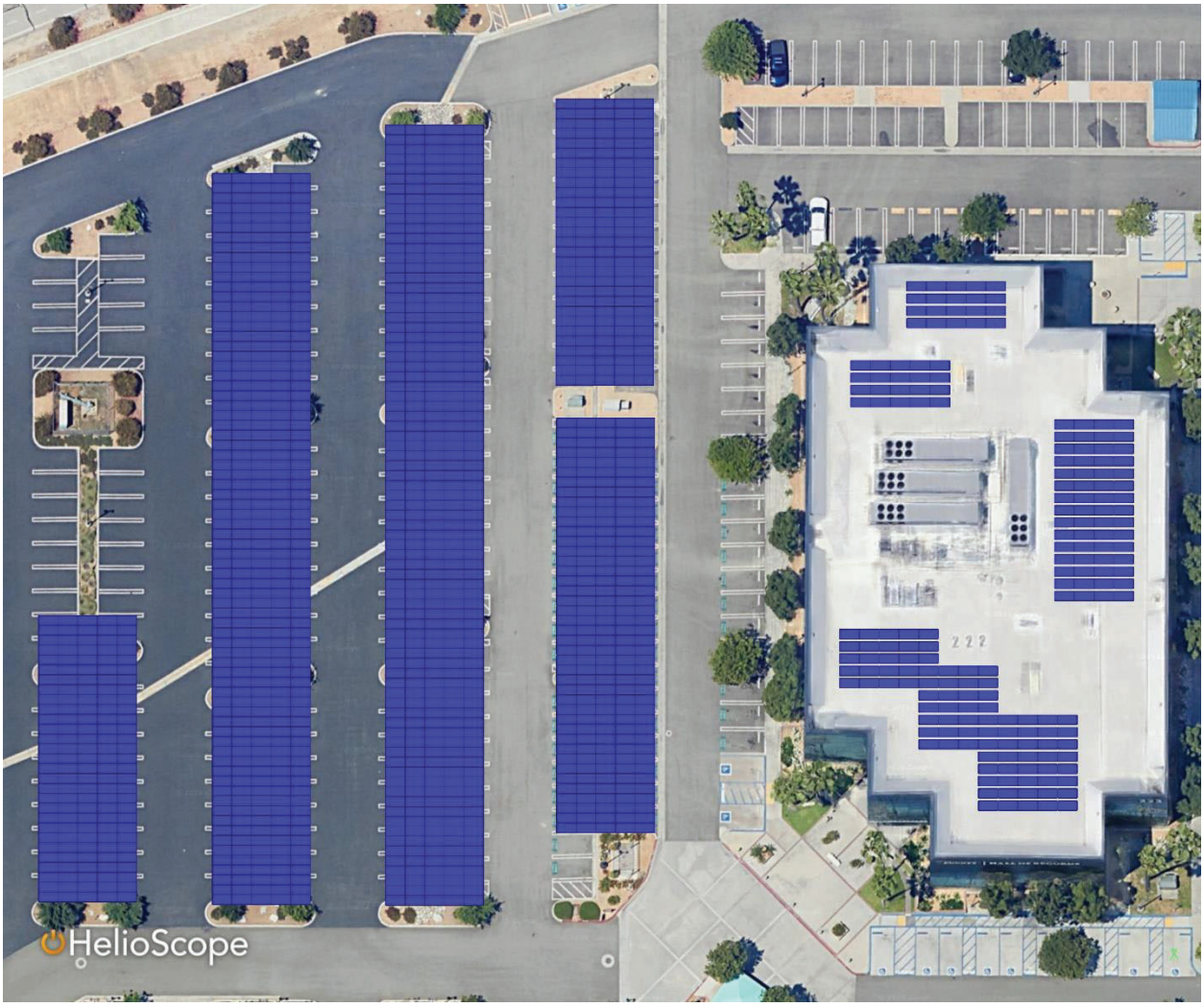
System 7 Design

Location:	**County Building**
Address:	8575 Haven Ave, Rancho Cucamonga, CA 91730
Estimated Combined Power Rating:	92,650 W-DC
Estimated Annual Production:	157,151 kWh



System 8 Design

Location:	**New Hall of Records**
Address:	222 W. Hospitality Lane, San Bernardino, CA 92415
Estimated Power Rating:	791,885 W-DC
Estimated Annual Production:	1,353,793 kWh
Battery Energy Storage System:	(3) BYD CHESS 120kW / 258kWh



Assumptions:

1. All technology & equipment specified/used in this project will meet or exceed all currently applicable & proposed safety, environmental and interconnection standards, as well as all fire safety requirements.
2. All PV system equipment & components will be UL certified.
3. ABS will obtain permits (without any building and safety or planning fees) & utility approvals necessary to install the PV System.
4. Assumes all carport foundation drilling in clean dirt. All rock drilling to be at additional costs.
5. Interconnection work/outages will be scheduled during normal business hours.
6. Building department and utility inspections will be scheduled during normal business hours.
7. ABS will provide electrical drawings stamped by a licensed California Registered Electrical Professional Engineer.
8. The planned AC electrical tie-in will not require component upgrades or improvements.
9. The System & installation will meet all requirements for interconnection with appropriate documentation. ABS will be responsible for providing all documentation.
10. System layout is acceptable to AHJ in terms of clearances.
11. As built plans are available for engineering reference.
12. ABS is not responsible for superficial marking of parking area due to use of equipment.
13. On-site staging areas are available for storage of equipment and materials.
14. Pricing includes NEMA 3R painted steel electrical equipment
15. Module pricing is based on current market value. Price is subject to adjustment based on market conditions at time of construction.
16. Ground penetrating radar (GPR) is accurate down to a depth of 3’-4’. There may be underground utilities below this level that are untraceable with GPR that would require the use of an underground camera to be located.
17. Pricing assumes the structure can support the additional loads of the PV array. If additional load is required, cost shall be included.
18. Pricing is based on prevailing wage rates.

Exclusions:

1. UL recertification of existing electrical equipment beyond our scope of work
2. Repairs of any electrical code violations at the existing facility
3. Removal and/or disposal of hazardous materials
4. Arc flash or breaker coordination studies
5. 3rd party (private) locating services
6. Pedestrian & vehicle traffic control
7. Re-creation of building plan sets
8. Union project labor agreements
9. Lightening protection systems
10. Revenue grade metering
11. ADA design/compliance
12. Sprinklers & gutters
13. Inverter enclosures
14. Phasing
15. Electrical infrastructure upgrades

Underground Exclusions:

Surfaces upon which carports are to be installed, must permit the movement and weight of the drilling or lifting equipment. ABS shall not be responsible for any damages to the surfaces due to the use of the movement, drilling, or lifting equipment. The Purchaser expressly warrants that the asphalt, concrete, or other surface of the access route and / or the area in which the Purchaser has carefully examined the work site, have been carefully examined and approved for the work contemplated and the layout of the carport. The Purchaser also approves of jackhammering and drilling of caisson type footings as part of the work contemplated.

Two (2) foot tolerance must exist in any direction where footing holes are being drilled. If two (2) foot tolerance is not feasible, ABS must be notified immediately. If the carports cannot be moved to accommodate the two-foot tolerance, the footing holes must be hand dug.

Footing holes must be hand dug if the underground objects are located within two feet of any footing hole.

Should site and soil or concealed conditions below the surface of the ground encountered in the performance of the work vary from those indicated by the Purchaser or should unknown physical conditions below the surface of the ground differ from those ordinarily encountered, an adjustment to the contract price will be agreed upon and a contract change order issued, and work will cease until the contract change order is signed by all parties involved.

ABS will remove its spoils.

Harvest the Sunshine

DEEP BLUE 3.0

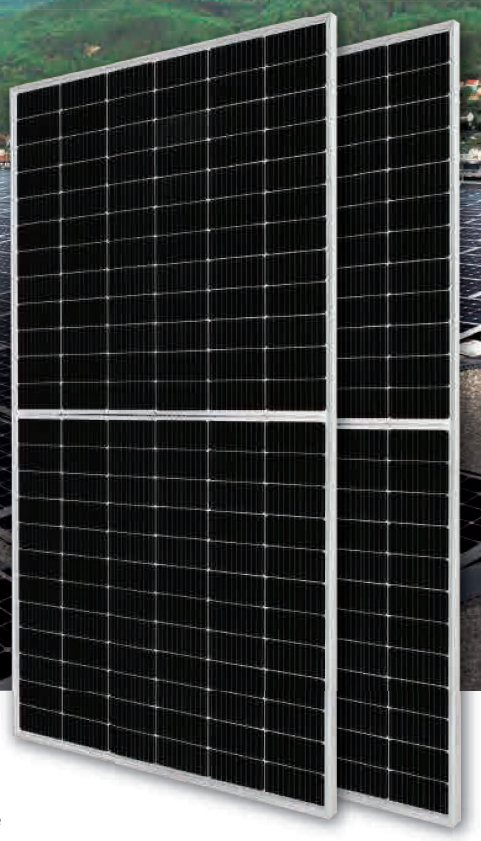
Mono

550W MBB Bifacial Mono PERC Half-cell Double Glass Module

JAM72D30 525-550/MB Series

Introduction

Assembled with 11BB bifacial PERCIUM cells and half-cell configuration, these double glass modules have the capability of converting the incident light from the rear side together with the front side into electricity, providing higher output power, lower temperature coefficient, less shading loss, as well as enhanced tolerance for mechanical loading.

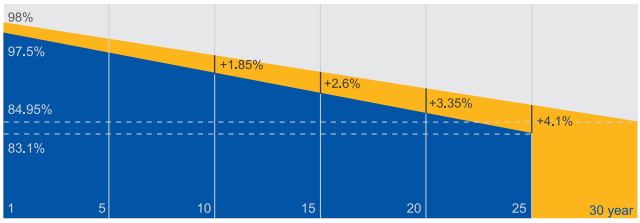


- Higher output power
- More reliable, more stable power generation
- Less shading effect
- Lower temperature coefficient

Superior Warranty

- 12-year product warranty
- 30-year linear power output warranty

0.45% Annual Degradation Over 30 years



- Bifacial double glass module linear power warranty
- Standard module linear power warranty

Comprehensive Certificates

- IEC 61215, IEC 61730,UL 61215, UL 61730
- ISO 9001: 2015 Quality management systems
- ISO 14001: 2015 Environmental management systems
- ISO 45001: 2018 Occupational health and safety management systems
- IEC TS 62941: 2016 Terrestrial photovoltaic (PV) modules – Guidelines for increased confidence in PV module design qualification and type approval

JA SOLAR

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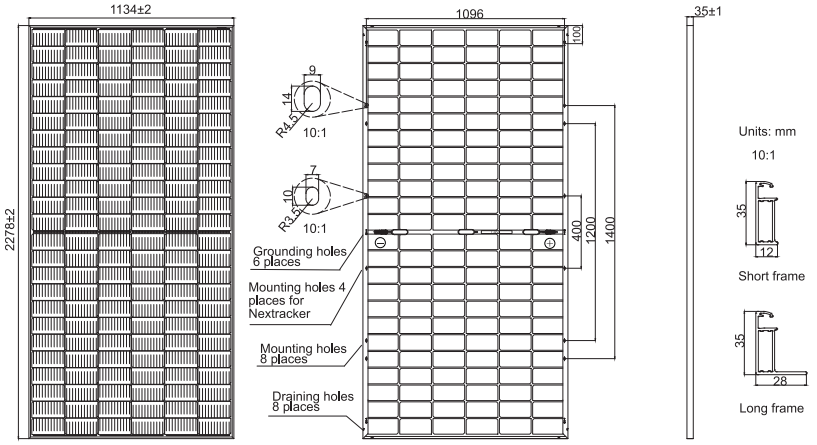
JA SOLAR

JAM72D30 525-550/MB Series

MECHANICAL DIAGRAMS



Remark: customized frame color and cable length available upon request

SPECIFICATIONS

Cell	Mono
Weight	31.8kg±3%
Dimensions	2278±2mm×1134±2mm×35±1mm
Cable Cross Section Size	4mm² (IEC), 12 AWG(UL)
No. of cells	144(6×24)
Junction Box	IP68, 3 diodes
Connector	QC 4.10-35
Cable Length (Including Connector)	Portrait:300mm(+)/400mm(-); Landscape:1300mm(+)/1300mm(-)
Front Glass/Back Glass	2.0mm/2.0mm
Packaging Configuration	31pcs/Pallet 589pcs/40HQ Container

ELECTRICAL PARAMETERS AT STC

TYPE	JAM72D30 -525/MB	JAM72D30 -530/MB	JAM72D30 -535/MB	JAM72D30 -540/MB	JAM72D30 -545/MB	JAM72D30 -550/MB
Rated Maximum Power(Pmax) [W]	525	530	535	540	545	550
Open Circuit Voltage(Voc) [V]	49.15	49.30	49.45	49.60	49.75	49.90
Maximum Power Voltage(Vmp) [V]	41.15	41.31	41.47	41.64	41.80	41.96
Short Circuit Current(Isc) [A]	13.65	13.72	13.79	13.86	13.93	14.00
Maximum Power Current(Imp) [A]	12.76	12.83	12.90	12.97	13.04	13.11
Module Efficiency [%]	20.3	20.5	20.7	20.9	21.1	21.3
Power Tolerance	0~+5W					
Temperature Coefficient of Isc(α_Isc)	+0.045%/°C					
Temperature Coefficient of Voc(β_Voc)	-0.275%/°C					
Temperature Coefficient of Pmax(γ_Pmp)	-0.350%/°C					
STC	Irradiance 1000W/m², cell temperature 25°C, AM1.5G					

Remark: Electrical data in this catalog do not refer to a single module and they are not part of the offer.They only serve for comparison among different module types.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO

TYPE	JAM72D30 -525/MB	JAM72D30 -530/MB	JAM72D30 -535/MB	JAM72D30 -540/MB	JAM72D30 -545/MB	JAM72D30 -550/MB
Rated Max Power(Pmax) [W]	562	567	572	578	583	589
Open Circuit Voltage(Voc) [V]	49.54	49.67	49.80	49.93	50.03	50.21
Max Power Voltage(Vmp) [V]	41.14	41.31	41.47	41.65	41.78	41.95
Short Circuit Current(Isc) [A]	14.61	14.68	14.76	14.83	14.91	14.98
Max Power Current(Imp) [A]	13.65	13.73	13.80	13.88	13.95	14.03
Irradiation Ratio(rear/front)	10%					

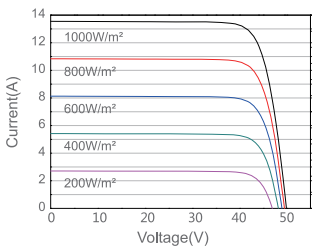
*For NexTracker installations, Maximum Static Load, Front is 2400Pa while Maximum Static Load, Back is 2400Pa.
**Bifaciality=Pmax,rear/Rated Pmax,front

OPERATING CONDITIONS

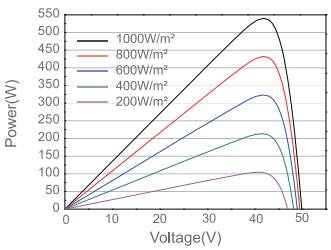
Maximum System Voltage	1500V DC
Operating Temperature	-40°C~+85°C
Maximum Series Fuse Rating	30A
Maximum Static Load,Front* Maximum Static Load,Back*	5400Pa(112 lb/ft²) 2400Pa(50 lb/ft²)
NOCT	45±2°C
Bifaciality**	70%±10%
Fire Performance	UL Type 29

CHARACTERISTICS

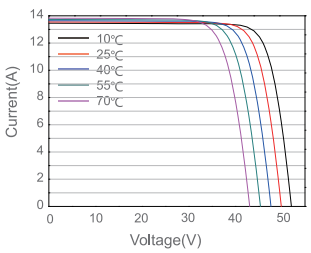
Current-Voltage Curve JAM72D30-540/MB



Power-Voltage Curve JAM72D30-540/MB



Current-Voltage Curve JAM72D30-540/MB



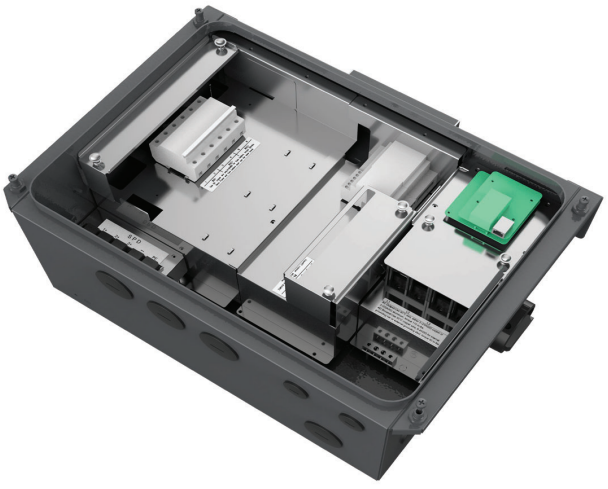
25kW 208V, 1000Vdc String Inverters for North America

The 25kW (25kVA) CPS three phase string inverters are designed for rooftop and carport applications. The units are high performance, advanced and reliable inverters designed specifically for the North American environment and grid. High efficiency at 97.0% peak and 96.5% CEC, wide operating voltages, broad temperature ranges and a NEMA Type 4X enclosure enable this inverter platform to operate at high performance across many applications. The CPS 25KTL product ships with the Rapid Shutdown wire-box, fully integrated and separable with touch safe fusing, monitoring, and AC and DC disconnect switches. The integrated PLC transmitter in the Rapid Shutdown wire-box enables PVRSS certified module-level rapid shutdown when used with the APS RSD-S-PLC-A products. The CPS Flex Gateway enables monitoring, controls and remote product upgrades.

CPS SCA25KTL-DO/US-208

Key Features

- NEC 2017/2020 PVRSS Certified Rapid Shutdown
- NEC 2017 compliant & UL listed Arc-Fault circuit protection
- 15-90° Mounting orientation for low profile roof installs
- Optional Flex Gateway enables remote FW upgrades
- Integrated AC & DC disconnect switches
- 3 MPPT's with 2 inputs each for maximum flexibility
- Copper and Aluminum compatible AC connections
- NEMA Type 4X outdoor rated, tough tested enclosure
- UL1741 SA Certified to CA Rule 21, including SA14 FW and SA15 VW
- Separable wire-box design for fast service
- Standard 10 year warranty with extensions to 20 years
- Generous 1.8 DC/AC Inverter Load Ratio



25KTL Rapid Shutdown Wire-box

C US

This device compli part 15 of the FCC

Chint Power Systems America
6800 Koll Center Parkway, Suite 235 Pleasanton, CA 94566
Tel: 855-584-7168 Mail: AmericaSales@chintpower.com Web: www.chintpowersystems.com

Model Name	CPS SCA25KTL-DO/US-208
DC Input	
Max. PV Power	45kW (17kW per MPPT)
Max. DC Input Voltage	1000Vdc
Operating DC Input Voltage Range	200-950Vdc
Start-up DC Input Voltage / Power	330V / 80W
Number of MPP Trackers	3
MPPT Voltage Range @ PF>0.99	480-850Vdc
Max. PV Short-Circuit Current (Isc x 1.25)	135A (45A per MPPT)
Number of DC Inputs	6 inputs, 2 per MPPT
DC Disconnection Type	Load-rated DC switch
DC Surge Protection	Type II MOV, 2800V_C, 20kA I_{TM} (8/20..S)
AC Output	
Rated AC Output Power @ PF>0.99	25kW
Max. AC Apparent Power (Selectable)	25kVA
Rated Output Voltage	208Vac
Output Voltage Range[1]	183 - 228Vac
Grid Connection Type	3Φ / PE / N (Neutral optional)
Max. AC Output Current @208Vac	69.5A
Rated Output Frequency	60Hz
Output Frequency Range[1]	57 - 63Hz
Power Factor	>0.99 (±0.8 adjustable)
Current THD @ Rated Load	<3%
Max. Fault Current Contribution (1 Cycle RMS)	64.1A (0.92 PU)
Max. OCPD Rating	125A
AC Disconnection Type	Load-break rated AC switch
AC Surge Protection	Type II MOV, 1240V_C, 15kA I_{TM} (8/20..S)
System and Performance	
Topology	Transformerless
Max. Efficiency	97.0%
CEC Efficiency	96.5%
Stand-by / Night Consumption	<3W
Environment	
Enclosure Protection Degree	NEMA Type 4X
Cooling Method	Variable speed cooling fans
Operating Temperature Range[2]	-22°F to +140°F / - 30°C to +60°C
Non-Operating Temperature Range[3]	No low temp minimum to +158°F / +70°C maximum
Operating Humidity	0 to 100%
Operating Altitude	13,123.4ft / 4000m (derating from 9842.5ft / 3000m)
Audible Noise	<60dBA @ 1m and 25°C
Display and Communication	
User Interface and Display	LCD+LED
Inverter Monitoring	SunSpec, Modbus RS485
Site Level Monitoring	CPS Flex Gateway (1 per 32 inverters)
Modbus Data Mapping	CPS
Remote Diagnostics / FW Upgrade Functions	Standard / (with Flex Gateway)
Mechanical	
Dimensions (HxWxD)	39.4 x 23.6 x 10.24in. (1000 x 600 x 260mm)
Weight	Inverter: 123.5lbs/56kg; Wire-box: 33lbs/15kg
Mounting / Installation Angle[4]	15 to 90 degrees from horizontal (vertical or angled)
AC Termination	M8 Stud Type Terminal Block (Wire range: #6 - 3/0AWG CU/AL , Lugs not supplied)
DC Termination[5]	Screw Clamp, Neg. Busbar[5] Wire range: #14 - #6AWG CU
Fused String Inputs (2 per MPPT)[6]	20A fuses provided (Fuse values up to 30A acceptable)
Safety	
Certifications and Standards	UL1741SA-2016, UL1699B, UL1998, CSA-C22.2 NO.107.1-01, IEEE1547a-2014, FCC PART15
Selectable Grid Standard	IEEE 1547, CA Rule 21, ISO-NE, HECO
Smart-Grid Features	Volt-RideThru, Freq-RideThru, Ramp-Rate, Specified-PF, Volt-VAr, Freq-Watt, Volt-Watt
Warranty	
Standard	10 years
Extended Terms	15 and 20 years

1) The "Output Voltage Range" and "Output Frequency Range" may differ according to the specific grid standard.
2) Active Power Derating begins; at 45°C when PF=1 and MPPT≥Vmin, and at 50°C when PF=1 and MPPT V ≥ 700Vdc.
3) See user manual for further requirements regarding non-operating conditions.
4) Shade Cover accessory required for installation angles of 75 degrees or less.
5) RSD wire-box only includes fuses/fuseholders on the positive polarity, compliant with NEC 2017, 690.9 (C).
6) Fuse values above 20A have additional spacing requirements or require the use of the Y-Comb Terminal Block. See user manual for details.

NEW 36 kW, 1000 Vdc String Inverters for North America

The new, V2 version of the 36 kW (36 kVA) CPS three-phase string inverter is designed for rooftop and carport applications. The units are high performance, advanced and reliable inverters designed specifically for the North American environment and grid. High efficiency at 98.8% peak and 97.4% CEC, wide operating voltages, broad temperature ranges and a NEMA Type 4X enclosure enable this inverter platform to operate at high performance across many applications.

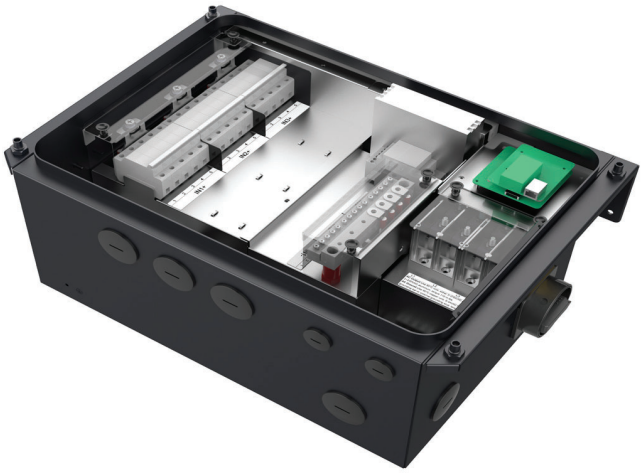
CPS 36KTL V2 ships with either the Standard wire-box or the Rapid Shutdown wire-box, each fully integrated and separable with touch-safe fusing, monitoring, and AC and DC disconnect switches. The integrated PLC transmitter in the Rapid Shutdown Wire-box enables PVRSS certified module-level rapid shutdown when used with APS RSD-S-PLC/RSD-D products. The CPS FlexOM Gateway enables monitoring, controls and remote product upgrades.

CPS SCA36KTL-DO/US-480 V2

Key Features

- NEC 2017/2020 PVRSS certified for rapid shutdown
- NEC-compliant & UL listed arc-fault circuit protection
- 15-90° mounting orientation for low-profile roof installs
- Optional FlexOM Gateway enables remote firmware upgrades
- Integrated AC and DC disconnect switches
- Copper- and Aluminum-compatible AC connections
- 3 MPPTs with 5 inputs each for maximum flexibility
- NEMA Type 4X outdoor rated enclosure
- UL 1741-SA certified to CA Rule 21, including SA8-SA18 VW
- UL 1741-SB and IEEE 1547-2018 certified
- Separable wire-box design for fast service
- Standard 10-year warranty with extensions up to 20 years

36/50/60KTL Standard Wire-box



36/50/60KTL Rapid Shutdown Wire-box

C SA US

FC This device complies with part 15 of the FCC Rules

Chint Power Systems America
1380 Presidential Drive, Suite 100, Richardson, TX 75081
Tel: 855-584-7168 Mail: AmericaSales@chintpower.com Web: www.chintpowersystems.com

Model Name	CPS SCA36KTL-DO/US-480
DC Input	
Max. PV power	90 kW (33 kW per MPPT)
Max. DC input voltage	1000 Vdc
Operating DC input voltage range	200-950 Vdc
Start-up DC input voltage / power	330 V / 80 W
Number of MPP trackers	3
MPPT voltage range @ PF>0.99	400-850 Vdc
Max. PV short-circuit current (Isc x 1.25)	204 A (68 A per MPPT)
Number of DC inputs	15 inputs, 5 per MPPT
DC disconnection type	Load-rated DC switch
DC surge protection	Type II MOV
AC Output	
Rated AC output power @ PF>0.99	36 kW
Max. AC apparent power (selectable)	36 kVA
Rated output voltage	480 Vac
Output voltage range[1]	422 - 528 Vac
Grid connection type	3Φ / PE / N (neutral optional)
Max. AC output current @ 480 Vac	43.5 A
Rated output frequency	60 Hz
Output frequency range[1]	57 - 63 Hz
Power factor	>0.99 (±0.8 adjustable)
Current THD @ rated load	<3%
Max. fault current contribution (1 cycle RMS)	73.2 A (1.68 PU)
Max. OCPD rating	125 A
AC disconnection type	Load-break rated AC switch
AC surge protection	Type II MOV
System and Performance	
Topology	Transformerless
Max. efficiency	98.8%
CEC efficiency	97.4%
Stand-by / night consumption	<3 W
Environment	
Enclosure protection degree	NEMA Type 4X
Cooling method	Variable speed cooling fans
Operating temperature range[2]	-22°F to +140°F / - 30°C to +60°C
Non-operating temperature range[3]	No low temp minimum to +158°F / +70°C maximum
Operating humidity	0 to 100%
Operating altitude	13123 ft / 4000 m (derating from 9843 ft / 3000 m)
Audible noise	<60 dBA @ 1 m and 25°C
Display and Communication	
User interface and display	LCD + LED
Inverter monitoring	SunSpec, Modbus RS485
Site-level monitoring	CPS FlexOM Gateway (1 per 32 inverters)
Modbus data mapping	CPS
Remote diagnostics / firmware upgrade functions	Standard / (with FlexOM Gateway)
Mechanical	
Dimensions (H x W x D)	39.4 x 23.6 x 10.24 in (1000 x 600 x 260 mm)
Weight	Inverter: 123.5 lbs (56 kg); Wire-box: 33 lbs (15 kg)
Mounting / installation angle[4]	15 to 90 degrees from horizontal (vertical or angled)
AC termination	M8 stud type terminal block (wire range: #6 - 3/0 AWG CU/AL; lugs not supplied)
DC termination[5]	Screw clamp, neg. busbar (RSD version[5]) wire range: #14 - #6 AWG CU
Fused string inputs (5 per MPPT)[6]	20 A fuses provided (fuse values up to 30 A acceptable)
Safety	
Certifications and standards	UL 1741-SA/SB Ed. 3, UL 1699B, UL 1998, CSA-C22.2 NO.107.1-01, IEEE 1547-2018, FCC PART15
Selectable grid standard	IEEE 1547a-2014, IEEE 1547-2018[7], CA Rule 21, ISO-NE, HECO
Smart-grid features	Volt-RideThru, Freq-RideThru, Ramp-Rate, Specified-PF, Volt-VAR, Freq-Watt, Volt-Watt
Warranty	
Standard	10 years
Extended terms	15 and 20 years

1) The output voltage and frequency ranges may differ according to the specific grid standard.
2) Active power derating begins at 45°C when PF=1 and MPPT≥Vmin, and at 50°C when PF=1 and MPPT≥700 Vdc.
3) See user manual for further requirements regarding non-operating conditions.
4) Shade Cover accessory required for installation angles of 75 degrees or less.
5) RSD wire-box only includes fuses and fuse holders on the positive polarity, compliant with NEC 2017/2020 Section 690.9(C).
6) Fuse values above 20 A have additional spacing requirements or require the use of the Y-Comb Terminal Block. See the user manual for further details.
7) Firmware version 17.0 or later required.

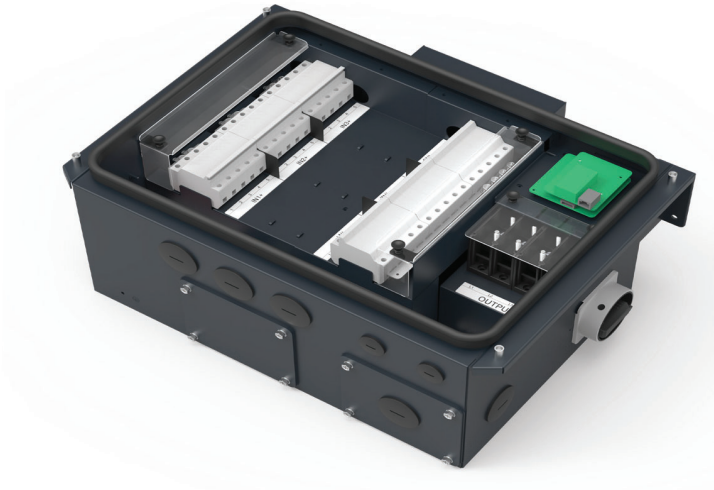
50/60kW, 1000Vdc String Inverters for North America

The 50 & 60kW (55 & 66kVA) medium power CPS three phase string inverters are designed for ground mount, large rooftop and carport applications. The units are high performance, advanced and reliable inverters designed specifically for the North American environment and grid. High efficiency at 98.8% peak and 98.5% CEC, wide operating voltages, broad temperature ranges and a NEMA Type 4X enclosure enable this inverter platform to operate at high performance across many applications. The CPS 50/60KTL products ship with either the Standard wire-box or the Rapid Shutdown wire-box, each fully integrated and separable with touch safe fusing, monitoring, and AC and DC disconnect switches. The integrated PLC transmitter in the Rapid Shutdown wire-box enables PVRSS certified module-level rapid shutdown when used with the Tigo TS4-F/TS4-A-F products, APS RSD-S-PLC-A products, and NEP PVG-4 products. The CPS Flex Gateway enables monitoring, controls and remote product upgrades.

CPS SCA50KTL-DO/US-480
CPS SCA60KTL-DO/US-480

Key Features

- NEC 2017 PVRSS Certified Rapid Shutdown
- 55 & 66kVA rating allows max rated Active Power @±0.91PF
- Selectable Max AC Apparent Power of 50/55kVA and 60/66kVA
- NEC 2014/17 compliant & UL listed Arc-Fault circuit protection
- 15-90° Mounting orientation for low profile roof installs
- Optional Flex Gateway enables remote FW upgrades
- Integrated AC & DC disconnect switches
- 3 MPPT's with 5 inputs each for maximum flexibility
- Copper and Aluminum compatible AC connections
- NEMA Type 4X outdoor rated, tough tested enclosure
- UL1741 SA Certified to CA Rule 21, including SA14 FW and SA15 VW
- Separable wire-box design for fast service
- Standard 10 year warranty with extensions to 20 years
- Generous 1.8 and 1.5 DC/AC Inverter Load Ratios



50/60KTL Standard Wire-box

50/60KTL Rapid Shutdown Wire-box

Chint Power Systems America
6800 Koll Center Parkway, Suite 235 Pleasanton, CA 94566
Tel: 855-584-7168 Mail: AmericaSales@chintpower.com Web: www.chintpowersystems.com

Model Name	CPS SCA50KTL-DO/US-480	CPS SCA60KTL-DO/US-480
DC Input		
Max. PV Power	90kW (33kW per MPPT)	
Max. DC Input Voltage	1000Vdc	
Operating DC Input Voltage Range	200-950Vdc	
Start-up DC Input Voltage / Power	330V / 80W	
Number of MPP Trackers	3	
MPPT Voltage Range @ PF>0.99	480-850Vdc	540-850Vdc
Max. PV Short-Circuit Current (Isc x 1.25)	204A (68A per MPPT)	
Number of DC Inputs	15 inputs, 5 per MPPT	
DC Disconnection Type	Load-rated DC switch	
DC Surge Protection	Type II MOV, 2800V_C, 20kA I_{TM} (8/20μS)	
AC Output		
Rated AC Output Power @ PF>0.99 to ±0.91[1]	50kW	60kW
Max. AC Apparent Power (Selectable)	50/55kVA	60/66kVA
Rated Output Voltage	480Vac	
Output Voltage Range[2]	422 - 528Vac	
Grid Connection Type	3Φ / PE / N (Neutral optional)	
Max. AC Output Current @480Vac	60.2/66.2A	72.2/79.4A
Rated Output Frequency	60Hz	
Output Frequency Range[2]	57 - 63Hz	
Power Factor	>0.99 (±0.8 adjustable)	
Current THD @ Rated Load	<3%	
Max. Fault Current Contribution (1 Cycle RMS)	64.1A	
Max. OCPD Rating	110A	125A
AC Disconnection Type	Load-break rated AC switch	
AC Surge Protection	Type II MOV, 1240V_C, 15kA I_{TM} (8/20μS)	
System and Performance		
Topology	Transformerless	
Max. Efficiency	98.8%	
CEC Efficiency	98.5%	
Stand-by / Night Consumption	<1W	
Environment		
Enclosure Protection Degree	NEMA Type 4X	
Cooling Method	Variable speed cooling fans	
Operating Temperature Range[3]	-22°F to +140°F / - 30°C to +60°C	
Non-Operating Temperature Range[4]	No low temp minimum to +158°F / +70°C maximum	
Operating Humidity	0 to 100%	
Operating Altitude	13,123.4ft / 4000m (derating from 9842.5ft / 3000m)	
Audible Noise	<60dBA @ 1m and 25°C	
Display and Communication		
User Interface and Display	LCD+LED	
Inverter Monitoring	SunSpec, Modbus RS485	
Site Level Monitoring	CPS Flex Gateway (1 per 32 inverters)	
Modbus Data Mapping	CPS	
Remote Diagnostics / FW Upgrade Functions	Standard / (with Flex Gateway)	
Mechanical		
Dimensions (HxWxD)	39.4 x 23.6 x 10.24in. (1000 x 600 x 260mm)	
Weight	Inverter: 123.5lbs/56kg; Wire-box: 33lbs/15kg	
Mounting / Installation Angle[5]	15 to 90 degrees from horizontal (vertical or angled)	
AC Termination	M8 Stud Type Terminal Block (Wire range: #6 - 3/0AWG CU/AL, Lugs not supplied)	
DC Termination[6]	Screw Clamp, Neg. Busbar (RSD version[6]) Wire range: #14 - #6AWG CU	
Fused String Inputs (5 per MPPT)[7]	15A fuses provided (Fuse values up to 30A acceptable)	
Safety		
Certifications and Standards	UL1741SA-2016, UL1699B, CSA-C22.2 NO.107.1-01, IEEE1547a-2014; FCC PART15	
Selectable Grid Standard	IEEE 1547a-2014, CA Rule 21, ISO-NE	
Smart-Grid Features	Volt-RideThru, Freq-RideThru, Ramp-Rate, Specified-PF, Volt-VAr, Freq-Watt, Volt-Watt	
Warranty		
Standard	10 years	
Extended Terms	15 and 20 years	

1) Active Power Derating begins; at PF=±0.91 to ±0.8 when Max AC Apparent Power is set to 55 or 66kVA.
2) The "Output Voltage Range" and "Output Frequency Range" may differ according to the specific grid standard.
3) Active Power Derating begins; at 40°C when PF=±0.9 and MPPT ≥Vmin, at 45°C when PF=1 and MPPT ≥Vmin, and at 50°C when PF=1 and MPPT V ≥ 700Vdc.
4) See user manual for further requirements regarding non-operating conditions.
5) Shade Cover accessory required for installation angles of 75 degrees or less.
6) RSD wire-box only includes fuses/fuseholders on the positive polarity, compliant with NEC 2017, 690.9 (C).
7) Fuse values above 20A have additional spacing requirements or require the use of the Y-Comb Terminal Block. See user manual for details.

APsmart

Raising the bar in innovative DC MLPE solar power systems

RSD-D

- Meets NEC 2017 & 2020 (690.12) requirements
- Executes rapid shutdown of system when Transmitter-PLC signal is absent
- Meets SunSpec requirements
- Dual-input channel

RSD-D meets SunSpec requirements, maintaining normal function by continually receiving a heartbeat signal from the APsmart Transmitter. The RSD-D executes rapid system shutdown when the Transmitter signal is absent. Users can manually execute rapid shutdown using Transmitter breaker switch.

> RSD-D TECHNICAL DATA

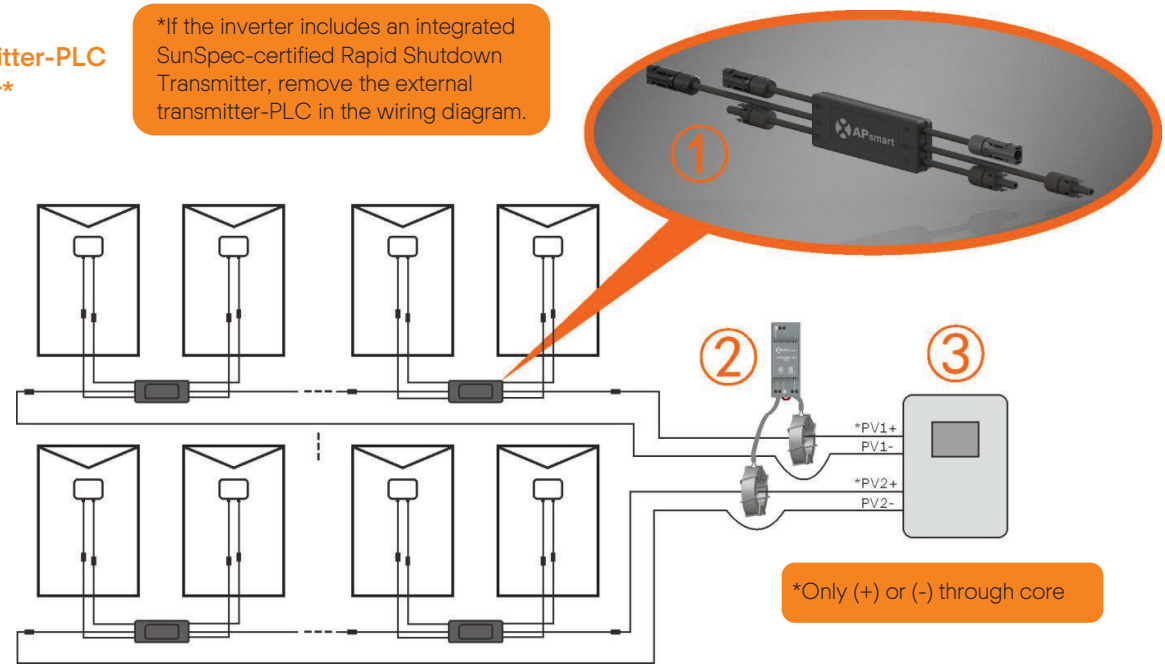
MODEL	RSD-D-15	RSD-D-20
INPUT DATA (DC)		
Range of Input Operating Voltage	8-65V Per Channel	
Maximum Cont. Input Current (Imax)	15A Per Channel	20A Per Channel
Maximum Short Circuit Current（Isc）	25A	
OUTPUT DATA (DC)		
Range of Output Operating Voltage	16-130V	
Maximum Cont. Output Current	15A	20A
Maximum System Voltage	1000V/1500V	
Maximum Series Fuse Rating	30A	
MECHANICAL DATA		
Operating Ambient Temperature Range	-40 °F to +167 °F (-40 °C to + 75 °C)	
Dimensions (without cable & connectors)	5.5" x 2" x 0.8"(140 mm x 50.6 mm x 20 mm)	
Cable Length	Input 500mm/Output 2400mm	
Cable Cross Section Size	TUV:4mm²/UL:12AWG	
Connector	Input: Stäubli MC4 PV-KBT4&KST4 or Customize	
	Output: APsystems specified or Customized	
Enclosure Rating	NEMA Type 6P/IP68	
Protection Temperature	100°C	
FEATURES & COMPLIANCE		
Communication Compliance	PLC	
Safety Compliance	NEC 2017 & 2020 (690.12); UL1741; CSA C22.2 No. 330-17; IEC/EN62109-1	
EMC Compliance	FCC Part15; ICES-003	

Rev2.0 2022-05-27

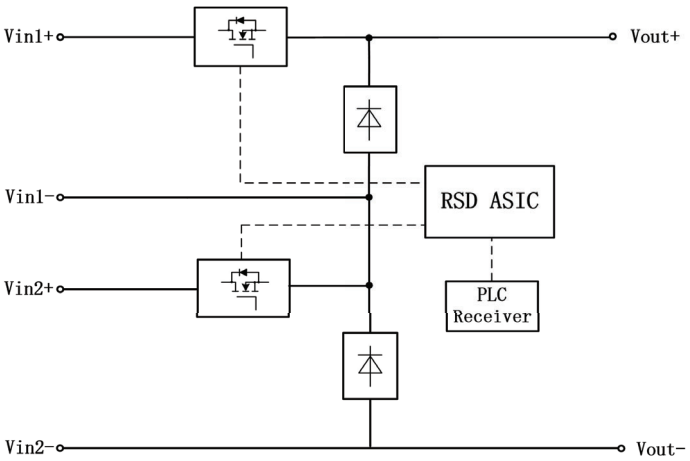
> RSD-D WIRING DIAGRAM

① RSD-D
② Transmitter-PLC
③ Inverter*

*If the inverter includes an integrated SunSpec-certified Rapid Shutdown Transmitter, remove the external transmitter-PLC in the wiring diagram.



> WORKING SCHEMATIC DIAGRAM



ORDERING INFORMATION

426101	1500V UL/1000V TUV, 15A, 2.4m cable, Stäubli MC4 PV-KBT4&KST4
446101	1500V UL/1000V TUV, 20A, 2.4m cable, Stäubli MC4 PV-KBT4&KST4
4261xx*	15A, 2.4m cable, Customize connector
4461xx*	20A, 2.4m cable, Customize connector

*please see the RSD Series Ordering Information

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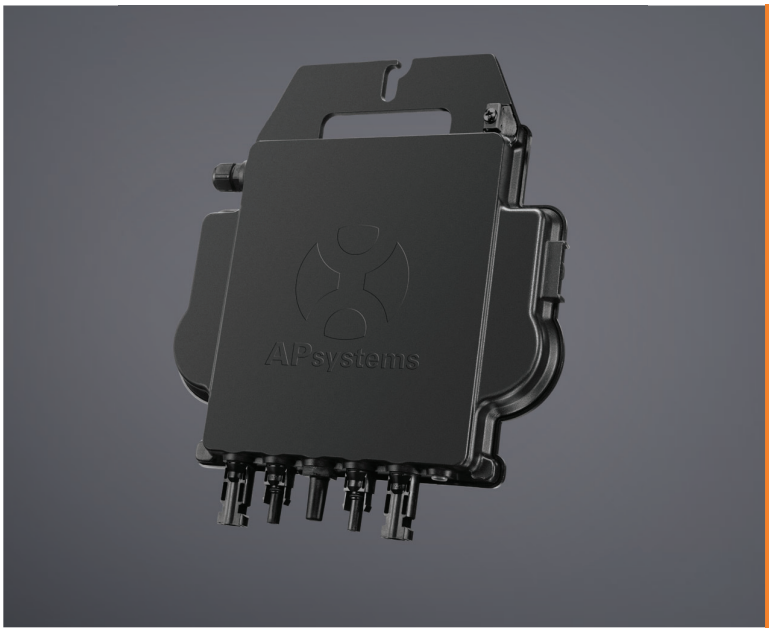
APsystems
ALTENERGY POWER

Leading the Industry in
Solar Microinverter Technology



DS3 Series

The most powerful Dual Microinverter

- One microinverter connects to two solar modules
- Max output power reaching 640VA, 768VA or 880VA
- Two independent input channels (MPPT)
- CA Rule 21 (UL 1741 SA) compliant
- NEC 2020 690.12 Rapid Shutdown Compliant
- Encrypted Wireless ZigBee Communication
- Phase Monitored and Phase Balanced

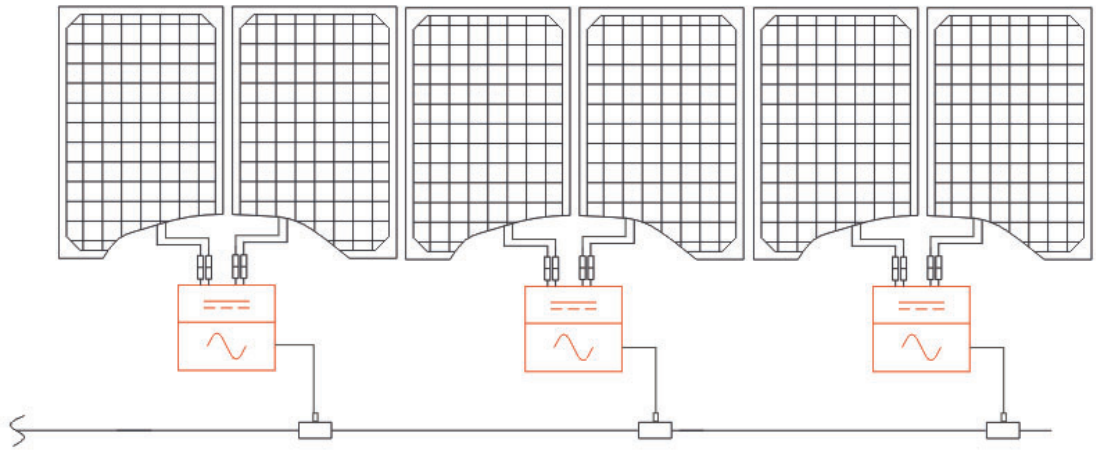
PRODUCT FEATURES

APsystems' 3rd generation of dual-module microinverters, the DS3 product family represents the culmination of years of power conversion expertise and innovation in high-efficiency, high-density power conversion to maximize the peak performance of today's high-capacity PV modules.

The DS3 series reaches unprecedented levels of power output and is fully backwards compatible with QS1 and YC600 microinverters and accessories. It features 2 input channels, each with independent MPPT, and encrypted wireless ZigBee communication. An innovative and compact design makes the product lighter while maximizing power production, and silicone-encapsulated components reduce stress on electronics, facilitate thermal dissipation, and enhance weatherproofing. Reliability is significantly increased thanks to 20% fewer components than previous generations. A 24/7 energy access through apps or web based portal facilitate remote diagnosis and maintenance.

The DS3 series is grid-interactive and fully compliant with CA Rule 21 requirements. With its unparalleled performance, efficiency of 97.3%, and increased reliability, the APsystems DS3 series is a gamechanger for residential and commercial solar.

WIRING SCHEMATIC



10 YEAR ANNIVERSARY • 2010-2020 •

2022/10/27 Rev1.6

Datasheet | DS3 Microinverter Series

Model	DS3-S	DS3-L	DS3
Region		USA / Canada	
Input Data (DC)			
Recommended PV Module Power (STC) Range	250Wp-480Wp+	265Wp-570Wp+	300Wp-660Wp+
Peak Power Tracking Voltage(1)		28V-45V	
Operating Voltage Range		26V-60V	
Maximum Input Voltage		60V	
Maximum Input Current	16A x 2	18A x 2	20A x 2
Maximum input short circuit current	20A per input	22.5A per input	25A per input
Output Data (AC)			
Maximum Continuous Output Power	640VA	768VA	880VA
Nominal Output Voltage/Range(2)		240V / 211V-264V	
Nominal Output Current	2.66A	3.2A	3.7A
Maximum Output Fault Current (ac) And Duration		5.691Apk, 26.75ms of duration; 3.307Arms	
Nominal Output Frequency/ Range(2)		60Hz/59.3Hz-60.5Hz	
Power Factor (Default/Adjustable)		0.99/0.8 leading...0.8 lagging	
Maximum Units per 20A Branch(3)	6	5	4
Maximum Units per 30A Branch(3)	9	7	6
AC Bus Cable		12AWG / 10AWG	
Efficiency			
Peak Efficiency		97.3%	
CEC Efficiency		97%	
Nominal MPPT Efficiency		99.5%	
Night Power Consumption		20mW	
Mechanical Data			
Operating Ambient Temperature Range(4)		-40°F to +149°F (-40°C to +65°C)	
Storage Temperature Range		-40°F to +185°F (-40°C to+85°C)	
Dimensions (W x H x D)	10.3" × 8.6" × 1.6" (263mm x 218mm x 41.2mm)		10.3" × 8.6" × 1.7" (263mm x 218mm x 42.5mm)
Weight	5.7lbs(2.7kg)		6.8lbs(3.1kg)
DC Connector Type		Stäubli MC4 PV-ADBP4-S2&ADSP4-S2	
Cooling		Natural Convection - No Fans	
Enclosure Environmental Rating		Type 6	
Features			
Communication (Inverter To ECU) (5)		Encrypted ZigBee	
Isolation Design		High Frequency Transformers, Galvanically Isolated	
Energy Management		Energy Management Analysis (EMA) system	
Warranty(6)		10 Years Standard ; 25 Years Optional	
Compliance			
Safety and EMC Compliance		UL1741; CSA C22.2 No. 107.1-16;CA Rule 21 (UL 1741 SA); FCC Part15; ICES-003; IEEE1547; NEC2014&NEC2017&NEC2020 Section 690.11 DC Arc-Fault circuit Protection; NEC2014&NEC2017&NEC2020 Section 690.12 Rapid Shutdown of PV systems on Buildings	

(1) VMP values may be different on previous DS3 models with a 34 -45V range for microinverters not connected to an ECU and 30-45V range for devices upgraded with an ECU.
(2) Nominal voltage/frequency range can be extended beyond nominal if required by the utility.
(3) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.
(4) The inverter may enter to power de-grade mode under poor ventilation and heat dissipation installation environment.
(5) Recommend no more than 80 inverters register to one ECU for stable communication.
(6) To be eligible for the warranty, APsystems microinverters need to be monitored via the EMA portal. Please refer to our warranty T&Cs available on emea.APsystems.com.

Specifications subject to change without notice please ensure you are using the most recent update found at web : usa.APsystems.com

Meets the standard requirements for Distributed Energy Resources (UL 1741) and identified with the CSA Listed Mark

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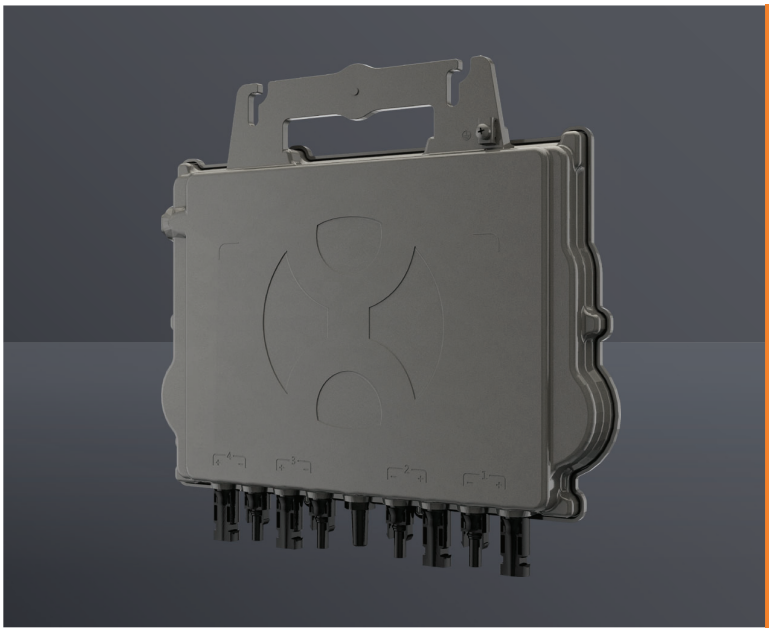
ALTENERGY POWER

Leading the Industry in
Solar Microinverter Technology



QT2

The most powerful 3-phase Quad microinverter

- Designed for 3-phase grid connection (208V or 480V)
- Single unit connects to 4 modules, 2 MPPTs, module-level DC voltage
- Maximum continuous AC output power 1728VA @ 208V, 1800VA @ 480V
- Engineered to harness today's high-capacity PV modules (Maximum input current 20A)
- Integrated safety protection relay
- Adjustable power factor
- Balancing 3-phase output
- Compatible with both △ and Y 3-phase grid

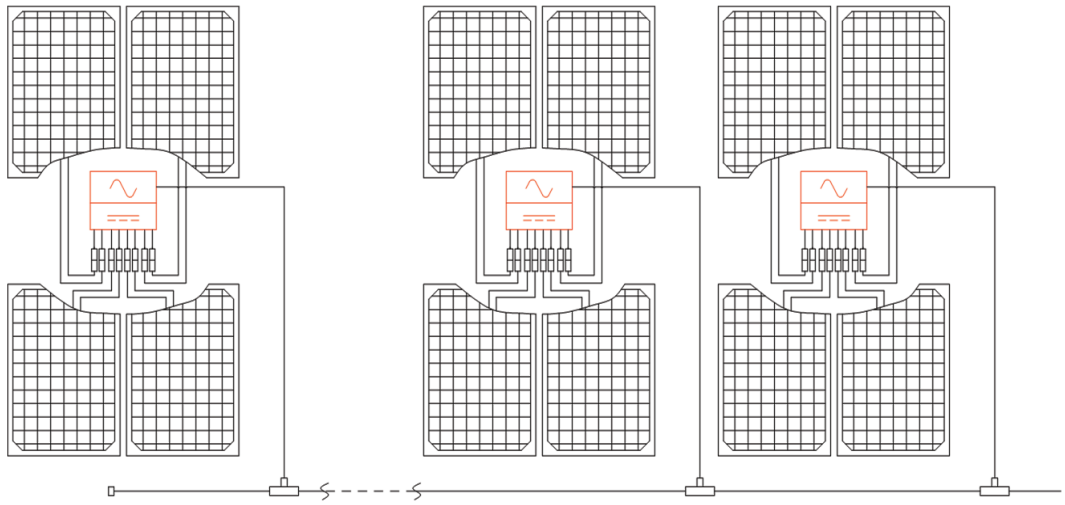
PRODUCT FEATURES

APsystems introduces its 2nd generation of native 3-phase quad microinverters, reaching unprecedented power outputs of 1728VA (for 208V) and 1800VA (for 480V) to harness the power of today's high-output PV modules. The QT2 microinverter gives commercial installers a powerful plug-and-play MLPE inverter that installs faster than competing solutions and is inherently compliant to rapid shutdown requirements.

With balancing 3-phase output, 4 DC inputs and encrypted ZigBee wireless, installers and system owners alike benefit from new QT2 architecture platform. The innovative design facilitates thermal dissipation while maximizing power production. The components are encapsulated with silicone to reduce stress on the electronics, dissipate heat, enhance waterproof properties, and ensure maximum reliability of the system. 24/7 access to performance data through apps or APsystems EMA web-based portal facilitate remote diagnosis and troubleshooting.

The new QT2 is grid interactive through its Reactive Power Control (RPC) feature, designed to better manage photovoltaic power spikes in the grid. At 96.5% peak efficiency and improved reliability, the QT2 is a game changer for commercial solar.

WIRING SCHEMATIC



2022/10/11 Rev1.2

Datasheet | QT2 3-Phase Microinverter

Model	QT2-208	QT2-480
Region	USA/Canada	

Input Data (DC)

Recommended PV Module Power (STC) Range	315Wp-670Wp+	
Peak Power Tracking Voltage	30V-45V	
Operating Voltage Range	26V-60V	
Maximum Input Voltage	60V	
Maximum Input Current	20A x 4	
Maximum input short circuit current	25A per input	

Output Data (AC)

Maximum Continuous Output Power	1728VA	1800VA
Nominal Output Voltage/Range(1)	208V/183V-229V	480V/422V-528V
Adjustable Output Voltage Range	166V-240V	385V-552V
Nominal Output Current	4.8Ax3	2.17Ax3
Maximum Output Fault Current (ac) And Duration	L-L:85.4Apk, 13.6ms of duration, 4.967Arms	L-L:35.1Apk, 13.9ms of duration, 2.199Arms
Nominal Output Frequency/Range(1)	60Hz/59.3Hz-60.5Hz	
Adjustable Output Frequency Range	55Hz-65Hz	
Power Factor(Default/Adjustable)	0.99/0.8 leading...0.8 lagging	
Maximum Units per 30A branch(2)	5	11
AC Bus Cable	10AWG	

Efficiency

Peak Efficiency	96.5%	
CEC Efficiency	96%	95.5%
Nominal MPPT Efficiency	99.5%	
Night Power Consumption	80mW	200mW

Mechanical Data

Operating Ambient Temperature Range(3)	-40 °F to +149 °F (-40 °C to +65 °C)
Storage Temperature Range	-40 °F to +185 °F (-40 °C to +85 °C)
Dimensions (W x H x D)	14” × 9.5” × 1.8” (359mm X 242mm X 46mm)
Weight	13 lbs (6kg)
DC Connector Type	Stäubli MC4 PV-ADBP4-S2&ADSP4-S2
Cooling	Natural Convection - No Fans
Enclosure Environmental Rating	Type 6

Features

Communication (Inverter To ECU)(4)	Encrypted ZigBee
Isolation Design	High Frequency Transformers, Galvanically Isolated
Energy Management	Energy Management Analysis (EMA) system
Warranty(5)	10 Years Standard ; 25 Years Optional

Compliances

Safety, EMC & Grid Compliances	UL1741; CSA C22.2 No. 107.1-16;CA Rule 21 (UL 1741 SA); FCC Part15; ICES-003; IEEE1547; NEC2014&NEC2017&NEC2020 Section 690.11 DC Arc-Fault circuit Protection; NEC2014&NEC2017&NEC2020 Section 690.12 Rapid Shutdown of PV systems on Buildings

(1) Nominal voltage/frequency range can be extended beyond nominal if required by the utility.
(2) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.
(3) The inverter may enter to power de-grade mode under poor ventilation and heat dissipation installation environment.
(4) Recommend no more than 80 inverters register to one ECU for stable communication.
(5) To be eligible for the warranty, APsystems microinverters need to be monitored via the EMA portal. Please refer to our warranty T&Cs available on usa.APsystems.com.

Specifications subject to change without notice please ensure you are using the most recent update found at usa.APsystems.com or canada.APsystems.com

Meets the standard requirements for Distributed Energy Resources (UL 1741) and identified with the CSA Listed Mark

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CHESS

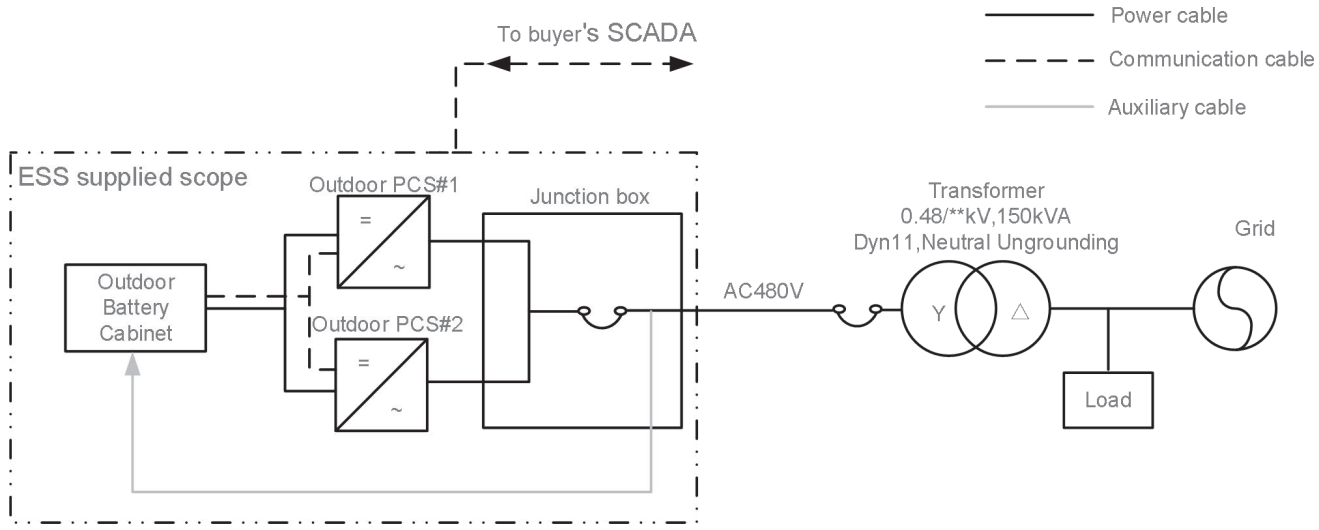
OSN-P120B274-U
OSN-P60B274-U

System Features

- Lithium iron phosphate battery (LFP) with intelligent battery management system, which guarantee battery with safety, high efficiency and long lifetime;
- Within intelligent temperature control and high protection structure design, to satisfy outdoor application;
- Modular design, convenient for maintenance and installation
- The hierarchical linkage ensures the safety of the system in an all-round way

Circuit Diagram

- OSN-P120B274-U is equipped with 2 PCS and OSN-P60B274-U is equipped with 1 PCS.



V1.0 2023-04-28

System Parameter

System Type	OSN-P120B274-U	OSN-P60B274-U
DC Input Data		
Cell Type	LFP C15	LFP C15
Module Type	1P9S	1P9S
Battery String Type	1P252S (28 Modules)	1P252S (28 Modules)
System Configuration	1 × 1P252S	1 × 1P252S
Battery capacity (BOL)@FAT	258kWh	258kWh
DC Usable Energy (BOL)@FAT	247kWh	247kWh
Battery Voltage Range	705.6~907.2V	705.6~907.2V
AC Output Data		
Nominal Power	120kVA	60kVA
AC usable energy (BOL)@FAT	240kWh	240kWh
AC full power energy (BOL)@FAT	240kWh	240kWh
Nominal Voltage	480V	480V
Voltage Range	422V~528V	422V~528V
Nominal Grid Frequency	60Hz	60Hz
Grid Frequency Range	57Hz~60.5Hz	57Hz~60.5Hz
Power Factor	1 leading~1 lagging	1 leading ~1 lagging
Max. THD of Current	＜3% (@Nominal Power)	＜3% (@Nominal Power)
Isolation Method	Transformer less	Transformer less
General Data		
Dimensions of ESS Unit (W×D×H)	1600×1900×2300mm	1600×1900×2300mm
Weight of ESS Unit	3110kg	2970kg
IP Rating of PCS Cabinet	IP65	IP65
IP Rating of Battery Cabinet	IP55	IP55
Operating Temperature Range	-20℃~+55℃【1】	-20℃~+55℃【1】
Relative Humidity	5%～100%	5%～100%
Max. Working Altitude	＜3000m【2】	＜3000m【2】
Cooling Concept (PCS Cabinet)	Forced Air Cooling	Forced Air Cooling
Cooling Concept (Battery Cabinet)	HVAC	HVAC
Noise	≤75dB(A)	≤75dB(A)
Fire detection system	With fire detection system	With fire detection system
Auxiliary power interface	AC480V/60Hz, 3 phase(L1/L2, 2 wires)	AC480V/60Hz, 3 phase(L1/L2, 2 wires)
Auxiliary system peak power requirement	3.5kW	3.5kW
Communication Interfaces	Ethernet	Ethernet
Communication Protocols	Modbus TCP/IP	Modbus TCP/IP
Compliance	UL9540/UL1741 SB/UL9540A	UL9540/UL1741 SB/UL9540A

Annotation：

V1.0 2023-04-28

【1】Power derating when environment temperature exceeding 40℃.
【2】When the altitude is between 2000-3000m, the output of the system will be derated.

Attachment G: Air Disinfection Systems

San Bernardino County

Removed from Scope of Work

Attachment H: EV Chargers

San Bernardino County

ALLIANCE
BUILDING SOLUTIONS

San Bernardino County – EV Chargers Inventory

Product:	EV Loop – Flex Level 2 Charger
Quantity:	10 Units
Location:	Various facilities throughout the County of San Bernardino where Solar PV Carports will be installed as part of this energy efficiency and renewable project
Equipment Details:	See specification sheet attached below

loop
ev charging network

ALLIANCE

EV-FLEX™

Electric Vehicle Level 2 Charging Station

Meet the best-in-class EV charging network technology for at home or on the go. The EV-FLEX™ Level 2 charging station is the ideal EV charging solution for multi-tenant residential, commercial, retail or municipal properties.

+ Sleek, compact modern design
+ Flexibly mounted on a wall, ceiling, pole or pedestal
+ WiFi & LTE cellular enabled for public or private networks
+ RFID, Smartphone App and Bluetooth user authentication
+ Real-time load management and demand response
+ Tamper resistant; rated for indoor/outdoor use
+ Universal compatibility

Support: (888) 385-6671 www.evloop.io 141 Nevada St. El Segundo, CA 90245

loop
ev charging network

EV-FLEX™ Specifications

Electrical	+ 32 A / 7.68 kW max output, 60 Hz + 208/240 VAC, single phase input + Hardwired, single port
Connector	+ 25 ft. charging cable (18 ft. optional) + SAE J1772 Type 1 standard compliant
Network Connectivity	+ Built-in Wi-Fi (802.11 b/g/n) + Built-in LTE Cellular (Cat 1; AT&T or Verizon) + OCPP 1.6 Communication Protocol
Firmware	+ 90-day, 15-minute encrypted interval data storage + Persistent data storage upon power interruption + Over the Air (OTA) updates available via Loop Network™
Core Specifications	+ Weatherproof, dust-tight: NEMA 4 (IP66), IK10 tamper resistant + Integrated cable management saddle and holster + Operating Temperature = -30 to 50 °C / -22 to 122 °F + Metering Accuracy = Embedded +/- 3% + User Interface = Configurable OLED display + Status Indicators = Power/Ready, Charging, Fault + Wall, ceiling, pole or pedestal mounting options + Main Enclosure Dimensions = 11.14" H x 7.56" W x 3.11" D + Weight = 5.28 kg / 11.64 lbs
Certifications & Standards	+ UL, FCC, Energy Star + Open ADR 2.0b compliant + CALeVIP, Charge Ready 2
Loop Network™ App (Optional)	+ Web-based portal for desktop access & remote troubleshooting + Public or private network enabled + User access control through RFID, NFC, Bluetooth and/or QR code + Flexible billing models (Pay-Per-Use vs. Subscription) + Automated billing & real-time payment resolution
Warranty	+ 3-year limited product warranty (parts only); optional 5-year and 10-year extended warranties available
Ordering	+ EV-FLEX™, Wall Mount, Single Port Charger **#EVS-32A-L2-001** + EV-FLEX™, Pedestal Mount, Single Port Charger **#EVS-32A-L2-001-P** + EV-FLEX™, Pedestal Mount, Dual Single Port Chargers **#EVS-32A-L2-001-2P**

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