HORNER AUTOMATION GROUP

SMARTBLOCK I/O MODULE DATASHEET

Image not model specific.

HE579ADC570/970

12 Input Channels, 5V / 10V 4-20mA / 20mA, CsCAN

1 TECHNICAL SPECIFICATIONS

GENERAL	
Required Power (Steady State)	1.8W (75mA @ 24VDC)
Required Power (Inrush)	8A @ 24VDC for 5ms
Relative Humidity	5 to 95% Non-condensing
Atmosphere	Free from corrosive gases and excessive dust
Cooling Method	Self-cooling
Operating Temperature	0˚C to 55˚C
Storage Temperature	-25˚C to 70˚C
Altitude	Up to 2000m
Pollution Degree	2 or lower
Weight	8 oz. / 227g
Certifications (CE)	USA: https://hornerautomation.com/certifications/ Europe: www.hornerautomation.eu

ANALOG IN			
Number of Input Points	ADC570: 6 ADC970: 12	Additional error for temperatures other than 25°C	0.01%/˚C
Input Ranges	5, 10VDC 4-20, 20mA DC 10k Thermistor (Precon Type III)	Isolation	1000VDC IEC61010-1 300V RMS
Accuracy, 25°C Input Impedance	0.1% V: 1MΩ mA: 75Ω	Isolation Method	Magnetic
Register Value for Nominal Full Scale	32,000	Maximum Continuous Overload	10V: 0 to 30V 20mA: 30mA, 0 to 30V
Conversion Time	10ms for all channels	Programmable Filter Time	0.01 to 1.28 seconds
Resolution	16 bits	Filter Modes	Running average or adaptive

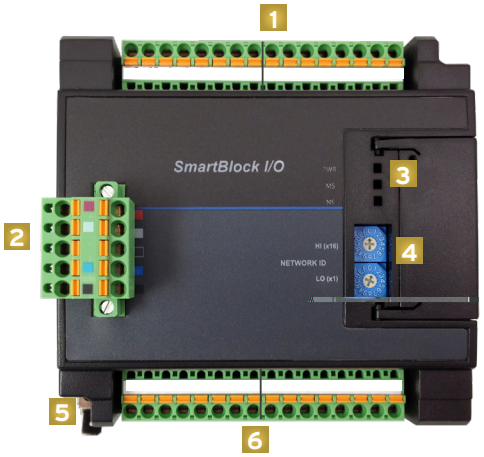
VIBRATION				
	Frequency	Acceleration	Amplitude	Sweep Count
Occasional Vibration	10 ≤ f < 57Hz	--	0.075mm	10x in each direction for X, Y, Z
	57 ≤ f < 150Hz	9.8m/s (1G)	--	
Continuous Vibration	10 ≤ f < 57Hz	--	0.035mm	10x in each direction for X, Y, Z
	57 ≤ f < 150Hz	4.96m/s (0.5G)	--	

SHOCKS				
Maximum Shock Acceleration	147m/s² (15G)			
Duration Time	11ms			
Pulse Wave	Half sine wave pulse (3x in each of X, Y, Z directions)			
Square wave impulse noise	AC: +/-1500VDC; DC: +/- 900VDC			
Radiated electromagnetic field	27 - 500MHz, 10V/m			
Fast Transient burst noise	Severity Level	All Power Modules	Digital I/O (Use ≥ 24V)	Digital I/O ((Use ≥ 24V) Analog Communication I/O
	Voltage	2kV	1kV	0.25kV

59 South State Ave., Indianapolis, IN 46201 | (p) 317.916.4274 (tf) 877.665.5666 (f) 317.639.4279 | www.hornerautomation.com

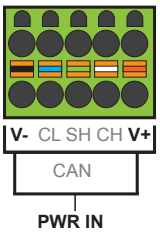
12/10/19 | MAN1245-01-EN

2 PORT CONNECTORS



1. Configurable Input Channels (12 Total)
2. CAN and Power Connector
3. Status LEDs
4. Network ID Selector Switches
5. Earth Ground
6. Configurable Input Channels (12 Total)

3 POWER WIRING



A single 5-pin connector is used to make both a network connection and power input. A quality Class 2 power supply should be used for this product. If the power is run with the network cable, care must be taken so that the voltage does not drop below the lower supply limit on longer runs.

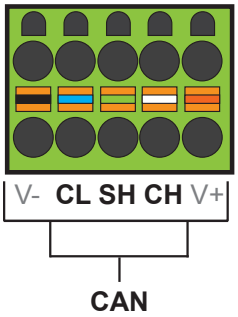
A quality earth ground is required for safe and proper operation. The best ground is achieved by screwing the left grounding location into a grounded back plate. Alternately, a ground can be connected to the spade lug.

4 CAN COMMUNICATIONS

The CAN port is provided via three connections on the CAN/Power: CAN_LOW (CL), CAN_HIGH (CH), and V- (C). It may be used to communicate with other OCS products using Horner's CsCAN protocol. A 24VDC power source will be required on the CsCAN bus in order to power the expansion I/O modules.

NOTE: 12-24VDC must be supplied to the network.

NOTE: For detailed wiring information, refer to CAN Manual (MAN0799).



Wiring Details

- Locking Spring-Clamp
- Two-terminators per Conductor
- Torque Rating: 4.5 in-lbs (0.50 N-m)
- SHLD and V+ pins are not internally connected

CAN Port Pins		
PIN	**SIGNAL**	**DESCRIPTION**
1	V-	CAN and Device Ground - Black
2	CN L	CAN Data Low - Blue
3	SHLD	Shield Ground - None
4	CN H	CAN Data High - White
5	V+	Positive DC VoltageInput (10-28VDC) - Red

Recommended Cable		
Thick	Max Distance = 500m	Belden 3082A
Thin	Max Distance = 100m	Belden 3084A

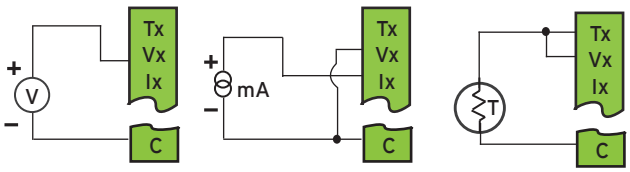
5 DIAGNOSTIC LED INDICATORS

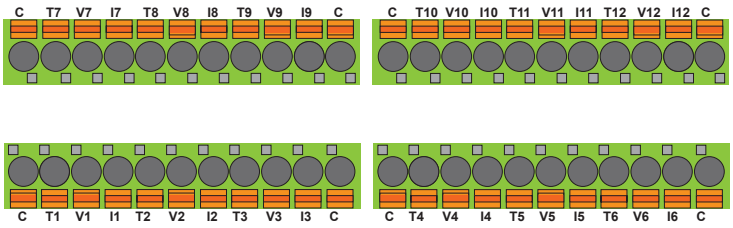
Diagnostic LED	State	Meaning
MS indicates fault status of the Module	Solid Red	RAM or ROM test failed
	Flashing Red	I/O test failed
	Flashing Green	Module is in power-up state, no config from OCS
	Solid Green	Module is running normally
NS indicates fault status of the Network	Solid Red	Network Ack or Dup ID test failed
	Flashing Red	Network ID test failed
	Flashing Green	Controlling OCS is offline.
	Green	Network is running normally.

Status LED Indicators - The Power Status LED illuminates **RED** when power is applied to the module. There are I/O status LED indicators for each of the Digital I/O points, which illuminate **RED** when the I/O point is ON.

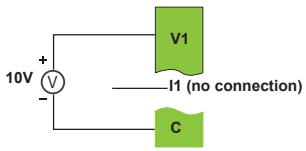
59 South State Ave., Indianapolis, IN 46201 | (p) 317.916.4274 (tf) 877.665.5666 (f) 317.639.4279 | www.hornerautomation.com

6 WIRING

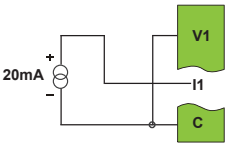




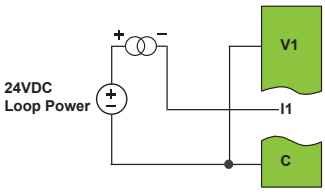
10V Analog In



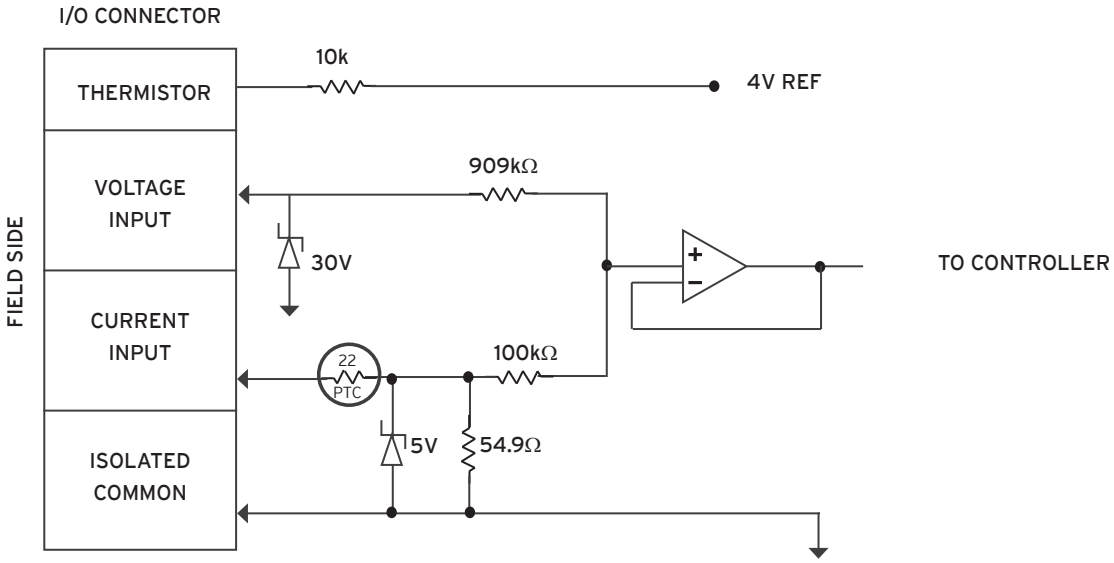
20mA Analog In - Self Powered



20mA Analog In - Not Self-Powered



7 INTERNAL WIRING



8 CSCAN SMARTBLOCK I/O STATUS REGISTER DEFINITION

Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
				Version Error	Incorrect Module	Not Configured	Offline
Bit 16	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**
Send						Reconfig (Sticky)	Lifetime (Sticky)

NOTE: The Status Register, viewed in INT format, is designed to be zero if there are no faults and non-zero if faults occur. Moving a value of 0 into the status register clears faults that remain on after they have been remedied, or "sticky".

59 South State Ave., Indianapolis, IN 46201 | (p) 317.916.4274 (tf) 877.665.5666 (f) 317.639.4279 | www.hornerautomation.com

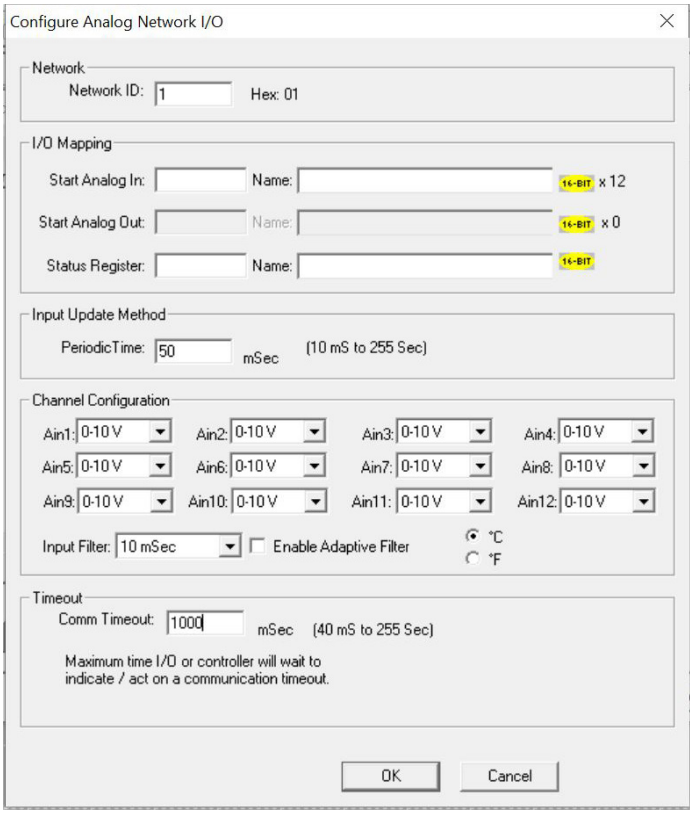
9 CSCAPE CONFIGURATION

The HE579RTD100 and HE579RTD200 SmartBlock modules are configured through the Hardware Configuration menu in Cscape. To configure module and input settings:

1. Select **Controller** from Cscape the top navigation bar.
2. Select **Hardware Configuration** from dropdown menu.
3. Select **CAN1 (CsCAN) I/O** tab.
4. Click on **Add** button.
5. Select **SmartBlock** tab.
6. Select either **HE579ADC570 or HE579ADC970**
7. Click **OK**.

Network ID	The Unique CAN ID of this device. Enter any decimal number between 1 and 253 here and note the translated hexadecimal value. Set the hexadecimal Network ID rotary switches on the device to translated value.
I/O Mapping	These registers define how the OCS controller registers are mapped to the data to and from the SmartBlock I/O. These registers do no have to match the I/O types typically used for I/O such as %AI, Q... Any standard controller registers may be used such as %R, %T and %M.
Input Update Method	This defines how often analog data is sent from the SmartBlock to the CsCAN network. Digital data is transmitted on change of state.
Channel Configuration	This selects how each analog channel is configured including filtering.
Timeout	This sets the time a controller will wait before assuming the host OCS is offline.

HE579ADC970 Cscape Configuration screen



NOTE: With Thermistor configured, registers have a resolution of 0.1°F or 0.1°C, ex. 250 = 25.0°.

10 INPUT MODE AND PROGRAMMABLE FILTER CONFIGURATION USING NETPUT

NOTE: This section may be ignored when using the CsCAN I/O configuration tool in Cscape.

The network supplies configuration information to the HE579ADC970 in the Consumed Directed Digital Data Words sent to the HE579ADC970. In the first word, the low 12 bits, 1 through 12, are channel mode bits. A low mode bit selects 10V and a high mode bit selects 20mA. The next three bits, 13 through 15, are input digital filter time constant codes and the high bit, 16, is an adaptive filter enable bit. In the second word, the low 12 bits are channel scale bits. A low scale bit selects 10V or 20mA for the corresponding channel. A high scale bit selects 5V or 4-20mA. The upper four bits are unused. The fifth word selects thermistor. A high bit selects thermistor for the respective channel. Bit 16 selects 0.1°C when off and 0.1°F when on for all thermistor channels.

Bit	Channel	Bit	Channel
1	AI1	7	AI7
2	AI2	8	AI8
3	AI3	9	AI9
4	AI4	10	AI10
5	AI5	11	AI11
6	AI6	12	AI12

input mode continued....

input mode and programmable filter configuration using netput continued....

Each analog input on the HE579ADC970 has a single pole 345Hz (461µs) cutoff high frequency noise filter. In addition, a second digital filter may be specified in the first configuration word with the following time constants.

Bit			Time Constant
15	14	13	
0	0	0	10ms Nominal hardware scan rate
0	0	1	15ms
0	1	0	35ms
0	1	1	75ms
1	0	0	155ms
1	0	1	315ms
1	1	0	635ms
1	1	1	1.275s

This digital filter is useful for applications with significant amounts of random noise. The slower time constants, while yielding better noise suppression, take a longer time to settle after step changes and are also sensitive to impulse noise which is treated like Gaussian noise and averaged.

Bit 16 of the first configuration word may be set to specify an adaptive filter algorithm that:
1. Responds much more quickly to large step changes at slower time constants with full filtering of low-level noise.
2. Suppresses impulse noise at the expense of slightly slower response at the shortest time Constant settings, approximately 10ms.

NOTE: The actual system response time is network dependent.

11 INPUT CONVERSION FACTOR

The following table describes how real-world inputs are scaled into the controller. Given a known input voltage or current, the register data value may be calculated by using the conversion factor from the table. The following formula is used: Data = Voltage or Current In / Conversion Factor.

Example: The user selects a voltage range of 5V:

A. The known input voltage is 3VDC.
B. Using the table, the conversion factor for the voltage range of 5V is .00015625.
C. To determine the data value, the formula is used: Data = V in / Conversion Factor 19200 = 3VDC / 0.0001562

Conversion of Real-World Inputs into Register Values			
Selected Range	**Input mA or Volts**	**Data Out**	**Conversion Factor**
5.00V	> +5.11	32767	0.00015625
	+5.00	32000	
	0.00	0	
10.00V	> +10.23	32767	0.0003125
	+10.00	32000	
	0.00	0	
4.20mA	> +20.47	32767	0.0005
	+20.00	32000	
	+4.00	0	
20.00mA	> +20.47	32767	0.0006250
	+20.00	32000	
	0	0	

NOTE: For the 4 to 20mA range, the offset, 4mA, must first be subtracted from the physical input value before dividing by the scale factor to yield the expected %AQG value for the given input.

59 South State Ave., Indianapolis, IN 46201 | (p) 317.916.4274 (tf) 877.665.5666 (f) 317.639.4279 | www.hornerautomation.com

12 THERMISTOR OPTION

The ADC920 supports Kele Engineering Precon Type III, 10kΩ thermistors. It also directly supports the following: 10kΩ (Beta=3574) thermistors from Yellow Springs Instruments (YSI).

Part Numbers	
44006	46006
44106	46031
44406	46041
44031	44907
45006	44908

Thermistor Curve or PreCon Type III (Model 3)					
Temperature °F	Resistance	Temperature °F	Resistance	Temperature °F	Resistance
-35	203.6k	60	14.78k	155	2.098k
-30	173.6k	65	13.15k	160	1.920k
-25	148.3k	70	11.72k	165	1.759k
-20	127.1k	75	10.46k	170	1.614k
-15	109.2k	80	9.354k	175	1.482k
-10	94.07k	85	8.378k	180	1.362k
-5	81.23k	90	7.516k	185	1.254k
0	70.32k	95	6.754k	190	1.156k
5	61.02k	100	6.078k	195	1.066k
10	53.07k	105	5.479k	200	984.0
15	46.27k	110	4.947k	205	909.8
20	40.42k	115	4.472k	210	841.9
25	35.39k	120	4.049k	215	779.8
30	31.06k	125	3.671k	220	723.0
35	27.31k	130	3.333k	225	671.0
40	24.06k	135	3.031k	230	623.3
45	21.24k	140	2.759k	235	579.5
50	18.79k	145	2.515k	240	539.4
55	16.65k	150	2.296k		

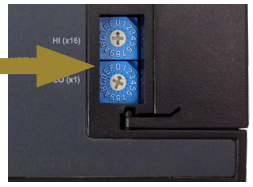
59 South State Ave., Indianapolis, IN 46201 | (p) 317.916.4274 (tf) 877.665.5666 (f) 317.639.4279 | www.hornerautomation.com

13 SETTING ID SWITCHES

Configure SmartBlock in Cscape before this step, then use the hexadecimal number converted during Cscape configuration.

CsCAN Network IDs are set using the hexadecimal number system from 01 to FD. The decimal equivalent is 1-253. Refer to the Conversion Table below, which shows the decimal equivalent of hexadecimal numbers. Set a unique Network ID by inserting a small Phillips screwdriver into the two identical switches.

Network ID Switches



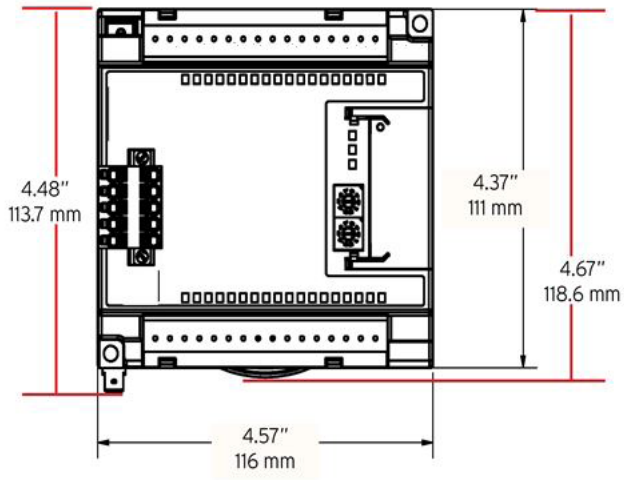
NOTE: The CsCAN Baud Rate for SmartBlock I/O is fixed at 125kBd.

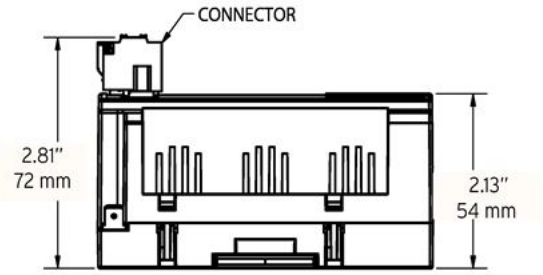
Setting ID Switches - Conversion Chart

Dec	Hex	Dec	Hex	Dec	Hex	Dec	Hex	Dec	Hex	Dec	Hex	Dec	Hex	Dec	Hex	Dec	Hex	Dec	Hex
	Hi Lo		Hi Lo		Hi Lo		Hi Lo		Hi Lo		Hi Lo		Hi Lo		Hi Lo		Hi Lo		Hi Lo
1	0 1	29	1 D	57	3 9	85	5 5	113	7 1	141	8 D	169	A 9	197	C 5	225	E 1		
2	0 2	30	1 E	58	3 A	86	5 6	114	7 2	142	8 E	170	A A	198	C 6	226	E 2		
3	0 3	31	1 F	59	3 B	87	5 7	115	7 3	143	8 F	171	A B	199	C 7	227	E 3		
4	0 4	32	2 0	60	3 C	88	5 8	116	7 4	144	9 0	172	A C	200	C 8	228	E 4		
5	0 5	33	2 1	61	3 D	89	5 9	117	7 5	145	9 1	173	A D	201	C 9	229	E 5		
6	0 6	34	2 2	62	3 E	90	5 A	118	7 6	146	9 2	174	A E	202	C A	230	E 6		
7	0 7	35	2 3	63	3 F	91	5 B	119	7 7	147	9 3	175	A F	203	C B	231	E 7		
8	0 8	36	2 4	64	4 0	92	5 C	120	7 8	147	9 4	176	B 0	204	C C	232	E 8		
9	0 9	37	2 5	65	4 1	93	5 D	121	7 9	149	9 5	177	B 1	205	C D	233	E 9		
10	0 A	38	2 6	66	4 2	94	5 E	122	7 A	150	9 6	178	B 2	206	C E	234	E A		
11	0 B	39	2 7	67	4 3	95	5 F	123	7 B	151	9 7	179	B 3	207	C F	235	E B		
12	0 C	40	2 8	68	4 4	96	6 0	124	7 C	152	9 8	180	B 4	208	D 0	236	E C		
13	0 D	41	2 9	69	4 5	97	6 1	125	7 D	153	9 9	181	B 5	209	D 1	237	E D		
14	0 E	42	2 A	70	4 6	98	6 2	126	7 E	154	9 A	182	B 6	210	D 2	238	E E		
15	0 F	43	2 B	71	4 7	99	6 3	127	7 F	155	9 B	183	B 7	211	D 3	239	E F		
16	1 0	44	2 C	72	4 8	100	6 4	128	8 0	156	9 C	184	B 8	212	D 4	240	F 0		
17	1 1	45	2 D	73	4 9	101	6 5	129	8 1	157	9 D	185	B 9	213	D 5	241	F 1		
18	1 2	46	2 E	74	4 A	102	6 6	130	8 2	158	9 E	186	B A	214	D 6	2412	F 2		
19	1 3	47	2 F	75	4 B	103	6 7	131	8 3	159	9 F	187	B B	215	D 7	243	F 3		
20	1 4	48	3 0	76	4 C	104	6 8	132	8 4	160	A 0	188	B C	216	D 8	244	F 4		
21	1 5	49	3 1	77	4 D	105	6 9	133	8 5	161	A 1	189	B D	217	D 9	245	F 5		
22	1 6	50	3 2	78	4 E	106	6 A	134	8 6	162	A 2	190	B E	218	D A	246	F 6		
23	1 7	51	3 3	79	4 F	107	6 B	135	8 7	163	A 3	191	B F	219	D B	247	F 7		
24	1 8	52	3 4	80	5 0	108	6 C	136	8 8	164	A 4	192	C 0	220	D C	248	F 8		
25	1 9	53	3 5	81	5 1	109	6 D	137	8 9	165	A 5	193	C 1	221	D D	249	F 9		
26	1 A	54	3 6	82	5 2	110	6 E	138	8 A	166	A 6	194	C 2	222	D E	250	F A		
27	1 B	55	3 7	83	5 3	111	6 F	139	8 B	167	A 7	195	C 3	223	D F	251	F B		
28	1 C	56	3 8	84	5 4	112	7 0	140	8 C	168	A 8	196	C 4	224	E 0	252	F C		
																253	F D		

59 South State Ave., Indianapolis, IN 46201 | (p) 317.916.4274 (tf) 877.665.5666 (f) 317.639.4279 | www.hornerautomation.com

14 INSTALLATION DIMENSIONS AND SAFETY





The SmartBlock modules are suitable for use in the Class I, Division 2, Groups A, B, C and D Hazardous Locations, or nonhazardous locations only.

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
ATTENTION - RISQUE D'EXPLOSION - NE DÉBRANCHEZ PAS L'ÉQUIPEMENT SAUF SI L'ALIMENTATION A ÉTÉ COUPÉE OU SI LA ZONE N'EST PAS DANGEREUSE.

Device shall be installed into an enclosure that is only accessible with the use of a tool.

INSTALLATION PROCEDURE

1. The SmartBlock modules conveniently mount on a DIN rail.
2. Be sure the DIN rail is in a horizontal position before installing the unit.
3. The orientation shown to the right is necessary to prevent the unit from slipping off the DIN rail.
4. Align the unit on the DIN rail then push the DIN rail clip until it clicks into place. Check to ensure that the unit is secure on the DIN rail.
5. Do NOT mount the unit on its side as this may cause the unit from slipping off the DIN rail.

NOTE: The spade connector for grounding and the DIN rail clip add to the overall measurements. The CAN/PWR and LAN connectors also add to the measurements.

WARNINGS

1. To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.
2. To reduce the risk of fire, electrical shock, or physical injury, it is strongly recommended to fuse the voltage measurement inputs. Be sure to locate fuses as close to the source as possible.
3. Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.
4. In the event of repeated failure, do NOT replace the fuse again as repeated failure indicates a defective condition that will NOT clear by replacing the fuse.
5. Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

FCC COMPLIANCE

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation

PRECAUTIONS

All applicable codes and standards need to be followed in the installation of this product. Adhere to the following safety precautions whenever any type of connection is made to the module:

1. Connect the safety (earth) ground on the power connector first before making any other connections.
2. When connecting to the electric circuits or pulse-initiating equipment, open their related breakers.
3. Do NOT make connection to live power lines.
4. Make connections to the module first; then connect to the circuit to be monitored.
5. Route power wires in a safe manner in accordance with good practice and local codes.
6. Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.
7. Ensure hands, shoes, and floor are dry before making any connection to a power line.
8. Make sure the unit is turned OFF before making connection to terminals.
9. Make sure all circuits are de-energized before making connections.
10. Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
11. Use copper conductors in Field Wiring only, 60/75°C.

15 PART NUMBERS

The global part numbers are **HE579ADC570 and HE579ADC970.**

16 TECHNICAL SUPPORT

For assistance and datasheet updates, contact Technical Support at the following locations:

North America
+1 (317) 916-4274
www.hornerautomation.com
techsppt@heapg.com

Europe
+353 (21) 4321-266
www.hornerautomation.eu
technical.support@horner-apg.com

59 South State Ave., Indianapolis, IN 46201 | (p) 317.916.4274 (tf) 877.665.5666 (f) 317.639.4279 | www.hornerautomation.com