HORNER AUTOMATION GROUP

SMARTBLOCK I/O MODULE DATASHEET

*Image is not model specific.

HE579ACM300
SmartBlock Power and Energy Monitor

- 3-Phase power monitoring with three current (0-5A CTs) and voltage inputs (480V, direct connect of PTs).
- CsCAN CAN network connection provides a fast, flexible communication path.
- SmartBlock package allows convenient mounting close to the source to be monitored.
- On board relay allows load shedding, alarming, or other local switching.

1 TECHNICAL SPECIFICATIONS

GENERAL SPECIFICATIONS	
Required Power (Steady State)	60mA @ 24VDC
Required Power (Inrush)	14A for 50µs
Primary Power Range	10-30VDC
Relative Humidity	5-95% Non-condensing
Operating Temperature	0˚ to 60˚C
Measurement Rating	CAT III Max 600V
Certifications (CE)	USA: https://hornerautomation.com/certifications/ Europe: http://www.horner-apg.com/en/support/certification.aspx
CONNECTIVITY	
CAN Port	Horner CsCAN Peer-to-Peer

CURRENT INPUTS		VOLTAGE INPUTS	
Conversion	True RMS 78.1K samples/sec	Conversion	True RMS
CT Input	5A Secondary	PT Input (or direct)	480V Secondary
Burden	0.2VA	Burden	2.0MΩ
Range	1 to 150% of CT Primary	Input Range	40 to 600VAC
Full Scale	150% of CT Primary	Full Scale	600VAC
Accuracy	<1% of Full Scale	Accuracy	Better than 1% full scale

RELAY OUTUT (Form C)			
Current	1A max at 30VDC 0.5A max at 125VDC	Contact Voltage	30VDC, Max 125VAC, Max

MEASURED DATA VALUES	
Phase A RMS voltage (Va)	Watts (W)
Phase B RMS voltage (Vb)	Power Factor (PF)
Phase C RMS voltage (Vc)	Volt-Amps (VA)
Phase A RMS current (Ia)	Volt-Amps Reactive (VAR)
Phase B RMS current (Ib)	Kilowatt Hour (KWhr)
Phase C RMS current (Ic)	Voltage Peak (Vpeak)
Frequency Hz	Current Peak (Ipeak)

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8/2/19 | MAN1229-01-EN

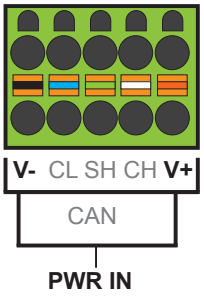
2 PORT CONNECTORS AND POWER WIRING

1. J2 Connector
2. CAN and Power Connector
3. Status LEDs
4. Network ID Selector Switches
5. Earth Ground
6. J1 Connector

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.

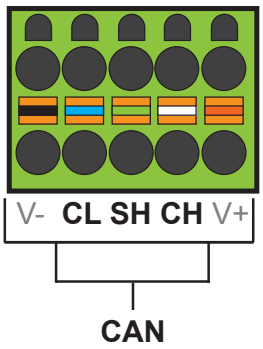


Removing and Inserting Connectors:
Use a small screwdriver to gently pry up the connector. Gently press on connector to snap into place.

Wiring Details:
Solid/Stranded wire: 12-24 awg (2.5-0.2mm).
Strip length: 0.28" (7mm)
Torque rating: 4.5 - 7 in-lbs (0.50 - 0.78 Nm).

3 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: For detailed wiring information, refer to CAN Network Manual (MAN0799).
NOTE: 12-24VDC must be supplied to the network.



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 Voltage Input (10-28VDC) - Red

Wiring Details

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

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

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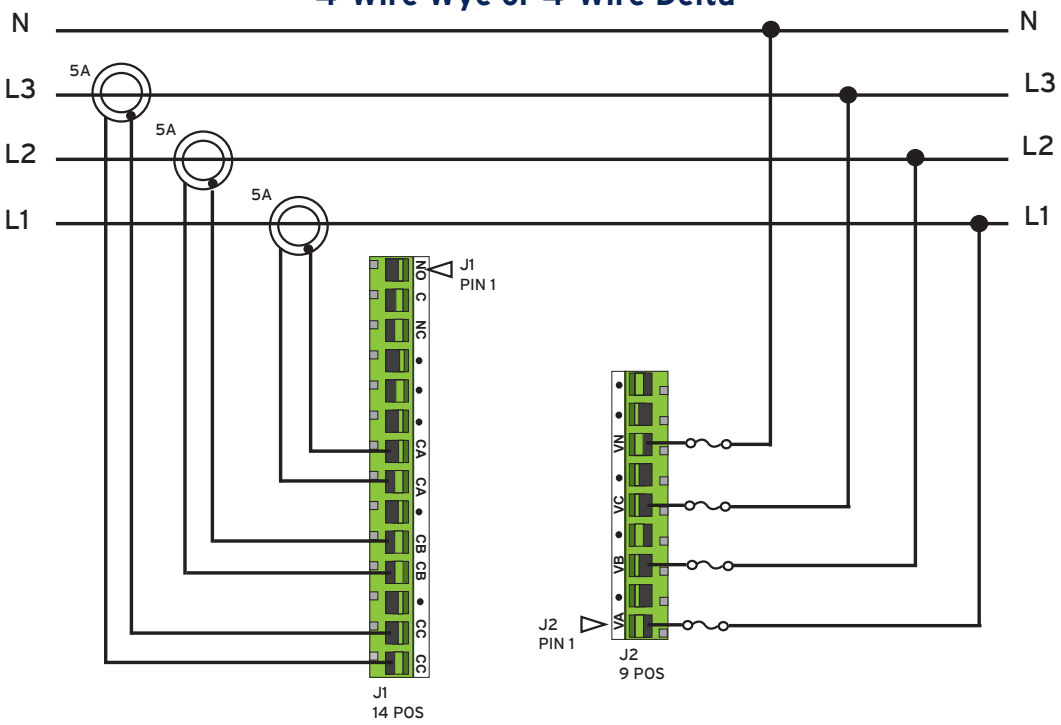
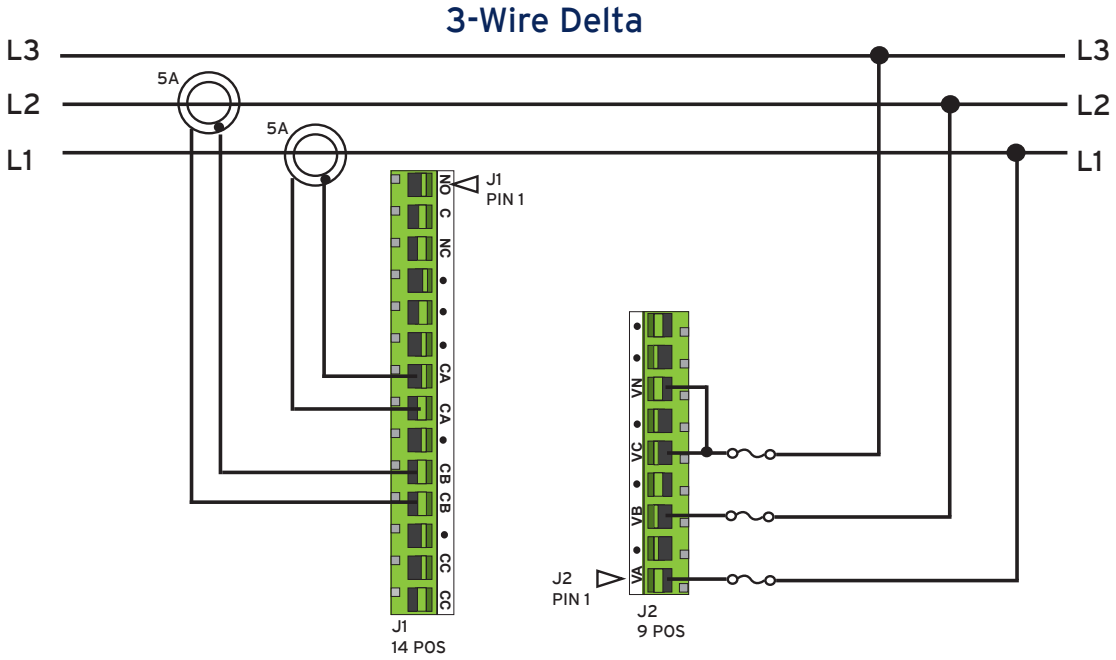
4 WIRING

4-Wire Wye or 4-Wire Delta



3-Wire Delta



3-Wire Delta and Third Voltage - The HE579ACM300 is primarily a power (watt) monitor and does not use the third line-to-line voltage in delta mode because it is fixed by the other two line-to-line voltages. The two measured phase voltages and two associated phase currents allow accurate calculation of the full three phase power. Any phase angle imbalance affects both the voltage and current angle, so the accuracy of the power reading is unaffected.

It is possible to calculate the third line to voltage in ladder assuming a 120° angle between the measured phases.
The formula should be: C = √(A*A + B*B - A*B).
NOTE: This calculation will not be accurate if the phase angles are not 120°.

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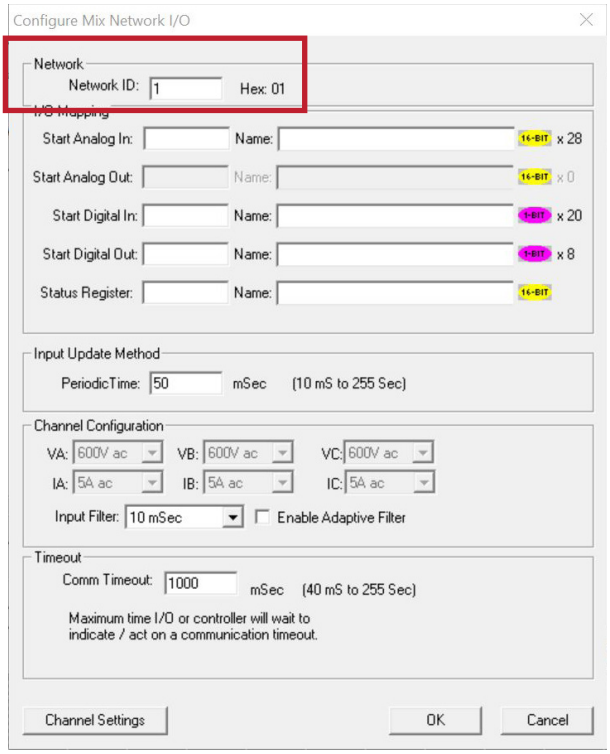
5 CSCAPE CONFIGURATION

The HE579ACM300 SmartBlock module is configured through the Hardware Configuration menu in Cscape.
To open the configuration screen 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 (**or **CAN2** where available**) I/O** tab.
4. Click on **Add** button.
5. Select **SmartBlock** tab.
6. Select either **HE579ACM300**
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 not 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.

HE579ACM300 Cscape Configuration Screen



6 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 "stickey"

7 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 illunminates **RED** when the I/O point is ON.

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8 NETWORK DATA

CONSUMED DIGITAL DATA

This data is sent from the controller to the SmartBlock. For typical applications, the Hardware Configuration setup in Cscape will automatically populate this data. For more advanced applications, use NetPut functions to write this data.

Bit	Description	
1	Q1 Default	
2	Q1 Override Upon module stop / timeout, if Q1 override is true, Q1 is set to Q1 default, otherwise the Q1 value is held. This override / hold polarity is consistent with OCS / Cscape usage, but the reverse of the legacy analog hold / override polarity in word 5.	
3	Frequency Source: Set for phase B, Clear for phase A or C.	
4	Frequency Source: Set for phase C, Clear for phase A or B	
5	If Clear	Always accumulate Watt-hours
	If Set	Do not accumulate Watt-hours if load is under 0.005% of full scale to avoid meter creep due to slight zero errors.
6	Set to report period instead of frequency AI13 / AI14	
17	Relay Output, set to ON to close N.O. and open N.C contacts.	
23	Set to ON to clear kW-h, set to OFF to re-enable kW-h accumulator.	
24	Set to ON to clear Status flags, set to OFF to re-enable Status flags (resets Produced Data)	

PRODUCED DIGITAL DATA

This data is sent from the SmartBlock to the controller. Normally this data is mapped into specific registers in the Hardware Configuration in Cscape. For advanced applications, NetGet functions can be used to obtain this data. Since this data is broadcast to all controllers on the network, additional controllers can use NetGet functions to obtain this data as well.

Bit	Name	Description (Retentive - resettable by setting bit 24 above high)
I1	AEHF	Watt-Hour accumulator half full
I2	REHF	VAR-Hour accumlator half full
I3	VAEHF	VA-Hour accumulator half
I4	SAGA	Voltage sag on Phase A
I5	SAGB	Voltage sag on Phase B
I6	SAGC	Voltage sag on Phase C
I7	ZXTOA	Zero Cross timeout on Phase A
I8	ZXTOB	Zero Cross timeout on Phase B
I9	ZXTOC	Zero Cross timeout on Phase C
I10	ZXA	Zero Cross detected on Phase A
I11	ZXB	Zero Cross detected on Phase B
I12	ZXC	Zero Cross detected on Phase C
I13	LENERGY	Reserved
I14	RESET	5V supply rail under 4V
I15	PKV	Peak voltage level exceeded
I16	PKI	Peak current level exceeded
I17	WFSM	Reserved
I18	REVPAP	Sign changed occurred in Watt calculation
I19	REVPRP	Sign changed occured in VAR calculation
I20	SEQERR	A-B-C Rotation

network data continued on next page...

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network data continued...

CONSUMED ANALOG DATA

This data is sent from the controller to the SmartBlock. For typical applications, the Hardware Configuration setup in Cscape will automatically populate this data. For more advanced applications, use NetPut functions to write this data.

Word	Description		Details
Word 1 / 2	REAL	PT A Ratio	Voltage Input Ratio For example, 120 to 480 step up enter 0.25; for 7200 to 480 step down enter 15.
Word 3 /4	REAL	PT B Ratio	
Word 5 / 6	REAL	PT C Ratio	
Word 7 / 8	REAL	CT A Ratio	Current Input Ratio For example, for a 100/5 Current Transformer, enter 20.
Word 9 / 10	REAL	CT B Ratio	
Word 11 / 12	REAL	CT C Ratio	
Word 13 / 14	REAL	CT A Phase Shift	Phase correction for CTs Enter in degrees Min of -1.63° Lag, Max of +3.32 Lead
Word 15 / 16	REAL	CT B Phase Shift	
Word 17 / 18	REAL	CT C Phase Shift	
Word 19 / 20	REAL	Zero Cross Timeout	Seconds for zero cross alarm - max 2.5
Word 21 / 22	REAL	RMS Sag Voltage Level	Voltage Sag levels in volts
Word 23	UINT	Sag Half Cycles	Number of half cycles before alarm
Word 24	UINT	Peak Level Half Cycles	Number of half cycles before alarm
Word 25 / 26	REAL	Voltage Peak Level	Voltage level for peak alarm
Word 27 / 28	REAL	Current Peak Level	Current level for peak alarm

PRODUCED ANALOG DATA

This data is sent from the SmartBlock to the controller. Normally this data is mapped into specific registers in the Hardware Configuration in Cscape. For advanced applications, NetGet functions can be used to obtain this data. Since this data is broadcast to all controllers on the network, additional controllers can use NetGet functions to obtain this data as well.

Word	Function	
Word 1 / 2	REAL	Phase A RMS Voltage
Word 3 /4	REAL	Phase B RMS Voltage
Word 5 / 6	REAL	Phase C RMS Voltage
Word 7 / 8	REAL	Phase A RMS Current
Word 9 / 10	REAL	Phase B RMS Current
Word 11 / 12	REAL	Phase C RMS Current
Word 13 / 14	REAL	Frequency
Word 15 / 16	REAL	Watts
Word 17 / 18	REAL	PF Power Factor
Word 19 / 20	REAL	VA Volt - Amps
Word 21 / 22	REAL	VAR Volt - Amps Reactive
Word 23 / 24	REAL	kW-h
Word 25 / 26	REAL	Voltage Peak
Word 27 / 28	REAL	Current Peak

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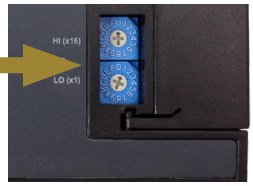
9 SETTING ID SWITCHES

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.

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

Network ID Switches



Setting ID Switches - Conversion Chart

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
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

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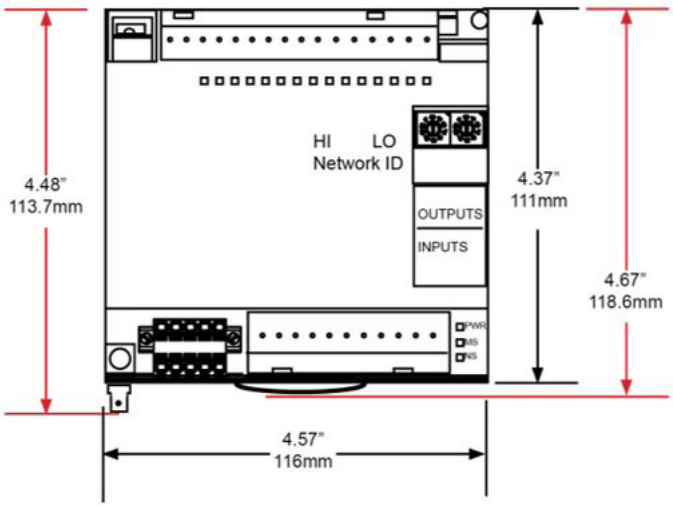
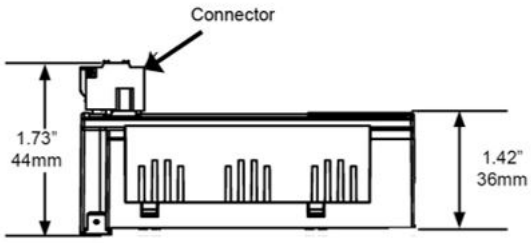
10 INSTALLATION DIMENSIONS AND SAFETY





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

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 connector also adds to the measurement.

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.

11 PART NUMBERS

The global part numbers is **HE579ACM300.**

12 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.horner-apg.com
technical.support@horner-apg.com

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