



SmartMod

Digital Input/Output Module

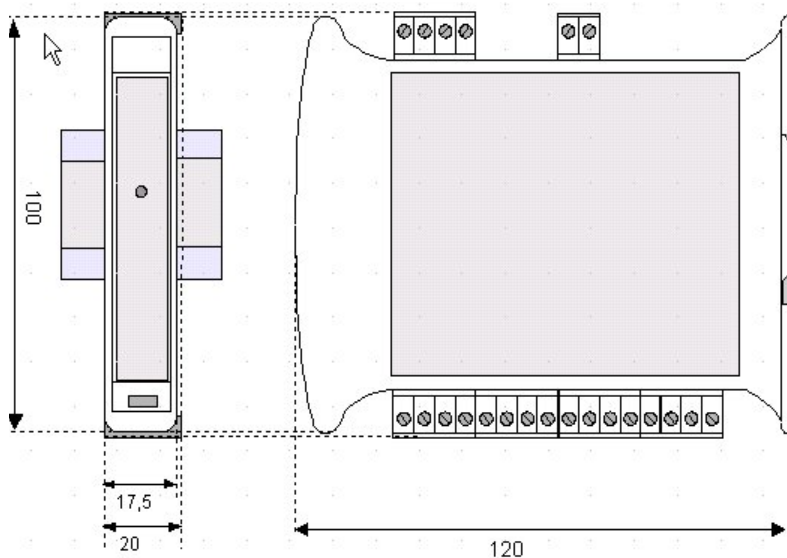
HE359DIQ516

-Four Isolated Digital Inputs
-Eight Isolated Digital Outputs

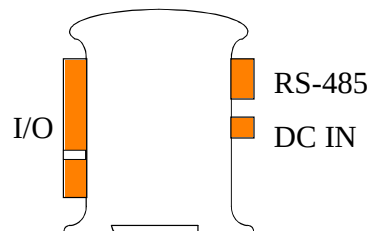


1 Specifications

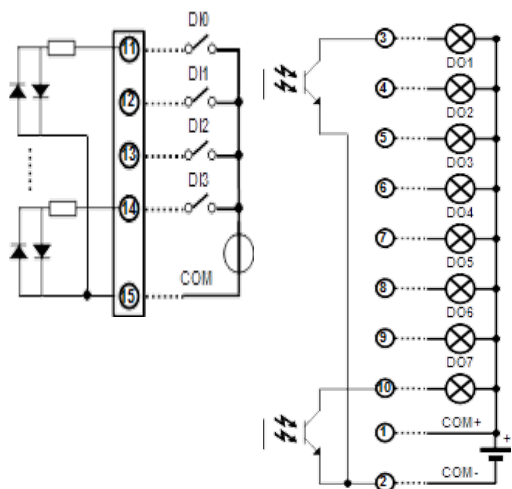
DIQ516		DIQ516	
Inputs per Module (Commons)	4 (1 Common)	Sample Time (PLC Update Rate)	Min. 20mS - Determined by Communications w/OCS
Input Voltage Range	12/24 VDC	Terminal Type	Screw Type, Removable
Impedance	4.7k ohms	Storage Temp.	-40° to 85° Celsius
Peak Voltage	30 VDC	Operating Temp.	-10° to 60° Celsius
ON voltage level	10 VDC	Relative Humidity	0 to 90% Non-condensing
OFF voltage level	0-3 VDC	Dimensions WxHxD	17.5mm x 100mm x 120mm 0.69" x 3.94" x 4.72"
Outputs per Module	8 (NPN)	Weight	210g (8.4 oz.)
Max Switching Power	2A @ 250 VAC 2A @ 30 VDC	Communication	Modbus/RTU (binary) RS-485 half duplex
Minimum Load	5 VDC, 10mA	Factory Default Communications Parameters	38400 baud, N, 8, 1, no h/s Default Modbus ID 1
Maximum Voltage	250VAC, 110 VDC	Supported Modbus Commands	1,2,3,4,5,6,8,15, 16
Required Power (Steady State)	45mA @ 24Vdc, typical		
Required Power (Inrush)	Negligible		
Isolation	2000Vac for 60 seconds (Input/Power & Input/Comms)		
CE & UL Compliance	See Compliance Table at http://www.heapg.com/Pages/TechSupport/ProductCert.html		



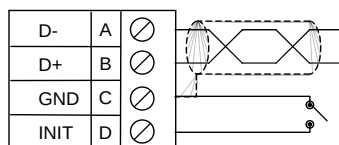
Dimensions in inches are 0.69"W x 3.95"H x 4.72"D
Note: Number of I/O terminal connections varies from model to model



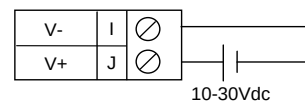
2 Wiring - I/O



Pin #	DIQ516	Pin #	DIQ516
1	COM+	9	OUT 6
2	COM-	10	OUT 7
3	OUT 0	11	INPUT 0
4	OUT 1	12	INPUT 1
5	OUT 2	13	INPUT 2
6	OUT 3	14	INPUT 3
7	OUT 4	15	COM
8	OUT 5	16	NC



Wiring RS-485



Wiring DC IN

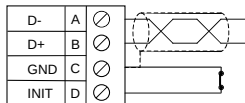
Notes:

Both ends of the RS-485 network should be terminated with a 100ohm, 1/4W, 1% resistor. Many OCS controllers feature dip switches or jumpers which enable appropriate termination if the OCS is located on a network end.

3 Init Default Setup

Communication parameters will be set to INIT default after performing the procedure:

1. Install jumper between INIT and GND terminals of the RS-485 port.
2. Apply power to Smartmod unit.
3. Read parameter words to see current parameters.
4. Write changes if necessary.



The INIT Default RS485 Settings Are:

Modbus ID = 1
Baud rate = 9600
Parity = None
Stop Bits = 1
Data Bits = 8
No handshake

Note: There are 2 types of default settings possible:

1. Factory default as described in section 1 (Specifications)
2. Default after INIT as described in section 3 (INIT Default Setup)

4 Configuration DATA

SmartMod Configuration settings are mapped into Modbus Register space. This configuration data may be modified with any Modbus/RTU Master device. For convenience, Horner APG has developed a variety of Cscape application files which allow an OCS to act as a SmartMod configuration device. Initial configuration of SmartMod module should be done on an individual basis, since all modules come from the factory with a default Modbus ID of 1. Once each module on the network has its own unique Modbus ID, further configuration adjustments can be made with the entire network powered.

All configuration parameters listed below are stored in EPROM. This means they should not be constantly rewritten.

Configuration Parameters – Registers 40001 through 40013				
Modbus Register	Description	Min	Max	Default
40001-40005	Reserved			
40006	Communications Parameters	See Table		38.4kbaud, N, 8, 1, RTU Mode
40007	Modbus ID	1	255	1
40008	Rx/Tx Delay (in 2mS steps)	0	255	0mS
40009	Input Coils	Not Configuration Data – See I/O Data		
40010	Output Coils			
40011	Coils			
40012	Power Up/Safe	See Table		0
40013	Watchdog Timer *in 0.5s steps)	0	255	10(5 sec)

Register 40006 (Communications Parameters) Bit Definition							
Bits 15 - 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Unused	Mode	Parity		Data Bits	Baud Rate		
	0 = ASCII Mode	Value 0	Meaning Mark	0 = 7 Data Bits	Value 0	Meaning 1200 baud	
		1	Even		1	2400 baud	
	1 = RTU Mode	2	Odd	1 = 8 Data Bits	2	4800 baud	
		3	Space		3	9600 baud	
					4	19200 baud	
					5-7	38400 baud	

NOTE:

Data bits number is ignored, in ASCII mode it is fixed at 7 and in RTU mode it is fixed to 8. In RTU mode the parity bit is ignored (parity is fixed at NONE).

5 Input/Output DATA

SmartMod Digital I/O data utilizes both Modbus Registers (40009-40011) and Coils (1-35). It is possible to access all data using Registers only, because the Coils data can be accessed through Registers.

The following tables lists all Modbus I/O data available.

Coils Table		
Coil	Description	Access
00001	Input #0	R
00002	Input #1	R
00003	Input #2	R
00004	Input #3	R
00005	Low Rise Latch #0	R/W
00006	Low Rise Latch #1	R/W
00007	Low Rise Latch #2	R/W
00008	Low Rise Latch #3	R/W
00009	High Rise Latch #0	R/W
00010	High Rise Latch #1	R/W
00011	High Rise Latch #2	R/W
00012	High Rise Latch #3	R/W
00013	Synchronism #0	R/W
00014	Synchronism #1	R/W
00015	Synchronism #2	R/W
00016	Synchronism #3	R/W
00017	Output #0	R/W
00018	Output #1	R/W
00019	Output #2	R/W
00020	Output #3	R/W
00021	Output #4	R/W
00022	Output #5	R/W
00023	Output #6	R/W
00024	Output #7	R/W
00033	Watchdog Enable	R/W
00034	Watchdog Event	R/W
00035	PowerUp Event	R/W

00005 / 00008 : DIGITAL INPUTS LOW RISE LATCH

Each coil is associated to a digital input and is forced to 1 when a low-rise event occurs (ON to OFF); this coil remains at 1 until it is cleared by writing or during a device reset.

00009 / 00012 : DIGITAL INPUTS HIGH RISE LATCH

Each coil is associated to a digital input and is forced to 1 when a high-rise event occurs (OFF to ON); this coil remains at 1 until it is cleared by writing or during a device reset.

00013 / 00016 : DIGITAL INPUTS SYNCHRONISM VALUE

When the device receives the Sync command (see Section 7), the actual input values in 00001 - 00004 coils are saved in these registers, channel by channel, to be read at a later time.

00017 / 00024 : DIGITAL OUTPUTS

These coils allow drive the output state (0 = OFF, 1 = ON). - In an alarm condition the outputs cannot be turned on.

- In a Watchdog alarm condition the outputs are forced to the specified value.

Register 40009 Definition (Mirror of Digital Inputs Coils)																
This register show digital inputs state (0 = OFF 1 = ON). The same values can be read by the coils table, of which this register is a mirror.																
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Description	Low Rise Latch				Input				Synch				High Rise Latch			
Channel	#3	#2	#1	#0	#3	#2	#1	#0	#3	#2	#1	#0	#3	#2	#1	#0
Coil	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

Register 40010 Definition (Mirror of Digital Output Coils)																
This register shows digital inputs state (0 = OFF, 1 = ON). The same values can be read by the coils table, of which this register is a mirror. These values are Read Only .																
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Channel	#7	#6	#5	#4	#3	#2	#1	#0	-	-	-	-	-	-	-	-
Coil	24	23	22	21	20	19	18	17	-	-	-	-	-	-	-	-

40011 : Mirror of Watchdog Coils

This register shows digital state of watchdog coils (0 = OFF, 1 = ON). These values are **Read/Write**.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Coil	-	-	-	-	-	35	34	33	-	-	-	-	-	-	-	-

40012 : POWERUP/SAFE VALUE

When the device is tuned-on (PowerUp) and in case of watchdog alarm (Safe), the outputs are automatically forced to the value specified in this register. Each bit corresponds to an output, as shown in the table.- Manufacturer default: 0

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Output	#7	#6	#5	#4	#3	#2	#1	#0	#7	#6	#5	#4	#3	#2	#1	#0
Value	PowerUp								Safe							

6 Watchdog

The module has been provided with a Host Watchdog timer which, when it is enabled, issues an alarm event each time the communication between the module and the host is inactive for a period time greater than the programmed one (40013).

When the alarm is activated, the values of the outputs are automatically converted to the preset safety values to avoid damage to the system in case of a fault occurring. Also, under the alarm condition the green LED on the front of the module blinks and the "Watchdog Event" coil is forced to 1. There is also a Module Watchdog timer that monitors the internal CPU work and activates when the CPU doesn't function correctly.

After the reset, all outputs will assume their initial default value ("power up value"), this may be different to the output value after the reset.

00033 : WATCHDOG ALARM ENABLE

Enables the WatchDog alarm. If the alarm is enabled and the device does not receive a command for a longer period than that specified in the 40013 register, the WatchDog alarm Event coil is forced to 1

0 = Watchdog alarm disabled

1 = Watchdog alarm enabled

00034 : WATCHDOG ALARM EVENT

This coil indicates the condition of WatchDog Alarm. If the alarm is enabled and the device does not receive any command for a time longer than the time specified in the 40013 register, this coil is forced to 1. To return from the alarm condition, set this coil to 0.

0 = Normal Condition

1 = Alarm Condition

00035 : POWER-UP EVENT

This coil is forced to 1 at each power-on of the device; this state indicates that the device has been switched off. It is possible to know if a reset of the device is happened clearing this coil and monitoring its state.

0 = reset not happened

1 = reset happened

7 Sync

The Sync function is performed by a command sent to all devices connected on the network. When the devices receive the Sync command, all Input states are saved in the relative register. Doing this, it is possible to read the value of all inputs at the Sync command time. To send the Sync command, write the value 10 in the "Test" register (40001) and send to node ID 255

NOTE: The sync values are not saved in EPROM.

8 LED Indicator

LED	COLOUR	STATE	DESCRIPTION
POWER	GREEN	ON	Device Powered
		OFF	Device Not Powered / Incorrect RS485 Cabling
		Fast Blink	Communication in progress/ (blink frequency depends on baud rate)
		1 Second Blink	Watch-dog Alarm Condition (See Section 6 above)

The LED is located on the front of the model.

9 Implemented Modbus Functions

Function	Code
01	Read multiple coils (0xxxx bank)
02	Read multiple coils (1xxxx bank)
03	Read multiple registers (4xxxx bank)
04	Read multiple registers (3xxxx bank)
05	Write single coil
06	Write single register
15	Write multiple coils
16	Write multiple registers
08	Diagnostic

For DIQ516 SmartMod modules, bank 0xxxx is a mirror of bank 1xxxx, as 3xxxx is a mirror of 4xxxx i.e. the first register can be read independently as 30001 (with the function 04) or 40001 (with the function 03)

10 Installation / safety

Warning: Remove power from the OCS controller, CAN port, and any peripheral equipment connected to this local system before adding or replacing this or any module.

- All applicable codes and standards should be followed in the installation of this product.
- Shielded, twisted-pair wiring should be used for best performance.
- Shields may be terminated at the module terminal strip.
- In severe applications, shields should be tied directly to the ground block within the panel.
- Use the following wire type or equivalent: Belden 8441.

For detailed installation and a [handy checklist](#) that covers panel box layout requirements and minimum clearances, refer to the hardware manual of the controller you are using.

When found on the product, the following symbols specify:



Warning: Electrical Shock Hazard.



Warning: Consult user documentation.

11 Technical support

Technical Support at the following locations:

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