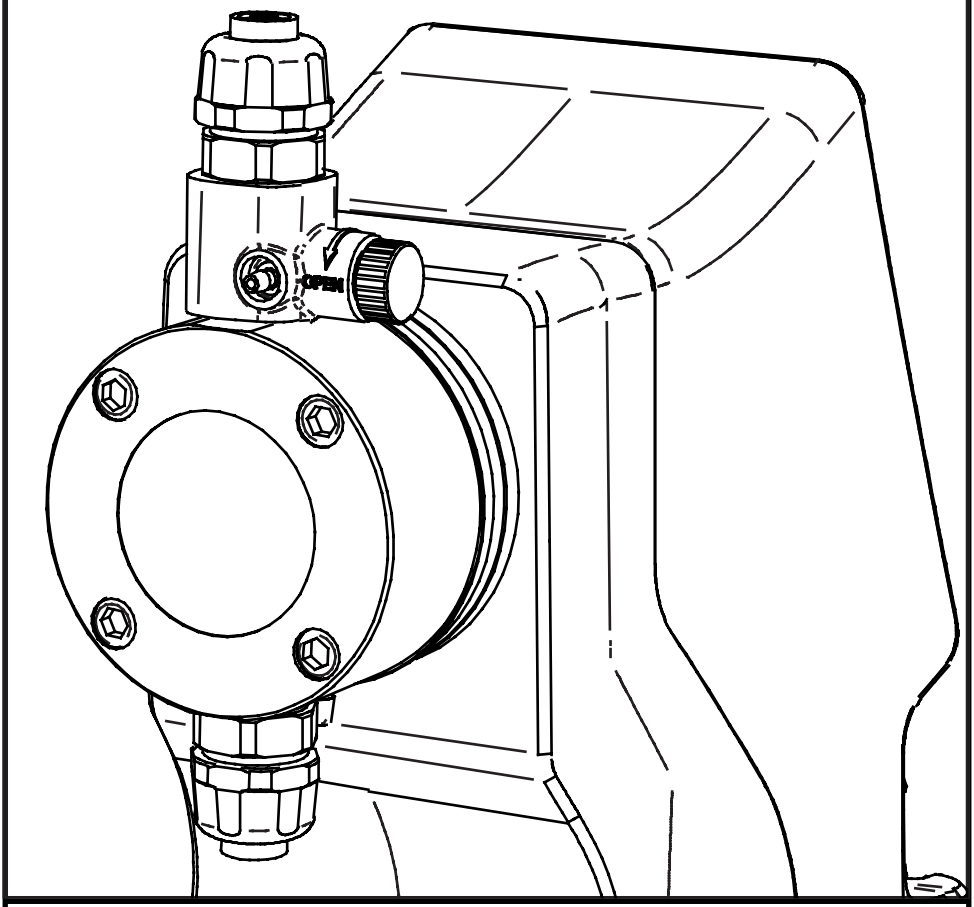
ITC

A **VERDER** COMPANY



DOSmart AC

MODBUS MANUAL

ENGLISH

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SAFETY RULES

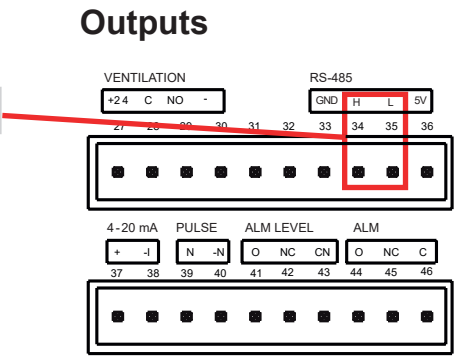
In order to avoid personal injury risks and environmental damage, and to ensure that the device works correctly, the personnel in charge of installing, operating and maintaining the device must follow the instructions given in this manual, paying particular attention to the recommendations and warning detailed in it. In addition, they must follow the specific instructions of use for the chemical products that they wish to dose.

This device must not be used by people (including children) with reduced physical, sensory or mental capacities or a lack of experience and knowledge, unless they do so under supervision or they are informed of the correct procedures. Children must not play with the device unsupervised.

1. HOOK-UP AND CONFIGURATION

Connections

Bus	RS-485
Communication/Wiring	Half-Duplex L(A) pin 35, H(B) pin 34
Protocol	Modbus RTU



Serial communication

	Default value	Value range
Modbus slave address	1	1-128
Bits per second (baud rate)	9600	1200/2400/4800/9600/19200
Number of bits	8	8
Parity	None	Even / Odd / Neither
Stop bits	1	1.2
Hardware control	No	-
Software control	No	-
Character timeout	20 ms	-
End of message timeout	100 ms	-

NB: If a RS232/RS485 converter or similar is required, make sure that the signal emitted does not produce an echo.

Supported modbus functions:

Read Input Registers	0x04
Write Single Register	0x06
Write Multiple Registers	0x10

NB: This version of the manual refers to pump firmware version **DOSmart v6.11.** For other versions, please contact **sat@itc.es.**

2. READ-ONLY VARIABLES

Supported functions: READ INPUT REGISTERS (0x04)

MODBUS ADDRESS	DESCRIPTION	NOTES
4500(0x1194)	Firmware version	B0: VERSION B1: SUBVERSION
4501(0x1195)	Hardware version	
4502(0x1196)	Serial number	
4503(0x1197)	Manufacture date	
4504(0x1198)	Pump speed in cycles/min.	
4505(0x1199)	Pump sub-status Operation mode / Interior menu / etc...	
4506(0x119A)	Alarm stoppage flag. It is used alongside 4511(0x119F) to find out whether the pump is on or off.	
4507(0x119B)	Pump alarms	0x01 → Level 1 0x02 → Level 2 0x04 → Flow 0x08 → Leakage 0x10 → Pressure
4508(0x119C)	Circuit alarms	0x01 -- > Short Circuit 0x02 -- > RESERVED 0x04 -- > OverTemp 0x08 -- > Voltage Range 0x10 -- > Motor Load 0x20 -- > Overload 0x40 -- > Temp Chip
4509(0x119D)	Pulse loss alarm (X/Y mode) Flow out of range alarm (Prop. %/ppm)	0 →ALARM OFF 1 →ALARM ON
4510(0x119E)	Screen lock	0 → Unlocked 1 → Locked
4511(0x119F)	On flag. It is used alongside 4506(0x119A) to find out whether the pump is on or off.	
4512(0x11A0)	RESERVED	RESERVED
4513(0x11A1)	RESERVED	RESERVED
4514(0x11A2)	RESERVED	RESERVED
4515(0x11A3)	Temperature (ºC)	
4516(0x11A4)	Supply voltage (V x 10)	
4517(0x11A5)	Filtered input value 0-4-20mA (mA x 100)	
4518(0x11A6)	HIGH flow rate input reader: Filtered (Hz)	MSB
4519(0x11A7)	HIGH flow rate input reader: Filtered (Hz)	LSB
4520(0x11A8)	LOW filtered flow meter (ms/pulse)	MSB
4521(0x11A9)	LOW filtered flow meter (ms/pulse)	LSB
4522(0x11AA)	Current accuracy in (BAR x 10) o (PSI x 1)	
4523(0x11AB)	Remote input status	0 == off 1 == on
4524(0x11AC)	XY pulses input status	0 == off 1 == on

MODBUS ADDRESS	DESCRIPTION	NOTES
4525(0x11AD)	FLOW pulses input status (flow meter)	0 == off 1 == on
4526(0x11AE)	4-20 output (mA x 10)	
4527(0x11AF)	LEVEL 2 relay output status	0 == off 1 == on
4528(0x11B0)	ALARM relay output status	0 == off 1 == on
4529(0x11B1)	TEMP relay output status	0 == off 1 == on
4530(0x11B2)	Remote input flag	
4531(0x11B3)	Calibration factor resulting from calibration and which applies to the nominal flow rate of the pump	
4532(0x11B4)	Corrected nominal flow rate with regulation and calibration factor (l/h or gph x 104)	MSB
4533(0x11B5)	Corrected nominal flow rate with regulation and calibration factor (l/h or gph x 104)	LSB
4534(0x11B6)	Cylinder volume (litres or gallons x 106)	MSB
4535(0x11B7)	Cylinder volume (litres or gallons x 106)	LSB
4536(0x11B8)	4-20 mA input value of pressure sensor (mA x 100)	
4537(0x11B9)	Reserved	
4538(0x11BA)	Calculated flow (m^3/h or gpm x 100)	MSB
4539(0x11BB)	Calculated flow (m^3/h or gpm x 100)	LSB
4540(0x11BC)	Recording counter in EEPROM	MSB
4541(0x11BD)	Recording counter in EEPROM	LSB
4542(0x11BE)	Total cycle counter	MSB
4543(0x11BF)	Total cycle counter	LSB
4544(0x11C0)	Operating time in hours	
4545(0x11C1)	Stoppage counter due to short circuit	
4546(0x11C2)	RESERVED	RESERVED
4547(0x11C3)	Stoppage counter due to Temperature	
4548(0x11C4)	Second counter until batch start	MSB
4549(0x11C5)	Second counter until batch start	LSB
4550(0x11C6)	Last cycle time (microseconds)	MSB
4551(0x11C7)	Last cycle time (microseconds)	LSB
4552(0x11C8)	Cycle counter until end of batch	MSB
4553(0x11C9)	Cycle counter until end of batch	LSB
4554(0x11CA)	Second counter until end of batch	MSB
4555(0x11CB)	Second counter until end of batch	LSB
4556(0x11CC)	Pump alarm memory	
4557(0x11CD)	Flow meter pulse counter	
4558(0x11CE)	Pump flow rate (l/h or gph x 104)	MSB
4559(0x11CF)	Pump flow rate (l/h or gph x 104)	LSB
4560(0x11D0)	Volume counter in proportional mode (litres or gallons x 106)	MSB
4561(0x11D1)	Volume counter in proportional mode (litres or gallons x 106)	LSB
4562(0x11D2)	Motor speed in (RPM x 103)	MSB
4563(0x11D3)	Motor speed in (RPM x 103)	LSB
4564(0x11D4)	Stoppage counter by voltage range	

MODBUS ADDRESS	DESCRIPTION	NOTES
4565(0x11D5)	Stoppage counter due to chip temperature	
4566(0x11D6)	Stoppage counter due to motor disconnection	
4567(0x11D7)	Stoppage counter due to short circuit	
4568(0x11D8)	Indicates whether the pump requires maintenance	0x01 -- > Oil 0x02 -- > Valves 0x04 -- > Collar 0x08 -- > Membrane 0x10 -- > Bellows
4569(0x11D9)	RESERVED	RESERVED
4570(0x11DA)	RESERVED	RESERVED
4571(0x11DB)	RESERVED	RESERVED
4572(0x11DC)	Cycles remaining to change valves	MSB
4573(0x11DD)	Cycles remaining to change valves	LSB
4574(0x11DE)	Cycles remaining to change membrane	MSB
4575(0x11DF)	Cycles remaining to change membrane	LSB
4576(0x11E0)	RESERVED	RESERVED
4577(0x11E1)	RESERVED	RESERVED
4578(0x11E2)	Cycles remaining to change bellows	MSB
4579(0x11E3)	Cycles remaining to change bellows	LSB

3. READ AND WRITE VARIABLES

Supported functions: READ INPUT REGISTERS (0x04), WRITE SINGLE REGISTER (0x06), WRITE MULTIPLE REGISTERS (0x10)

MODBUS ADDRESS	DESCRIPTION	BYTE ORDER
0001(0x0001)	Pump status - on/off	0 == off 1 == on
4684(0x124C)	Current flow rate (l/h or gph x 104)	MSB
4685(0x124D)	Current flow rate (l/h or gph x 104)	LSB
4686(0x124E)	Partial cycle counter	MSB
4687(0x124F)	Partial cycle counter	LSB
4688(0x1250)	RESERVED	RESERVED
4689(0x1251)	RESERVED	RESERVED
4690(0x1252)	RESERVED	RESERVED
4691(0x1253)	Permissible flow rate limit as % (% x100)	
4692(0x1254)	Maximum pump pressure (Bar x 10 or psi x 1)	
4693(0x1255)	Dosing profile	0-STANDARD 1-SLOW_SUCTION 1 2-SLOW_SUCTION 2
4694(0x1256)	RESERVED	RESERVED
4695(0x1257)	Flow rate units	0 = litres 1 = gallons
4696(0x1258)	Pressure units	0 = Bar 1 = psi
4697(0x1259)	Units - %/ppm	0 = % 1 = ppm
4698(0x125A)	Flow meter type	0 = LOW (Counter) 1 = HIGH (Flow meter)
4699(0x125B)	Reserved	Reserved
4700(0x125C)	Flow meter K factor Counter: (l/pulse or g/pulse x 100) Flow meter: (pulses/l or pulses/g x 100)	MSB
4701(0x125D)	Flow meter K factor Counter: (l/pulse or g/pulse x 100) Flow meter: (pulses/l or pulses/g x 100)	LSB
4702(0x125E)	Time without pulses for Low flow meter (counter) to be zero (seconds)	
4703(0x125F)	Pressure value at 4 mA (Bar x 10 or psi x 1)	
4704(0x1260)	Pressure value at 20 mA (Bar x 10 or psi x 1)	
4705(0x1261)	Number of pump cycles with no pulses in flow meter to activate alarm	
4706(0x1262)	RESERVED	RESERVED
4707(0x1263)	Output pulses per volume unit	
(pulses/litre or pulses/ gallon x 100)		
4708(0x1264)	% of pump corresponding to 4 mA at output	
4709(0x1265)	% of pump corresponding to 20mA at output	
4710(0x1266)	Level 1 and Level 2 alarm programming	B0: Alarm Level1 B1: Alarm Level2 b0 = Alarm ON(1)/OFF(0) b1 = Relay ON(1)/OFF(0) b2 = Stop ON(1)/OFF(0)

MODBUS ADDRESS	DESCRIPTION	BYTE ORDER
4711(0x1267)	Flow detector and leakage alarm programming	B0: Flow alarm B1: Leakage alarm b0 = Alarm ON(1)/OFF(0) b1 = Relay ON(1)/OFF(0) b2 = Stop ON(1)/OFF(0)
4712(0x1268)	Excess pressure alarm programming	B0: OverPressure alarm b0 = Alarm ON(1)/OFF(0) b1 = Relay ON(1)/OFF(0) b2 = Stop ON(1)/OFF(0)
4713(0x1269)	Proportional mode	0: X/Y mode 1: %/ppm mode
4714(0x126A)	X (input pulses) of XY mode	
4715(0x126B)	Proportional XY memory limit (pulses)	
4716(0x126C)	Y cycles to complete in proportional XY mode	
4717(0x126D)	Flow rate benchmark as % in XY mode (% x 100)	
4718(0x126E)	%/ppm mode set-point (ppm or % x 100)	MSB
4719(0x126F)	%/ppm mode set-point (ppm or % x 100)	LSB
4720(0x1270)	% of pump in point 1 that corresponds to an input current defined in address 4733/0x127D in analogue mode (% x 100)	
4721(0x1271)	% of pump in point 2 that corresponds to an input current defined in address 4734/0x127E in analogue mode (% x 100)	
4722(0x1272)	RESERVED	RESERVED
4723(0x1273)	Batch start	0 = button 1 = external 2 = time
4724(0x1274)	Time configuration between batches (seconds)	MSB
4725(0x1275)	Time configuration between batches (seconds)	LSB
4726(0x1276)	Cycles or seconds in batch dose mode	MSB
4727(0x1277)	Cycles or seconds in batch dose mode	LSB
4728(0x1278)	Batch type	0 = cycles 1 = time
4729(0x1279)	Flow rate benchmark as % for batch dose mode (% x 100)	
4730(0x127A)	Indicates whether the pump must stop automatically in %/ppm proportional mode when it reaches a determined volume	0 = Does not stop 1 = Stops at volume
4731(0x127B)	Volume to dose in proportional mode for the pump to stop automatically (l or g x 10)	
4732(0x127C)	RESERVED	RESERVED
4733(0x127D)	Current corresponding to point 1 (address 4720/0x1270) for analogue mode (mA x 10)	
4734(0x127E)	Current corresponding to point 2 (address 4721/0x1271) for analogue mode (mA x 10)	
4735(0x127F)	Indicates if the 4-20 analogue output replicates the 4-20 input or if it represents a proportion of those defined in 4708(0x1264) and 4709(0x1265).	0 = Proportion 1 = Copies input
4736(0x1280)	Indicates if the pulse output acts as a pulse per litre counter (address 4707/0x1263) or if it replicates the pulse input of the flow meter/ counter.	0 = Proportion 1 = Copies input

MODBUS ADDRESS	DESCRIPTION	BYTE ORDER
4737(0x1281)	Indicates if the pump compensates the nominal flow rate with the pressure and if the pressure is assigned (address 4738/0x1282), or if it works with the pressure sensor	0 = Compensation deactivated 1 = Compensation with assigned pressure 2 = Compensation with pressure sensor
4738(0x1282)	Working pressure assigned for compensation of flow rate with pressure. (Bar x 10 or psi x 1)	
4739(0x1283)	Pressure at which the excess pressure alarm will activate, if enabled. (Bar x 10 or psi x 1)	

NB: We recommend reading and modifying variables that occupy two registers at the same time (reading/writing of two registers).

NB: You cannot change any variable if the pump is in operation, except for the flow rate benchmark in Manual mode → 4684(0x124C) and 4685(0x124D), and the set-point work point for %/ppm proportional mode → 4718(0x126E) and 4719(0x126F).

NB: Each time a parameter is modified, the pump configuration is written on the non-volatile memory. These must not be continuous as the memory can only be written on a limited number of times (between 1 and 4 million).

4. EXAMPLES

Reading one register READ INPUT REGISTERS (0x04)

Request

Slave ID	Function	Reg ADDR HI	Reg ADDR LO	Num Reg HI	Num Reg LO	CRC HI	CRC LO
0x01	0x04	0x11	0x94	0x00	0x01	0x75	0x1A

Response

Slave ID	Function	Byte Count	Value HI	Value LO	CRC HI	CRC LO
0x01	0x04	0x02	0x06	0x0B	0xFB	0x57

Query results:

Software version	Version 6.11

Reading multiple registers (Flow, Cycle Counter) READ INPUT REGISTERS (0x04)

Request

Slave ID	Function	Reg ADDR HI	Reg ADDR LO	Num Reg HI	Num Reg LO	CRC HI	CRC LO
0x01	0x04	0x12	0x4C	0x00	0x04	0x35	0x66

Response

Slave ID	Function	Byte Count	Value1 HI	Value1 LO	Value2 HI	Value2 LO	Value3 HI	Value3 LO
0x01	0x04	0x08	0x00	0x16	0xE3	0x60	0x00	0x00

Value4 HI	Value4 LO	CRC HI	CRC LO
0x05	0x5B	0x87	0x3C

Query results:

Current flow	0x0016E360 → 1500000 * 10-4 → 150.0000 (l/h or gph)
Cycle counter	0x0000055B → 1371 cycles

Writing one register WRITE SINGLE REGISTER (0x06)

Limit as % of flow rate	(0x1253) = 86.50% (0x21CA)

Request:

Slave ID	Function	Reg ADDR HI	Reg ADDR LO	Value HI	Value LO	CRC HI	CRC LO
0x01	0x06	0x12	0x53	0x21	0xCA	0xE4	0xA4

Response:

Slave ID	Function	Reg ADDR HI	Reg ADDR LO	Value HI	Value LO	CRC HI	CRC LO
0x01	0x06	0x12	0x53	0x21	0xCA	0xE4	0xA4

Writing multiple registers WRITE MULTIPLE REGISTERS (0x10)

Batch start (0x1273)	0x0002 = 2 (Time)
Time configuration between batches (seconds)	0x000000FA = 250 seconds
Cycles or seconds in batch dose mode	0x00000064 = 100 cycles
Batch type	0x0000 = 0 (cycles)
Flow rate benchmark as % for batch dose mode	0x1770 = 60.00%

Request:

Slave ID	Function	Reg ADDR HI	Reg ADDR LO	Num Reg HI	Num Reg LO	Byte Count	Value1 HI	Value1 LO
0x01	0x10	0x12	0x73	0x00	0x07	0x0E	0x00	0x02

Value2 HI	Value2 LO	Value3 HI	Value3 LO	Value4 HI	Value4 LO	Value5 HI	Value5 LO
0x00	0x00	0x00	0xFA	0x00	0x00	0x00	0x64

Value6 HI	Value6 LO	Value7 HI	Value7 LO	CRC HI	CRC LO
0x00	0x00	0x17	0x70	0x50	0xB1

Response:

Slave ID	Function	Reg ADDR HI	Reg ADDR LO	Num Reg HI	Num Reg LO	CRC HI	CRC LO
0x01	0x10	0x12	0x73	0x00	0x07	0x75	0x68

5. ERROR RESPONSE CODES

Error response frames					Error description
Slave ID	**Error**	**Exception**	**CRC HI**	**CRC LO**	Invalid function code.
0x01	0x84	0x01	0x82	0xC0	
Slave ID	**Error**	**Exception**	**CRC HI**	**CRC LO**	Reading error. The number of registers to read is invalid (max. 80 registers) or one of the registers is not permitted.
0x01	0x84	0x03	0x03	0x01	
Slave ID	**Error**	**Exception**	**CRC HI**	**CRC LO**	Error writing single register. Register not permitted.
0x01	0x86	0x02	0xC3	0xA1	
Slave ID	**Error**	**Exception**	**CRC HI**	**CRC LO**	Error writing single register. The variable limits are out of range or the pump is turned on.
0x01	0x86	0x04	0x43	0xA3	
Slave ID	**Error**	**Exception**	**CRC HI**	**CRC LO**	Error writing multiple registers. The number of registers to read is invalid (max. 60 registers) or one of the registers is not permitted.
0x01	0x90	0x03	0xC0	0x01	
Slave ID	**Error**	**Exception**	**CRC HI**	**CRC LO**	Error writing multiple registers. The variable limits are out of range or the pump is turned on.
0x01	0x90	0x04	0x4D	0xC3	

EU DECLARATION OF CONFORMITY

CE

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Declares that all models of the DOSmart AC products identified by serial numbers and manufacture years comply with the Machinery Directive 2006/42/EC, the Low Voltage Directive 2014/35/EU and the Electromagnetic Compatibility Directive 2014/30/EU, provided that the installation, use and maintenance are performed in accordance with current legislation and the indications given in the instruction manual.

Xavier Corbella
Manager

ITC GUARANTEE
DOSING PUMPS

I.T.C. S.L. guarantees the product specified in this document against all manufacturer or material faults for 1 year, provided that the device has been installed, used and maintained correctly.
The device must be sent free of charge to an accredited workshop or to I.T.C. S.L.'s technical service, and it will be returned to you, cash on delivery.
The warranty document bearing the purchase date and the stamp of the establishment where the device was purchased, or a photocopy of the purchase invoice, must be sent alongside the device.

MODEL _____

SERIAL NO. _____

Purchase date and stamp of the establishment where the device was purchased

DATE: _____

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