CR-TEC Engineering

Automated Valve Solutions

MODBUS-RTU

Field-Bus for electric actuator

Installation and Operation Manual

Index

Description

MODBUS-RTU is a serial fieldbus communication protocol to automate up to 247 electric actuators.

This protocol is non-proprietary and cheap to build. This one of the most used industrial fieldbuses because of its reliability.

Bus type	RS485
Protocol	MODBUS RTU, 16 bit CRC
Baud	9600
Data bits	8
Parity	none
Stop bit	1
Distance	1200 m
Maximum number of slave devices per line/segment	31
Total number of slave devices	247 with repeater
Address range	1-247 (0=broadcast)

Fonctions utilisables

03 (0x03) Read Holding Registers:
This function code is used to read the contents of a contiguous block of holding registers in a remote device.

06 (0x06) Write Single Register:
This function code is used to write a single holding register in a remote device.

16 (0x10) Write Multiple registers:
This function code is used to write a block of contiguous registers in a remote device.

23 (0x17) Read/Write Multiple registers:
This function code performs a combination of one read operation and one write operation in a single MODBUS transaction.
The write operation is performed before the read.
The read possible registers are addresses from @0 to @41 (decimal) - same as read 0x03 function
The write possible registers are addresses from @20 to @29 (decimal) – same as write 0x10 function

Broadcast

broadcast is address 0, frame is understood but NO RESPONSE of the slave. No exception generated on address 0.

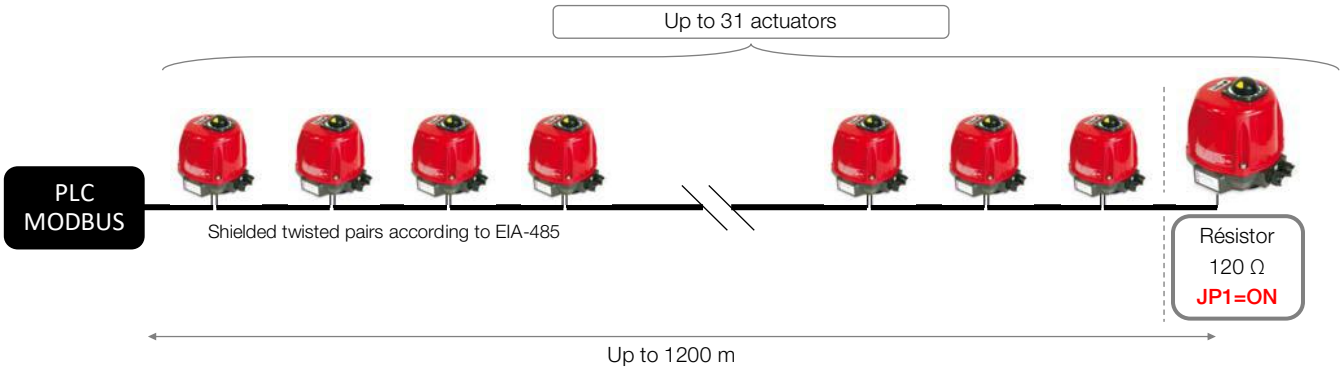
- **RS485 transfers are immune to electromagnetic noise and unwanted signal. However, it's mandatory to use only twisted pair with earth connected shield and within the constraints imposed by EIA-485 norm.**
- **The distance between MODBUS cables and others must be at least 20 cm.**

MODBUS-RTU network structure

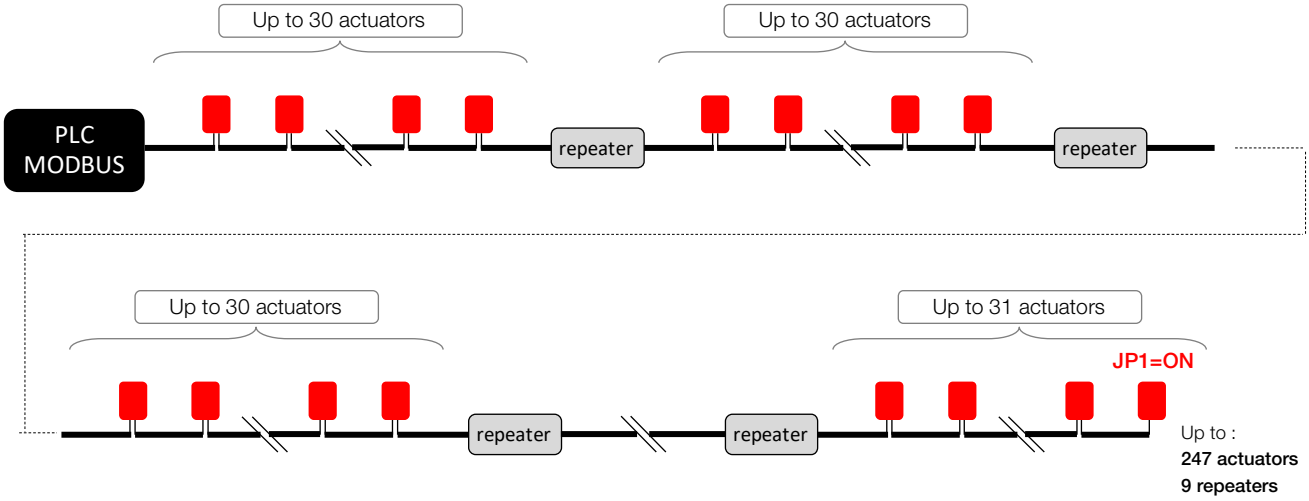
A RS485 line allows the association of a PLC (master node) to 31 devices (slave nodes) over a maximum of 1200 meters

MODBUS-RTU protocol provides addressing capacity for up to 247 Inputs, also, it's possible to use repeaters to connect several lines and automate up to 247 actuators over a greater distance.

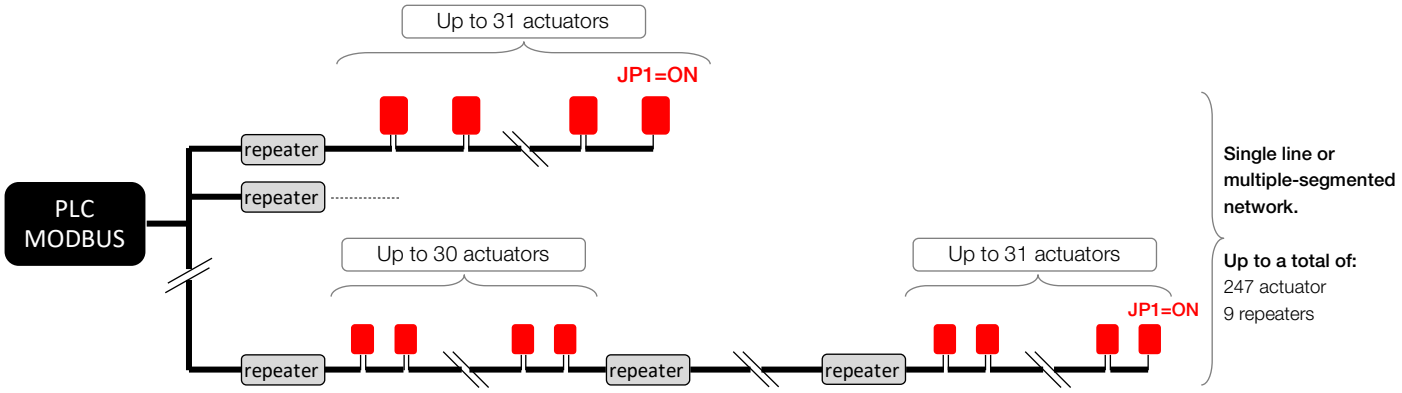
Single line network (one RS485 line)



Multiple-segmented network



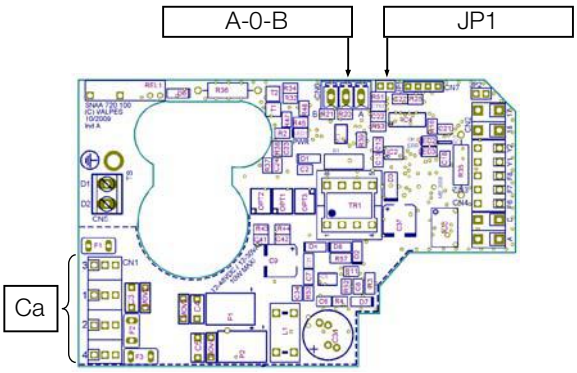
Multiple-segmented star network



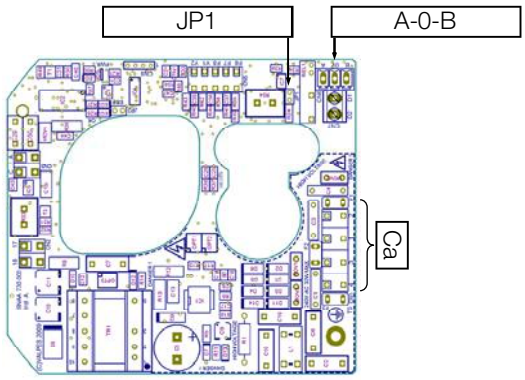
ER+, VR, VS, LT, DV, VRX and VSX models

Standard models (G00) and 3-position models

SNAA720000 & SNAA720100



SNAA730000 & SNAA730100



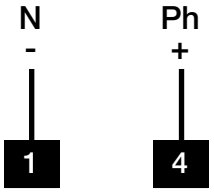
Rep.	Description
A-0-B	RS485 terminal (serial link) for MODBUS communication Use the supplied plug-in male connector Phoenix MC 1,5/3-ST-3,5 (3.5 mm, 3 ways, 8 A with screw tightening for wires from 16 to 28 AWG and 1.5 mm2 section).
JP1	Termination resistor jumper (Rt=120 Ω) for line last actuator
Ca	Electric power supply terminal

⚠ For further information, please refer to the actuator manuals

Electric connection

Connect the MODBUS communication wire on RS485 terminal (*0-A-B*).
Connect the power supply on the connector Ca

- 1 : neutral (50/60 Hz) or negative (DC)
- 4 : phase (50/60 Hz) or positive (DC)



Register table for models bought before 12/2021 (v.4.10)

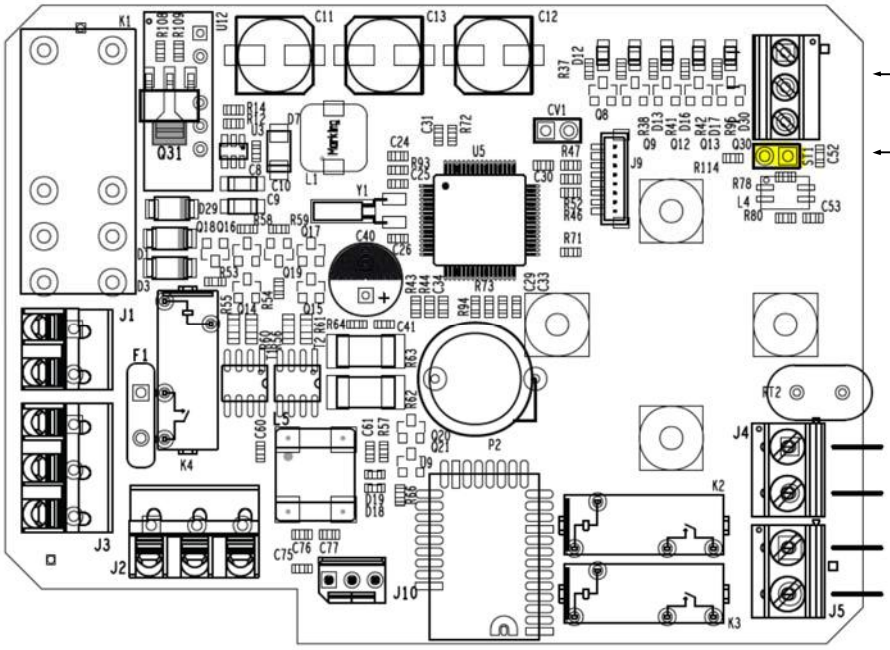
Register	Function	R/W	Bytes	Description	Minimum value	Default value	Maximum value
1	0x03	R	2	number of cycles	0	0	65535
2	0x03	R	2	Operating time (hours)	0	0	65535
3	0x03	R	2	Operating time (seconds)	0	0	3599
4	0x03	R	2	Software version	0	400	65535
5	0x03	R	2	EEPROM errors number	0	0	255
6	0x03	R	2	Detected defaults number (Intensity limitation + security temperature)	0	0	65535
7	0x03	R	2	Heating status (1=heating; 2=off; 0=non mesured)	0	2	2
10	0x03	R	2	Max recorded temperature	0		99
11	0x03	R	2	Min recorded temperature	-20		99
12	0x03	R	2	Actuator temperature	-20		99
13	0x03	R	2	Position (“OPEN”= 258 ; “OPENING”= 512 ; “CLOSE”= 260 ; “CLOSING”= 1024 ; “STOP”= 256 ; “INTER”= 257)			
14	0x03	R	2	Type of fault (No fault = 0 ; Over-torque = 1 ; Temperature too high = 2)	0	0	2
28	0x03/0x10	R/W	2	Actuator adress The addresses from 248 to 254 are not available. The address 255 is available but allowes neither action nor response.	1	247	255
35	0x03/0x06	R/W	2	Actuator operation : STOP (0) ; OPEN (1) ; CLOSE (2)	0	0	2
36	0x03/0x06	R/W	2	INTER position command (“INTER”= 1) **For GF3 models only**	0	0	1

Register table for models bought after 12/2021 (v.5.40)

Register	Function	R/W	Bytes	Description	Minimum value	Default value	Maximum value
1	0x03	R	2	Software version	0	500	65535
7	0x03	R	2	Heating status (heating = 1 ; off = 2 ; not measured = 0)	0	2	2
9	0x03 / 0x10	R/W	2	Modbus Adress	1	247	247
12	0x03	R	2	Start ramp (unit : 0,01s)	0	50	255
21	0x03	R	2	Overtorque detection delay (unit : 0,01s)	0	100	255
22	0x03	R	2	Torque limit. (%)	10		100
27	0x03	R	2	Gear unlock (unit : 0,01s)	0	100	255
30	0x03	R	2	Safety temperature (steps of 5°C ; starting 40°C to ending 100°C ; default = 100°C)	0	12	12
33	0x03	R	2	Regulation temperature (steps of 5°C starting 10°C to ending 40°C ; default = 20°C)	0	2	6
34	0x03	R	2	Min. temperature (°C)	-20		99
35	0x03	R	2	Max. temperature (°C)	0		99
36	0x03	R	2	Temperature (°C)	-20		99
101	0x06	W	2	Command (“OPEN”= 1 ; “CLOSE”= 2 ; “STOP”= 4)	0		4
103	0x03	R	2	Position (“OPEN”= 1 ; “OPENING”= 17 ; “CLOSE”= 2 ; “CLOSING”= 18 ; “STOP”= 4 ; “INTER”= 3)	1		18
105	0x06	W	2	INTER position command (“WIRE CONTROL”= 0 ; “INTER”= 1) **For GF3 models only**	0	0	1
106	0x03	R	2	Type of fault (No fault = 0 ; Over-torque = 1 ; Temperature too high = 2)	0	0	2
120	0x03	R	2	Nb. of cycles	0	0	65535
121	0x03	R	2	Nb. of EEPROM faults	0	0	255
122	0x03	R	2	Nb. of faults	0	0	65535
124	0x03	R	2	Operating time (hours)	0	0	65535
126	0x03	R	2	Operating time (seconds)	0	0	3599

BBPR (GS6) and 3-POSITION-BBPR (GFS) models

SNBA130000 & SNBA140000



RS485 terminal (serial link) for MODBUS-RTU communication

Terminating resistor activation jumper (ST1).
If there's no jumper on the board (previous version), it is necessary to connect a terminating resistor of 120 Ω between terminals A and B.

To be controled, the actuator must be in manual mode

For further information, please refer to the actuator manuals

Electric connection

Connect the MODBUS communication wire on the RS485 terminal of the BBPR board (0-A-B)
Connect the power supply on the terminal Ca of the main board (see page 16).

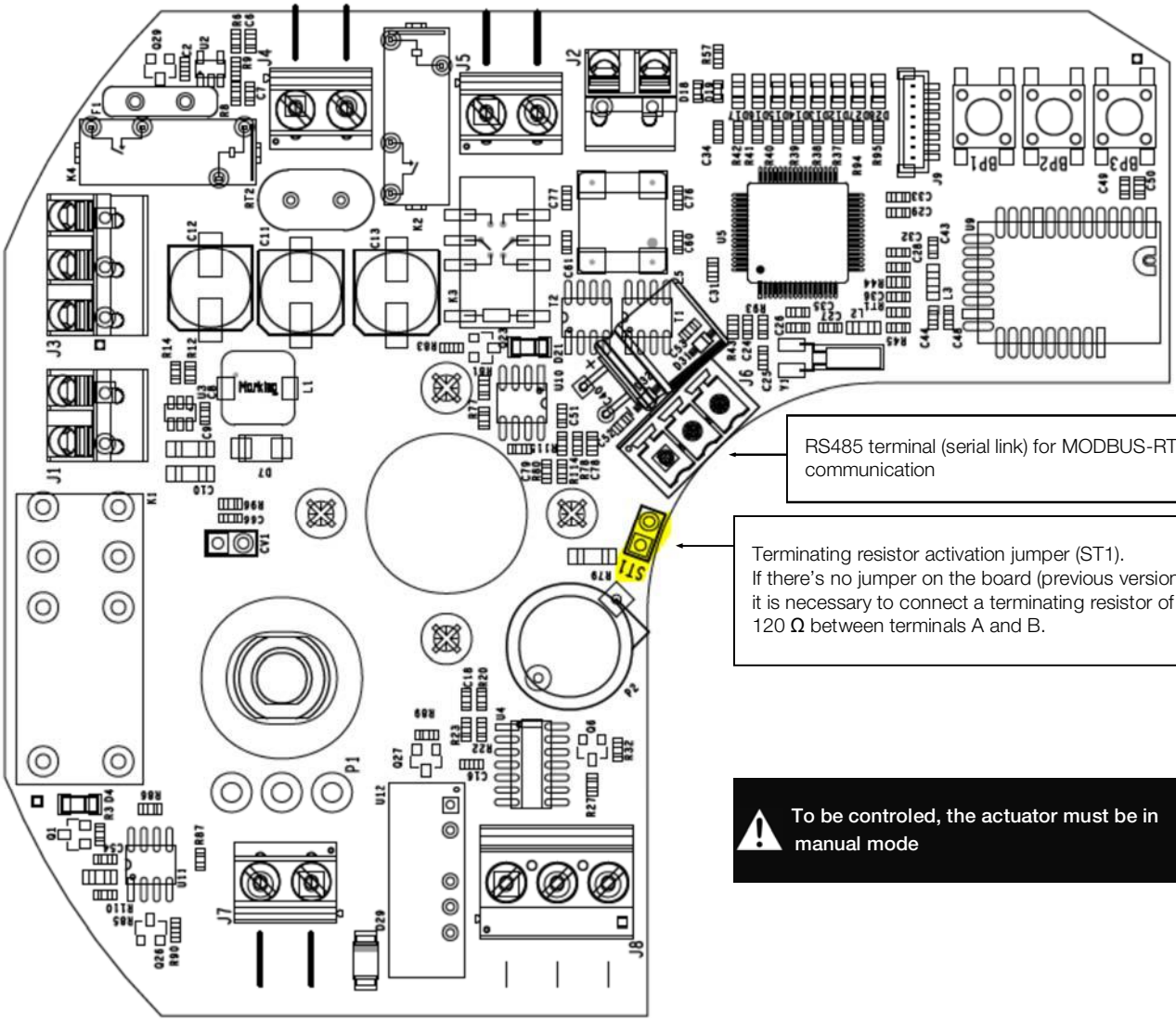
- 1 : neutral (50/60 Hz) or negative (DC)
- 3 : phase (50/60 Hz) or positive (DC)

Register table

Register	Function	R/W	Bytes	Description	Minimum value	Default value	Maximum value
1	0x03	R	2	Software version	0	0	65535
9	0x03 / 0x10	R/W	2	Modbus Adress	1	247	247
12	0x03	R	2	Start ramp (unit : 0,1 s)	0	5	20
21	0x03	R	2	Overtorque detection delay (unit : 0,1 s)	0	10	20
22	0x03	R	2	Torque limit. (%)	10		100
27	0x03	R	2	Gear unlock (unit : 0,1 s)	0	10	20
30	0x03	R	2	Safety temperature (°C)	40	70	150
34	0x03	R	2	Min. temperature (°C)	-20		127
35	0x03	R	2	Max. temperature (°C)	0		150
36	0x03	R	2	Temperature (unit : 0,1 °C)	-200		1270
41	0x03 / 0x10	R/W	2	Wiring type (“standard”= 1 ; “4 wires”= 2)	1	1	2
42	0x03 / 0x10	R/W	2	Safety position (“Open”= 1 ; “Inactive”= 4 ; “Close”= 2)	1	2	4
90	0x03	R	2	BBPR status (“Not Available”= 0 ; “Available”=1)	0	1	1
91	0x03	R	2	Battery charge (“HS”= 1 ; “En charge”= 2 ; “3 et 4”= Chargée)	1		4
92	0x03	R	2	Failure report (“Not active”= 0 ; “Active”=1)	0	0	1
100	0x03 / 0x06	R/W	2	Current mode (“MANUAL”= 1 ; “Prog.”= 4 ; “Wire control”= 8 ; “BBPR”= 64)	1	8	64
101	0x06	W	2	Command (“OPEN”= 1 ; “CLOSE”= 2 ; “INTER”= 3 ; “STOP”= 4)	1		4
102	0x03	R	2	Position (“OPENING”= 7 ; “CLOSING”= 8 ; “STOP”= 4 ; “OVERTORQUE”= 10)	4		10
103	0x03	R	2	Position (“OPEN”= 1 ; “OPENING”= 17 ; “CLOSE”= 2 ; “CLOSING”= 18 ; “STOP”= 4 ; “INTER”= 3 ; “OVERTORQUE”= 16)	1		18
120	0x03	R	2	Nb. of cycles	0	0	65535
122	0x03	R	2	Nb. of faults	0	0	65535
123	0x03	R	2	Number of power failure	0	0	65535
124	0x03	R	2	Operating time (hours)	0		65535
125	0x03	R	2	Operating time (minutes)	0		59
126	0x03	R	2	Operating time (seconds)	0		59

POSI (GP8) and POSI-BBPR (GPS) models

SNBA150000



For further information, please refer to the actuator manuals

Electric connection

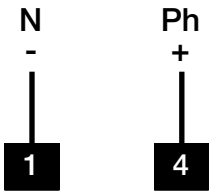
Connect the MODBUS communication wire on the RS485 terminal of the GPS board (0-A-B)
Connect the power supply on the terminal Ca of the main board (see p. 16).

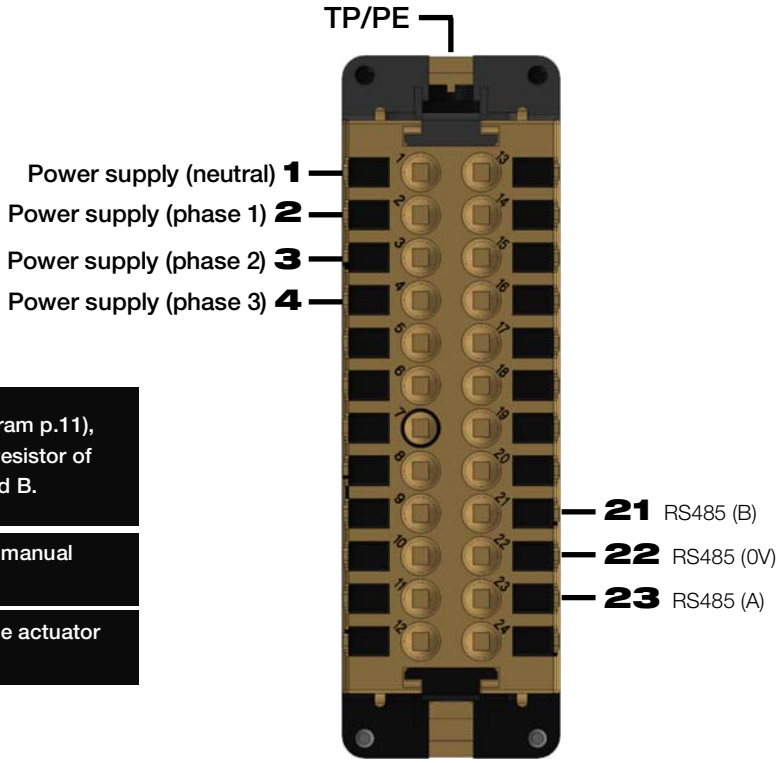
- 1 : neutral (50/60 Hz) or negative (DC)
- 3 : phase (50/60 Hz) or positive (DC)

Register table

Register	Function	R/W	Bytes	Description	Minimum value	Default value	Maximum value
1	0x03	R	2	Software version	0	0	65535
9	0x03 / 0x10	R/W	2	Modbus Adress	1	247	247
12	0x03	R	2	Start ramp (unit : 0,1s)	0	5	20
21	0x03	R	2	Overtorque detection delay (unit : 0,1s)	0	10	20
22	0x03	R	2	Torque limit. (%)	10		100
27	0x03	R	2	Gear unlock (unit : 0,1 s)	0	10	20
30	0x03	R	2	Safety temperature (°C)	40	70	150
34	0x03	R	2	Min. temperature (°C)	-20		127
35	0x03	R	2	Max. temperature (°C)	0		150
36	0x03	R	2	Temperature (unit : 0,1 °C)	-200		1270
42	0x03 / 0x10	R/W	2	Safety position (“Open”= 1 ; “Inactive”= 4 ; “Close”= 2) **For GPS models only**	1	2	4
50	0x03 / 0x10	R/W	2	Setpoint signal (“0_10 V”= 1 ; “4_20 mA”= 2)	1	2	2
51	0x03 / 0x10	R/W	2	Polarity setpoint signal (“Normal”= 1 ; “Inverted”= 2)	1	1	2
60	0x03 / 0x10	R/W	2	Feedback signal (“0_10 V”= 1 ; “4_20 mA”= 2)	1	2	2
61	0x03 / 0x10	R/W	2	Polarity feedback signal (“Normal”= 1 ; “Inverted”= 2)	1	1	2
62	0x06	W	2	Setpoint (unit : 0,1 %) (Manual mode only)	0		1000
63	0x03	R	2	Setpoint feedback (unit : 0,1 %)	0		1000
90	0x03	R	2	BBPR status (“Not Available”= 0 ; “Available”=1) **For GPS models only**	0	1	1
91	0x03	R	2	Battery charge (“HS”= 1 ; “En charge”= 2 ; “3 et 4”= Chargée) **For GPS models only**	1		4
92	0x03	R	2	Failure report (“Not active”= 0 ; “Active”=1)	0	0	1
100	0x03 / 0x06	R/W	2	Current mode (“MANUAL”= POSI”= 2 ; “Prog.”= 4 ; “Learning”= 16 ; “BBPR”= 64)	1	2	64
102	0x03	R	2	Position (“OPENING”= 7 ; “CLOSING”= 8 ; “STOP”= 4 ; “OVERTORQUE”= 10)	4		10
103	0x03	R	2	Position (“OPEN”= 1 ; “OPENING”= 17 ; “CLOSE”= 2 ; “CLOSING”= 18 ; “STOP”= 4 ; “OVERTORQUE”= 16)	1		18
120	0x03	R	2	Nb. of cycles	0	0	65535
122	0x03	R	2	Nb. of faults	0	0	65535
123	0x03	R	2	Number of power failure **For GPS models only**	0	0	65535
124	0x03	R	2	Operating time (hours)	0		65535
125	0x03	R	2	Operating time (minutes)	0		59
126	0x03	R	2	Operating time (seconds)	0		59

VT PLUS and MT models (all versions)





⚠ For the last actuator of the line (see diagram p.11), it is necessary to connect a terminating resistor of 120 Ω (supplied) between terminals A and B.

⚠ To be controled, the actuator must be in manual mode

⚠ For further information, please refer to the actuator manuals

Electric connection

Connect the MODBUS communication wire on the terminals 21, 22 and 23.
Connect the power supply wire on the terminals 1 and 3

- 1 : neutral (50/60 Hz) or negative (DC)
- 4 : phase (50/60 Hz) or positive (DC)

Register table for models bought before 12/2021 (v.34)

Register	Function	R/W	Bytes	Description	Minimum value	Default value	Maximum value
1	0x03	R	2	Software version	0	0	65535
9	0x03 / 0x10	R/W	2	Modbus Adress	1	247	247
12	0x03	R	2	Start ramp (unit : 0,1s)	0	10	200
20	0x03	R	2	Setting motor nominal speed (tr/min)	1500		3600
21	0x03	R	2	Overtorque detection delay (unit : 0,1s)	0		200
22	0x03	R	2	Torque limit. (%)	10	100	100
23	0x03	R	2	Actuator torque (%)	0		100
24	0x03	R	2	Actuator torque peak (%)	0		100
26	0x03	R	2	Motor speed (tr/min)	0		9999
27	0x03	R	2	Gear unlock (unit : 0,1s)	0		50
29	0x03	R	2	Setting motor speed (%)	0		100
30	0x03	R	2	Safety temperature (°C)	40	100	150

Register	Function	R/W	Bytes	Description	Minimum value	Default value	Maximum value
33	0x03	R	2	Regulation temperature (°C)	10	20	50
34	0x03	R	2	Min. temperature (°C)	-20		127
35	0x03	R	2	Max. temperature (°C)	0		150
36	0x03	R	2	Temperature (unit : 0,1°C)	-200		1270
40	0x03	R	2	Type of actuator ("VT+_4POLES"= 17 ; "VT+_6POLES"= 18 ; "MT_4POLES"= 33 ; "MT_6POLES"= 34)	17		34
41	0x03 / 0x10	R/W	2	Wiring ("Standard"= 1 ; "4 wires"= 2)	1	1	2
42	0x03 / 0x10	R/W	2	Safety position ("Open"= 1 ; "Inactive"= 4 ; "Close"= 2) **GS6, GFS & GPS models only**	1	2	4
50	0x03 / 0x10	R/W	2	Setpoint signal ("0_10V"= 1 ; "4_20mA"= 2) **GP7 & GPS models only**	1	2	2
51	0x03 / 0x10	R/W	2	Polarity setpoint signal ("Normal"= 1 ; "Inverted"= 2) **GP7 & GPS models only**	1	1	2
60	0x03 / 0x10	R/W	2	Feedback signal ("0_10V"= 1 ; "4_20mA"= 2) **GP7 & GPS models only**	1	2	2
61	0x03 / 0x10	R/W	2	Polarity feedback signal ("Normal"= 1 ; "Inverted"= 2) **GP7 & GPS models only**	1	1	2
62	0x06	W	2	Setpoint (unit : 0,1%) **GP7 & GPS models only**	0		1000
63	0x03	R	2	Setpoint feedback (unit : 0,1%) **GP7 & GPS models only**	0		1000
90	0x03	R	2	BBPR status ("Not Available"= 0 ; "Available"=1) **GS6, GFS & GPS models only**	0	1	1
91	0x03	R	2	Battery charge ("HS"= 1 ; "En charge"= 2 ; "3 et 4"= Chargée) **GS6, GFS & GPS models only**	1		4
100	0x03 / 0x06	R/W	2	Current mode ("MANUAL"= 1 ; "POSI"= 2 ; "Prog."= 4 ; "Wire control"= 8 ; "Learning"= 16 ; "BBPR"= 64)	1	8	64
101	0x06	W	2	Command ("OPEN"= 1 ; "CLOSE"= 2 ; "INTER"= 3 ; "STOP"= 4)	1		4
102	0x03	R	2	Position ("OPENING"= 0 ; "CLOSING"= 1 ; "STOP"= 2 ; "OVERTORQUE"= 3)	0		3
103	0x03	R	2	Position ("OPEN"= 1 ; "CLOSE"= 2 ; "STOP"= 4 ; "INTER"= 3 ; "OPEN -> INTER"= 5 ; "CLOSE -> INTER"= 6 ; "OVERTORQUE"= 16)	1		18
120	0x03	R	2	Nb. of cycles	0	0	65535
122	0x03	R	2	Nb. of faults	0	0	65535
123	0x03	R	2	Number of power failure **GS6, GFS & GPS models only**	0	0	65535
124	0x03	R	2	Operating time (hours)	0		65535
125	0x03	R	2	Operating time (minutes)	0		59
126	0x03	R	2	Operating time (seconds)	0		59

Register table for models bought after 12/2021 (v.35)

Register	Function	R/W	Bytes	Description	Minimum value	Default value	Maxi-mum value
1	0x03	R	2	Software version	0	0	65535
9	0x03 / 0x10	R/W	2	Modbus Adress	1	247	247
12	0x03	R	2	Start ramp *(unit : 0,1s)*	0	10	200
20	0x03	R	2	Setting motor nominal speed *(tr/min)*	1500		3600
21	0x03	R	2	Overtorque detection delay *(unit : 0,1s)*	0		200
22	0x03	R	2	Torque limit. *(%)*	10	100	100
23	0x03	R	2	Actuator torque *(%)*	0		100
24	0x03	R	2	Actuator torque peak *(%)*	0		100
26	0x03	R	2	Motor speed *(tr/min)*	0		9999
27	0x03	R	2	Gear unlock *(unit : 0,1s)*	0		50
29	0x03	R	2	Setting motor speed *(%)*	0		100
30	0x03	R	2	Safety temperature *(°C)*	40	100	150
33	0x03	R	2	Regulation temperature *(°C)*	10	20	50
34	0x03	R	2	Min. temperature *(°C)*	-20		127
35	0x03	R	2	Max. temperature *(°C)*	0		150
36	0x03	R	2	Temperature *(unit : 0,1°C)*	-200		1270
40	0x03	R	2	Type of actuator *("VT+_4POLES"= 17 ; "VT+_6POLES"= 18 ; "MT_4POLES"= 33 ; "MT_6POLES"= 34)*	17		34
41	0x03 / 0x10	R/W	2	Wiring *("Standard"= 1 ; "4 wires"= 2)*	1	1	2
42	0x03 / 0x10	R/W	2	Safety position ("Open"= 1 ; "Inactive"= 4 ; "Close"= 2) **GS6, GFS & GPS models only**	1	2	4
50	0x03 / 0x10	R/W	2	Setpoint signal ("0_10V"= 1 ; "4_20mA"= 2) **GP7 & GPS models only**	1	2	2
51	0x03 / 0x10	R/W	2	Polarity setpoint signal ("Normal"= 1 ; "Inverted"= 2) **GP7 & GPS models only**	1	1	2
60	0x03 / 0x10	R/W	2	Feedback signal ("0_10V"= 1 ; "4_20mA"= 2) **GP7 & GPS models only**	1	2	2
61	0x03 / 0x10	R/W	2	Polarity feedback signal ("Normal"= 1 ; "Inverted"= 2) **GP7 & GPS models only**	1	1	2
62	0x06	W	2	Setpoint (unit : 0,1%) **GP7 & GPS models only**	0		1000
63	0x03	R	2	Setpoint feedback (unit : 0,1%) **GP7 & GPS models only**	0		1000
90	0x03	R	2	BBPR status ("Not Available"= 0 ; "Available"=1) **GS6, GFS & GPS models only**	0	1	1
91	0x03	R	2	Battery charge ("HS"= 1 ; "En charge"= 2 ; "3 et 4"= Chargée) **GS6, GFS & GPS models only**	1		4
100	0x03 / 0x06	R/W	2	Current mode *("MANUAL"= 1 ; "POSI"= 2 ; "Prog."= 4 ; "Wire control"= 8 ; "Learning"= 16 ; "Failsafe"= 64)*	1	8	64
101	0x06	W	2	Command *("OPEN"= 1 ; "CLOSE"= 2 ; "INTER"= 3 ; "STOP"= 4)*	1		4
102	0x03	R	2	Position *("OPENING"= 7 ; "CLOSING"= 8 ; "STOP"= 4 ; "OVERTORQUE"= 10)*	4		10
103	0x03	R	2	Position *("OPEN"= 1 ; "CLOSE"= 2 ; "STOP"= 4 ; "INTER"= 3 ; "OPEN -> INTER"= 5 ; "CLOSE -> INTER"= 6 ; "OVERTORQUE"= 16)*	1		18
120	0x03	R	2	Nb. of cycles	0	0	65535
122	0x03	R	2	Nb. of faults	0	0	65535
123	0x03	R	2	Number of power failure **GS6, GFS & GPS models only**	0	0	65535
124	0x03	R	2	Operating time *(hours)*	0		65535
125	0x03	R	2	Operating time *(minutes)*	0		59
126	0x03	R	2	Operating time *(seconds)*	0		59

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