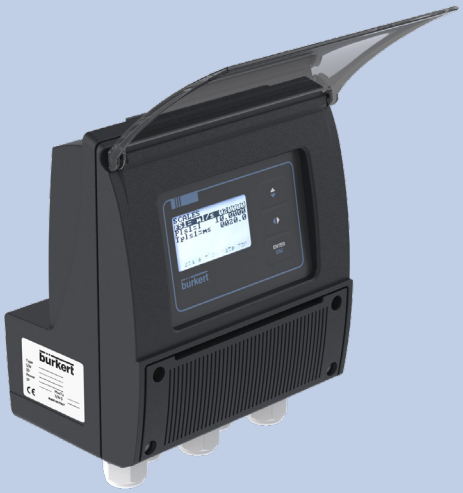
bürkert
FLUID CONTROL SYSTEMS

# Type SE58 L - SE58 M

MODBUS Protocol



CE

# Operating Instructions

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# SE58M - MODBUS PROTOCOL

**RS485 HARDWARE CONNECTION**
For the hardware connection see the relative section in this manual and MODBUS manual.

**Data word format**
The data bytes travelling in serial form on the communication line are enclosed in words which have a fixed length of 10 bits:
1 START BIT
8 DATA BITS = 1 DATA BYTE
1 STOP BIT
Each word contains one byte of data plus additional bits which serve to synchronies and make the communication safer. These extra bits added automatically in the transmission phase by the transmitter integrated circuit. In the reception phase, the reverse operation is executed by the receiver integrated circuit:
the eight data bits are extracted and the others eliminated. These operation are executed entirely on a hardware level.
The 8 data bits must be serialised staring from bit 0 (the least significant one).

**Communication speed**
The millennium series instruments have 4 communication speeds:
4800 bps
9600 bps
19200 bps
38400 bps

**Serial port settings**
Serial port setting:
Data bits: 8
Parity: Manu < 7-Comunication >, function - < Parity >
Stop bits: 1
Flow control: none (no control lines no xon/xoff characters used)

**General description**
All data are sent in group of 16 bits registers. The format used is BIG ENDIAN, MSB byte is sent first, LSB is sent last. When a variable is more than 16 bits in size, it uses two adjacent registers. The totalizer values are expressed as integer numbers. For the correct representation of the value in case there is a fractional part, the decimal dot must be placed in the position specified by the next variable register following the totalized value. All values relative to the flow rate are averaged. The number of samples that compose the average value varies depending on the measure sample rate and the MODBUS reading requests. Example: measure sample rate = 50 Hz, MODBUS reading frequency = 10 Hz, Number of samples used for average calculation = 50/10 = 5.

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## FUNCTION 04: READ PROCESS VARIABLE

| ADDRESS | SIZE | TYPE OF DATA | MEANING |
|---|---|---|---|
| 0000-0001 | 2 registers 32 bits | FLOAT | Full scale flow rate in the unit of measure chosen (as can be seen in the display of the instrument) |
| 0002-0003 | 2 registers 32 bit | FLOAT | Flow rate value in percentage |
| 0004-0005 | 2 registers 32 bits | FLOAT | Flow rate value in the unit of measure chosen |
| 0006-0007 | 2 registers 32 bits | FLOAT | Flow speed in the unit of measure chosen (m/s or ft/s) |
| 0008-0009 | 2 registers 32 bits | UNSIGNED LONG | Totalizer T+ value |
| 0010 | 1 register 8+8 bits | TWO BYTES | First byte (MSB): number of overflows recorded, second byte (LSB): number of decimal places |
| 0011-0012 | 2 registers 32 bits | UNSIGNED LONG | Totalizer P+ value |
| 0013 | 1 register 8+8 bits | TWO BYTES | First byte (MSB): number of overflows recorded, second byte (LSB): number of decimal places |
| 0014-0015 | 2 registers 32 bits | UNSIGNED LONG | Totalizer T- value |
| 0016 | 1 register 8+8 bits | TWO BYTES | First byte (MSB): number of overflows recorded, second byte (LSB): number of decimal places |
| 0017-0018 | 2 registers 32 bits | UNSIGNED LONG | Totalizer P- value |
| 0019 | 1 register 8+8 bits | TWO BYTES | First byte (MSB): number of overflows recorded, second byte (LSB): number of decimal places |
| 0020 | 1 register 8+8 bits | TWO BYTES | First byte (MSB): process flags 1, (LSB): process flags 2 |
| 0021 | 1 register 16 bits | UNSIGNED SHORT | Number of measure samples used for to calculate the latest read average value of flow rate |
| 0022 | 1 register 16 bits | UNSIGNED SHORT | Equivalent resistance measured between electrode E1 and the common point, in kilo ohm |
| 0023 | 1 register, 16 bits | UNSIGNED SHORT | Equivalent resistance measured between electrode E2 and the common point, in kilo ohm |
| 0024 | 1 register, 16 bits | SIGNED SHORT | Voltage measured between electrode E1 and the common point, in millVolts |
| 0025 | 1 register, 16 bits | SIGNED SHORT | Voltage measured between electrode E2 and the common point, in millVolts |
| 0026 | 1 register, 16 bits | UNSIGNED SHORT | Voltage measured at rechargeable terminals, in milliVolts |
| 0027 | 1 register, 16 bits | UNSIGNED SHORT | Residual battery capacity in percentage |
| 0028 | 1 register, 16 bits | SIGNED SHORT | CPU temperature in the unit of measure chosen |
| 0029 | 1 register, 16 bits | SIGNED SHORT | Board temperature T1 the unit of measure chosen |
| 0030 | 1 register, 16 bits | SIGNED SHORT | Board temperature T2 the unit of measure chosen |
| 0031 | 1 register, 16 bits | SIGNED SHORT | Flow sensor coil's temperature the unit of measure chosen |
| 0032-0033 | 2 register, 32 bits | UNSIGNED LONG | Latest sensor test result code |

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| | | | |
|---|---|---|---|
| 0034 | 1 register, 16 bits | UNSIGNED SHORT | Number of alarms currently active |
| 0035-0036 | 2 register, 32 bits | UNSIGNED LONG | Board's serial number |
| 0037 | 1 register, 16 bits | UNSIGNED SHORT | Flow rate unit and decimals |
| 0038 | 1 register, 16 bits | UNSIGNED SHORT | Totalizer T+ unit and decimals |
| 0039 | 1 register, 16 bits | UNSIGNED SHORT | Totalizer P+ unit and decimals |
| 0040 | 1 register, 16 bits | UNSIGNED SHORT | Totalizer T- unit and decimals |
| 0041 | 1 register, 16 bits | UNSIGNED SHORT | Totalizer P- unit and decimals |

**Meaning and value of the process flags 1 returned with the register 0020 (MSB):**

bit 7 (MSB): flow rate alarm MIN (flow rate below the minimum threshold set)
bit 6: flow rate alarm MAX (flow rate over the maximum threshold set)
bit 5: flow rate sign (1 = negative)
bit 4: flow rate below the cut-off value
bit 3: measure range active (0= range 1, 1= range 2)
bit 2: flow rate measure reset value status (1= measure is forcibly reset to zero)
bit 1: volume totalizers lock status (1= counters are locked)
bit 0 (LSB): internal use, no meaning

**Meaning and value of the process flags 2 returned with the register 0020 (LSB):**

bit 7 (MSB): flow rate overflow (value greater than full scale)
bit 6: pulse channel #2 overflow (frequency greater than maximum possible for the given parameters)
bit 5: pulse channel #1 overflow (frequency greater than maximum possible for the given parameters)
bit 4: measure signal amplitude out of A/D converter range
bit 3: measure signal amplitude out of amplifier capability
bit 2: input signal error (out of input chain capability)
bit 1: coils excitation error
bit 0: (LSB): pipe empty

**Meaning and value of the sensor test flags returned with the register 0032(MSW):**

bits 15-03 (MSB): reserved

| | |
|---|---|
| bit 02: | empty pipe |
| bit 01: | reference values not set |
| bit 0 (LSB) | excitation error |

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**Meaning and value of the sensor test flags returned with the register 0033 (LSW):**

bit 15 (MSB): resistance at electrode E2 is outside the limits respect to the reference value
bit 14 : resistance at electrode E1 is outside the limits respect to the reference value
bit 13: coil time B is outside the limits respect to the reference value
bit 12: coil time A is outside the limits respect to the reference value
bit 11: coil temperature is outside the limits respect to the reference value
bit 10: coil leakage current is outside the limit
bit 09: coil driver output 2 voltage is out of tolerance during test phase 3
bit 08: coil driver output 1 voltage is out of tolerance during test phase 3
bit 07: coil driver output 2 voltage is out of tolerance during test phase 2
bit 06: coil driver output 1 voltage is out of tolerance during test phase 2
bit 05: coil driver output 2 voltage is out of tolerance during test phase 1
bit 04: coil driver output 1 voltage is out of tolerance during test phase 1
bit 03: coil driver power generator voltage is out of tolerance during test phase 2
bit 02: coil driver power generator voltage is out of tolerance during test phase 1
bit 01: coil driver power generator value is out of tolerance during test phase 2
bit 00 (LSB): coil driver power generator value is out of tolerance during test phase 1

**Meaning and value of the unit of measures registers 0037, 0038, 0039, 0040, 0041:**

| | |
|---|---|
| bit 15 (MSB) | 0 = unit is metric, 1 = unit is imperial |
| bit 14 | 0 = volume unit, 1 = weight unit |
| bits 13-08 | index of unit of measure (unit kind depend on bits 14 and 15, see below) |
| bits 07-05 | reserved |
| bits 04-02 | decimal point position (number of digits after the decimal dot) |
| bits 01-00 (LSB) | time unit (for flow rate only): 0= day, 1=hour, 2=minute, 3=second |

**Index of metric volume units for flow rate, totalizers**

| | | |
|---|---|---|
| 00 | ml | (milliliter = 0.001 liter) |
| 01 | $cm^3$ | (cubic centimeter = 0.001 liter) |
| 02 | l | (liter) |
| 03 | $dm^3$ | (cubic decimeter = 1 liter) |
| 04 | dal | (decaliter = 10 liters) |
| 05 | hl | (hectoliter = 100 liters) |
| 06 | $m^3$ | (cubic meter = 1000 liters) |
| 07 | Ml | (Megaliter = 1000000 liters) |

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**Index of imperial volume units for flow rate, totalizers**

| | | |
|---|---|---|
| 00 | in3 | (cubic inches) |
| 01 | Gal | (US gallon) |
| 02 | IGL | (UK gallon) |
| 03 | ft3 | (cubic feet) |
| 04 | bbl | (standard barrel) |
| 05 | BBL | (oil barrel) |
| 06 | hf3 | (hundred cubic feet = 100 cubic feet) |
| 07 | KGL | (kilo-US gallon = 1000 US gallons) |
| 08 | IKG | (kilo-UK gallon = 1000 UK gallons) |
| 09 | kf3 | (kilo-cubic feet = 1000 cubic feet) |
| 10 | ttG | (ten-thousand US gallon = 10000 US gallons) |
| 11 | Aft | (acre feet) |
| 12 | MGL | (Mega-US gallon = 1000000 US gallons) |
| 13 | IMG | (Mega-UK gallon = 1000000 UK gallons) |

**Index of metric weight units for flow rate, totalizers**

| | | |
|---|---|---|
| 00 | g | (gram) |
| 01 | kg | (kilogram = 1000 grams) |
| 02 | t | (metric ton 0 1000000 grams) |

**Index of imperial weight units for flow rate, totalizers**

| | | |
|---|---|---|
| 00 | oz | (ounce = 1/16 lb) |
| 01 | lb | (pound) |
| 02 | ton | (short ton) |



## FUNCTION 05: ACTIVATE FUNCTIONS

| ADDRESS | SIZE | TYPE OF DATA | FUNCTION VALUE | MEANING |
|---|---|---|---|---|
| 0000 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | 0XFF00 (HEX) | Reset the enabled totalizers (same totalizer enabled for reset from digital input). |
| 0001 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | 0XFF00 (HEX) | enable or disable the sensor's excitation (toggle excitation status) |

## FUNCTION 08: DIAGNOSTICS

| SUB.-FUNCTION CODE | SIZE | TYPE OF DATA | FUNCTION / VALUE |
|---|---|---|---|
| 0000 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | RETURN QUERY DATA |
| 0001 | 1 REGISTER, 16 BITS | SIGNED SHORT | RESTART COMMUNICATION |
| 0004 | 1 REGISTER, 16 BITS | SIGNED SHORT | ACTIVATE LISTEN MODE |
| 0010 | 1 REGISTER, 16 BITS | SIGNED SHORT | CLEAR DIAGNOSTIC COUNTERS |
| 0011 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF TOTAL RECEIVED PACKETS |
| 0012 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF RECEIVED PACKETS WITH CRC ERROR |
| 0013 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF RECEIVED PACKETS WITH EXCEPTION ERROR |
| 0014 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF ADDRESSED OR BROADCAST RECEIVED PACKETS |
| 0015 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF BROADCAST RECEIVED PACKETS |
| 0016 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF RECEIVED PACKETS WITH NAK FLAG |
| 0017 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF RECEIVED PACKETS WITH BUSY FLAG |
| 0018 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF RECEIVED PACKETS WITH OVERRUN FLAG |

## FUNCTION 110: EXCHANGE MCP COMMANDS

This function permits to send MCP encapsulated commands into MODBUS packets.

Maximum allowed = 250 bytes of payload, data are NOT structured in 16-bit words as MODBUS standard, but 8-bits ascii characters strings instead.

See MCP manual for commands structure and syntax.

Reply to MCP commands sent must fit into 250 bytes packet size.

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# SE58 L - MODBUS PROTOCOL

## RS485 HARDWARE CONNECTION

For the hardware connection see the relative section in this manual and MODBUS manual.

## DATA WORD FORMAT

The data bytes send in serial form on the communication line are enclosed in words which have a fixed length of 10 bits:

1 START BIT
8 DATA BITS = 1 DATA BYTE
1 STOP BIT

Each word contains one byte of data plus additional bits which serve to synchronize and make the communication safer. These extra bits added automatically in the transmission phase by the transmitter integrated circuit. In the reception phase, the reverse operation is executed by the receiver integrated circuit:
the eight data bits are extracted and the others eliminated. These operation are executed entirely on a hardware level. The 8 data bits must be serialised staring from bit 0 (the least significant one).

## COMMUNICATION SPEED

The millennium series instruments have 4 communication speeds:
4800 bps
9600 bps
19200 bps
38400 bps

## SERIAL PORT SETTINGS

Serial port setting:
Data bits: 8
Parity: Manu < 7-Comunication >, function - < Parity >
Stop bits: 1
Flow control: none (no control lines no xon/xoff characters used)

## GENERAL DESCRIPTION

All data are sent in group of 16 bits registers. The format used is BIG ENDIAN, MSB byte is sent first, LSB is sent last. When a variable is more than 16 bits in size, it uses two adjacent registers. The totalizer values are expressed as integer numbers. For the correct representation of the value in case there is a fractional part, the decimal dot must be placed in the position specified by the next variable register following the totalized value. All values relative to the flow rate are averaged. The number of samples that compose the average value varies depending on the measure sample rate and the MODBUS reading requests. Example: measure sample rate = 50 Hz, MODBUS reading frequency = 10 Hz, Number of samples used for average calculation = 50/10 = 5.

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## FUNCTION 04: READ PROCESS VARIABLE

| ADDRESS | SIZE | TYPE OF DATA | MEANING |
|---|---|---|---|
| 0000-0001 | 2 registers 32 bits | FLOAT | Full scale flow rate in the unit of measure chosen (as can be seen in the display of the instrument) |
| 0002-0003 | 2 registers 32 bit | FLOAT | Flow rate value in percentage |
| 0004-0005 | 2 registers 32 bits | FLOAT | Flow rate value in the unit of measure chosen |
| 0006-0007 | 2 registers 32 bits | FLOAT | Flow speed in the unit of measure chosen (m/s or ft/s) |
| 0008-0009 | 2 registers 32 bits | UNSIGNED LONG | Totalizer T+ value |
| 0010 | 1 register 8+8 bits | TWO BYTES | First byte (MSB): number of overflows recorded, second byte (LSB): number of decimal places |
| 0011-0012 | 2 registers 32 bits | UNSIGNED LONG | Totalizer P+ value |
| 0013 | 1 register 8+8 bits | TWO BYTES | First byte (MSB): number of overflows recorded, second byte (LSB): number of decimal places |
| 0014-0015 | 2 registers 32 bits | UNSIGNED LONG | Totalizer T- value |
| 0016 | 1 register 8+8 bits | TWO BYTES | First byte (MSB): number of overflows recorded, second byte (LSB): number of decimal places |
| 0017-0018 | 2 registers 32 bits | UNSIGNED LONG | Totalizer P- value |
| 0019 | 1 register 8+8 bits | TWO BYTES | First byte (MSB): number of overflows recorded, second byte (LSB): number of decimal places |
| 0020 | 1 register 8+8 bits | TWO BYTES | First byte (MSB): process flags 1, (LSB): process flags 2 |
| 0021 | 1 register 16 bits | UNSIGNED SHORT | Number of measure samples used for to calculate the latest read average value of flow rate |
| 0022 | 1 register 16 bits | UNSIGNED SHORT | Equivalent resistance measured between electrode E1 and the common point, in kilo ohm |
| 0023 | 1 register, 16 bits | UNSIGNED SHORT | Equivalent resistance measured between electrode E2 and the common point, in kilo ohm |
| 0024 | 1 register, 16 bits | SIGNED SHORT | Voltage measured between electrode E1 and the common point, in millVolts |
| 0025 | 1 register, 16 bits | SIGNED SHORT | Voltage measured between electrode E2 and the common point, in millVolts |
| 0026 | 1 register, 16 bits | UNSIGNED SHORT | Voltage measured at rechargeable terminals, in milliVolts |
| 0027 | 1 register, 16 bits | UNSIGNED SHORT | Residual battery capacity in percentage |
| 0028 | 1 register, 16 bits | SIGNED SHORT | CPU temperature in the unit of measure chosen |
| 0029 | 1 register, 16 bits | SIGNED SHORT | Board temperature T1 the unit of measure chosen |

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| | | | |
|---|---|---|---|
| 0030 | 1 register, 16 bits | SIGNED SHORT | Board temperature T2 the unit of measure chosen |
| 0031 | 1 register, 16 bits | SIGNED SHORT | Flow sensor coil's temperature the unit of measure chosen |
| 0032-0033 | 2 register, 32 bits | UNSIGNED LONG | Latest sensor test result code |
| 0034 | 1 register, 16 bits | UNSIGNED SHORT | Number of alarms currently active |
| 0035-0036 | 2 register, 32 bits | UNSIGNED LONG | Board's serial number |
| 0037 | 1 register, 16 bits | UNSIGNED SHORT | Flow rate unit and decimals |
| 0038 | 1 register, 16 bits | UNSIGNED SHORT | Totalizer T+ unit and decimals |
| 0039 | 1 register, 16 bits | UNSIGNED SHORT | Totalizer P+ unit and decimals |
| 0040 | 1 register, 16 bits | UNSIGNED SHORT | Totalizer T- unit and decimals |
| 0041 | 1 register, 16 bits | UNSIGNED SHORT | Totalizer P- unit and decimals |
| 0042-0043 | 2 register, 32 bits | FLOAT | Batching volume preset quantity in the unit of measure chosen.<br>N.B: the registers returns a value only if batvhing is activated |
| 0044-0045 | 2 register, 32 bits | FLOAT | batching volume delivered quantity in the unit of measure chosen<br>N.B: the registers returns a value only if batvhing is activated |
| 0046 | 1 register, 16 bits | UNSIGNED SHORT | Batching volume unit and decimals<br>N.B: the register returns a value only if batvhing is activated |
| 0047 | 1 register 8+8 bits | TWO BYTES | Batching process flags<br>N.B: the register returns a value only if batvhing is activated |

**Meaning and value of the process flags 1 returned with the register 0020 (MSB):**

bit 7 (MSB): flow rate alarm MIN (flow rate below the minimum threshold set)
bit 6: flow rate alarm MAX (flow rate over the maximum threshold set)
bit 5: flow rate sign (1 = negative)
bit 4: flow rate below the cut-off value
bit 3: measure range active (0= range 1, 1= range 2)
bit 2: flow rate measure reset value status (1= measure is forcibly reset to zero)
bit 1: volume totalizers lock status (1= counters are locked)
bit 0 (LSB): internal use, no meaning

**Meaning and value of the process flags 2 returned with the register 0020 (LSB):**

bit 7 (MSB): flow rate overflow (value greater than full scale)
bit 6: pulse channel #2 overflow (frequency greater than maximum possible for the given parameters)
bit 5: pulse channel #1 overflow (frequency greater than maximum possible for the given parameters)
bit 4: measure signal amplitude out of A/D converter range
bit 3: measure signal amplitude out of amplifier capability
bit 2: input signal error (out of input chain capability)
bit 1: coils excitation error
bit 0 (LSB): pipe empty

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**Meaning and value of the process flags 2 returned with the register 0032 (MSW):**

| | |
|---|---|
| bits 15-03 (MSB): | reserved |
| bit 02: | empty pipe |
| bit 01: | reference values not set |
| bit 0 (LSB) | excitation error |

**Meaning and value of the sensor test flags returned with the register 0032(MSW):**

bit 15 (MSB): resistance at electrode E2 is outside the limits respect to the reference value
bit 14 : resistance at electrode E1 is outside the limits respect to the reference value
bit 13: coil time B is outside the limits respect to the reference value
bit 12: coil time A is outside the limits respect to the reference value
bit 11: coil temperature is outside the limits respect to the reference value
bit 10: coil leakage current is outside the limit
bit 09: coil driver output 2 voltage is out of tolerance during test phase 3
bit 08: coil driver output 1 voltage is out of tolerance during test phase 3
bit 07: coil driver output 2 voltage is out of tolerance during test phase 2
bit 06: coil driver output 1 voltage is out of tolerance during test phase 2
bit 05: coil driver output 2 voltage is out of tolerance during test phase 1
bit 04: coil driver output 1 voltage is out of tolerance during test phase 1
bit 03: coil driver power generator voltage is out of tolerance during test phase 2
bit 02: coil driver power generator voltage is out of tolerance during test phase 1
bit 01: coil driver power generator value is out of tolerance during test phase 2
bit 00 (LSB): coil driver power generator value is out of tolerance during test phase 1

**Meaning and value of the measure units registers 0037, 0038, 0039, 0040, 0041, 0046:**

| | |
|---|---|
| bit 15 (MSB) | 0 = unit is metric, 1 = unit is imperial |
| bit 14 | 0 = volume unit, 1 = weight unit |
| bits 13-08 | index of measure unit (unit kind depend on bits 14 and 15, see below) |
| bits 07-05 | reserved |
| bits 04-02 | decimal point position (number of digits after the decimal dot) |
| bits 01-00 (LSB) | time unit (for flow rate only): 0= day, 1=hour, 2=minute, 3=second |

**Index of metric volume units for flow rate, totalizers**

| | | |
|---|---|---|
| 00 | ml | (milliliter = 0.001 liter) |
| 01 | $cm^3$ | (cubic centimeter = 0.001 liter) |
| 02 | l | (liter) |
| 03 | $dm^3$ | (cubic decimeter = 1 liter) |
| 04 | dal | (decaliter = 10 liters) |
| 05 | hl | (hectoliter = 100 liters) |
| 06 | $m^3$ | (cubic meter = 1000 liters) |
| 07 | Ml | (Megaliter = 1000000 liters) |

**Index of imperial volume units for flow rate, totalizers and batching**

| | | |
|---|---|---|
| 00 | in3 | (cubic inches) |
| 01 | Gal | (US gallon) |
| 02 | IGL | (UK gallon) |
| 03 | ft3 | (cubic feet) |
| 04 | bbl | (standard barrel) |
| 05 | BBL | (oil barrel) |
| 06 | hf3 | (hundred cubic feet = 100 cubic feet) |
| 07 | KGL | (kilo-US gallon = 1000 US gallons) |
| 08 | IKG | (kilo-UK gallon = 1000 UK gallons) |
| 09 | kf3 | (kilo-cubic feet = 1000 cubic feet) |
| 10 | ttG | (ten-thousand US gallon = 10000 US gallons) |
| 11 | Aft | (acre feet) |
| 12 | MGL | (Mega-US gallon = 1000000 US gallons) |
| 13 | IMG | (Mega-UK gallon = 1000000 UK gallons) |

**Index of metric weight units for flow rate, totalizers**

| | | |
|---|---|---|
| 00 | g | (gram) |
| 01 | kg | (kilogram = 1000 grams) |
| 02 | t | (metric ton 0 1000000 grams) |

**Index of imperial weight units for flow rate, totalizers**

| | | |
|---|---|---|
| 00 | oz | (ounce = 1/16 lb) |
| 01 | lb | (pound) |
| 02 | ton | (short ton) |

**Meaning and value of the batching process flags returned with the register 0047 (MSB):**

| | |
|---|---|
| bit 7 (MSB) | batching status: 0 = inactive (valve closed), 1 = active (valve opened) |
| bit 6 | batching overflow error (delivered volume > 20% of set quantity) |
| bit 5 | batching timeout error (no delivered volume for more than 4s) |
| bits 4-0 (LSB) | reserved |

**Meaning and value of the batching process flags returned with the register 0047 (LSB):**

bits 7-0 reserved

## FUNCTION 05: ACTIVATE FUNCTIONS

| ADDRESS | SIZE | TYPE OF DATA | FUNCTION VALUE | MEANING |
|---|---|---|---|---|
| 0000 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | 0XFF00 (HEX) | Reset the enabled totalizers (same totalizer enabled for reset from digital input). |
| 0001 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | 0XFF00 (HEX) | Enable or disable the sensor's excitation (toggle excitation status) |
| 0002 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | 0XFF00 (HEX) | Start / stop the batching process (toggle the batching status) |

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## FUNCTION 08: DIAGNOSTICS

| ADDRESS | SIZE | TYPE OF DATA | FUNCTION / VALUE |
|---|---|---|---|
| 0000 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | RETURN QUERY DATA |
| 0001 | 1 REGISTER, 16 BITS | SIGNED SHORT | RESTART COMMUNICATION |
| 0004 | 1 REGISTER, 16 BITS | SIGNED SHORT | ACTIVATE LISTEN MODE |
| 0010 | 1 REGISTER, 16 BITS | SIGNED SHORT | CLEAR DIAGNOSTIC COUNTERS |
| 0011 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF TOTAL RECEIVED PACKETS |
| 0012 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF RECEIVED PACKETS WITH CRC ERROR |
| 0013 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF RECEIVED PACKETS WITH EXCEPTION ERROR |
| 0014 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF ADDRESSED OR BROADCAST RECEIVED PACKETS |
| 0015 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF BROADCAST RECEIVED PACKETS |
| 0016 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF RECEIVED PACKETS WITH NAK FLAG |
| 0017 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF RECEIVED PACKETS WITH BUSY FLAG |
| 0018 | 1 REGISTER, 16 BITS | UNSIGNED SHORT | NUMBER OF RECEIVED PACKETS WITH OVERRUN FLAG |

## FUNCTION 16: WRITE MULTIPLE REGISTERS

| ADDRESS | SIZE | TYPE OF DATA | FUNCTION / VALUE |
|---|---|---|---|
| 0000-0001 | 2 REGISTER, 32 BITS | FLOAT | BATCHING PRESET QUANTITY EXPRESSED IN THE CHOSEN UNIT OF MEASURE |
| 0002-0003 | 2 REGISTER, 32 BITS | FLOAT | BATCHING DELIVERED QUANTITY EXPRESSED IN THE CHOSEN UNIT OF MEASURE |

**NOTE:** registers 0000-0001 and 0002-0003 MUST be written in couples, 32 bits at time. Partial writes to a 16 bit register is NOT allowed.

## FUNCTION 110: EXCHANGE MCP COMMANDS

This function permits to send MCP encapsulated commands into MODBUS packets.

Maximum allowed = 250 bytes of payload, data are NOT structured in 16-bit words as MODBUS standard, but 8-bits ascii characters strings instead.

See MCP manual for commands structure and syntax.

Reply to MCP commands sent must fit into 250 bytes packet size.

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## MANUAL REVIEWS

| REVIEW | DATE | DESCRIPTION |
|---|---|---|
| MAN_MODBUS_EN_BU_R00 | 09/06/23 | First edition |

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At the end of its lifetime, this product shall be disposed of in full compliance with the environmental regulations of the state in which it is located.

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