## MD150E Instruction Manual



## Digital processing counter with display

for angle, velocity and distance measurement

P.P.H. WOBIT E. J OBER. s.c.

62-045 Pniewy, Dęborzyce 16
tel.(061) 2227 422, fax.(061) 2227439
e-mail: wobit@wobit.com.pl
www.wobit.com.pl

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## Thank you for selecting our product!

This instruction will help you at correct service and accurate exploitation of described device.

Information included in this instruction were prepared with high attention by our specialists and is description of the product without any responsibilities within the meaning of the commercial law. Based on the information should not be inferred a certain features or suitability for a particular application. This information does not release the user from the obligation of own judgment and verification. P.P.H. WObit E. J. Ober S.C. reserves the right to make changes without prior notice.

- Please read instructions below carefully and adhere to its recommendation
- Please pay special attention to the following characters:

CAUTION!
Not adhere to instruction can cause damage or impede the use of hardware or software.

## 1. Safety and assembly rules

## Safety rules

- Prior to first start-up of the device carefully read the manual.
- Prior to first start-up of the device make sure all cables are properly connected.
- Provide appropriate working conditions, in compliance with the device specifications (e.g.: power supply voltage, temperature, maximum current consumption).
- Prior to any modifications of cables connections, disconnect power supply voltage.
- Dismantling of the indicator housing during guarantee agreement period results in its invalidation


## Assembly recommendation

In the environments of unknown levels of interruptions it is recommended to use the following means preventing against possible interruptions of the device operation:

- Ground or zero the metal rails on which instruments are mounted.
- Do not power the device from the same lines as high power devices without appropriate network filters.
- Apply power supply, sensor and signal cables screening while screen grounding should be connected only on one side as close to the device as possible.
- Use communication cables (USB) equipped with filters in the form of ferrite beads.
- Avoid routing control (signal) cables in parallel with or in close vicinity of power and supply cables.
- Avoid close vicinity of devices generating high level of electromagnetic and/or pulse interference (high power loads, loads with phase or group power regulation).


## 2. Device description

### 2.1 Intended use and properties

MD150E is a multipurpose, programmable counter designed for counting pulses from incremental encoder or other sources of square wave signals. MD150E can define signal frequency and scale counted values into required unites (rpm, rps, mm, m, deg, etc.)

With two relay outputs the user is able to set thresholds as desired. MD150E is also equipped with additional input for resetting counter state. MD150E counter is very intuitive. Only one parameter is needed to scale number of counted pulses to required unit.

MD150E is equipped in USB and RS485 MODBUS interfaces. USB enables direct connection between processing unit and PC (record to csv file). RS485 interface with MODBUS-RTU protocol enables communication with industrial devices like PLC or HMI.

Housing made of full aluminum profile guarantees excellent mechanical resistance to harsh external conditions.

## MD150E features:

- Counting external pulses with frequency up to $\mathbf{2 M h z}$,
- Power supply $12 . . .36 \mathrm{~V}$ DC or 230 V AC (depends on version)
- Can cooperate with any incremental enkoder, linear magnetic enkoder, other sources of Step/direction signals etc.,
- Scale of counting pulses to any unites,
- Defining frequency of counted pulses,
- Possibility of recording counted pulses - reconstructing counter state after turning on the device,
- Setting status of relay outputs based on set thresholds,
- 4 operation modes of relay outputs + additional cycle counter - it allows use in dose application without additional controller,
- Data transmission to PC (USB) or master device e.g. HMI panel, PLC (RS485 MODBUS-RTU).


### 2.2 Description of connectors and front panel

| Front panel |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
|  |  |  |  | LED1 |  |



### 2.3 Power supply

MD150E counter is available in two versions of power supply - low voltage (12... 36 VDC ) and high voltage ( $85 . . .260 \mathrm{~V}$ AC) supplied directly from mains electricity $\sim 230 \mathrm{~V}$. For $\sim 230 \mathrm{~V}$ version on 13 (V+) clamp is available +15 V voltage, which can be used for supplying sensor.


## Caution!

For $\sim 230 \mathrm{~V}$ supply version, before any connections you should disconnect the device from main electricity.

### 2.4 Compatible devices

MD150E counter is designed for integration with optical encoders with square wave output. That transducers are available in wide range of resolutions, versions of electronics, with connector or cable. MD150E can be also integrate with magnetic linear encoders to measure linear displacement; with motor drivers which generates Step/Direction signal or to count pulses from inductive sensors etc.

Incremental encoders are designed for angle displacement measurement,
 which means measurement of angle, number of rotation and angle velocity. Using belt drive, cog wheel or friction wheel it is possible to measure linear displacement.

Encoder allow to define position by counting pulses. It also can recognize direction of movement due to phase shift of $A$ and $B$ channel (square wave signal).
Some encoders have C zero channel, which by each rotation indicates an absolute position. It can be used for designation of zero position.


## Linear magnetic encoders

This transducers are designed for direct measurement of linear displacement. Incremental length measuring system consisting of read head and magnetic tape. An example of sensor is GC-MK2 or GC-MK5 from WObit's offer.

## Proximity sensors, Area sensors

All sensors with output signal NPN or PNP can be connected directly to MD150E
 counter to count number of this signals. For example this sensors can be used for counting numbers of elements on a production line or for defining numbers of rotation/ velocity of measuring wheel.

## CLOCK/DIRECTION signals for controlling servomotors and stepper motor drivers

For controlling servomotors and stepper motor drivers often are used CLOCK/DIR signals. This signal can be connected directly to MD150E counter, then it can be used for direct indication of motor position/velocity.

### 2.5 Input signals - way of connection

MD150E counts pulses from two opt insulated $\mathbf{A}$ and $\mathbf{B}$ input channels + zeroing signal (RST). This signals can be given asymmetrically (input + or - connected to sensor's ground) as well as symmetrically (straight signal and negation + and - inputs simultaneously). Most of rotary and linear encoders give asymmetrical signal (differential) due to greater transmission resistance for industrial noise. Simple proximity sensors usually give straight signal (without negation).

Level of transducers input signal depend on electronic standard. The most popular is O.C. (voltage supply $+24 \mathrm{~V},+12$ or +5 V ). This standard can't be used for long distances with high signal frequency. At distances up to 100 m and high rotational velocity of transducer usually is used Line Driver standard (RS422). At this standard at transducer are available also $A$ and $B$ signal negations. Then should be used proper cable with correct impedance (signal send in pairs, e.g. A+/A-).

MD150E has fully opt insulated differential counter inputs, on which can be given signals in range $5 . .24 \mathrm{~V}$ (between „+" and ,,"" clamp). It can be integrated directly with most of sensors (supplied from +5 V as well as +24 V ).

Owing to input signal on opt-isolator is internally formed in square course with proper slope (for correct pulse identification). As pulse generator can be used almost any element with slow increasing
pulse like optical sensor or proximity sensor. In case of electromechanical pulse sources, the condition of correct operation is elimination of joint vibration effect, causing pulse multiplication. Way of connection external signals to MD150E counter depends on used sensor output type. Below are shown exemplary ways of connection.


Picture. 1 Connection of +5 V encoder with output RS422 type (Line driver).


Picture. 3 Connection of $+12 \mathrm{~V} . .+24 \mathrm{~V}$ encoder with output Open Collector (OC) or Push-Pull (PP) type.

Picture. 4 Connection of $+12 \mathrm{~V} . .+24 \mathrm{~V}$ encoder with output Push-Pull and Line Driver type.


Picture. 5 Connection of sensor with NPN output.

### 2.6 Counter indications - pulses / cycles / velocity

MD150E can display one of three measuring values:

- Value of pulses counter
- Value of cycle counter-value is preceded by $\mathbf{L}$
- Pulses frequency (velocity) - value is preceded by U

You can switch between next values apart from the MENU, using UP/DOWN buttons. There is an additional option to set default counter indications after its activation (MENU-> 11. DISP).

Value of pulses counter = counted pulses/calculator (DIV parameter) + offset (OFFS parameter) Value of cycle counter = pulses counter / P1 setting (only at 0 and 3 operation modes)

## 3. Menu description

### 3.1 MENU map

| 000000 |  | displaying of current measurement value |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | ntry | Change of displayed value: <br> - No sign: Pulses <br> - U sign: velocity <br> - L sign: cycles |  | (>3 sec.) Reset of pulses and cycles counter |
|  | $P 1$ | -> Menu |  |  |
| Next/previous parameter |  | parameter selection |  | Digit selection Change value Parameter edition |
| 1. | P1 | Setting control by relay | $\begin{aligned} & \frac{\sim}{\infty} \\ & \frac{\pi}{\otimes} \\ & \sim \sim \end{aligned}$ | $\pm 999999$ |
| 2. | P2 | Setting control by relay |  | $\pm 999999$ |
| 3. | PTIM | Time of relays activation (depends on PMOD) |  | 0... 999999 ms |
| 4. | PMOD | Relays operations mode |  | mode 0 / 1 / 2 / 3 / 4 |
| 5. | DIV | Pulses calculator (divider) into required unit |  | $\pm 9999.99$ |
| 6. | OFFS | Offset of initial counter value |  | $\pm 999999$ |
| 7. | IN | Signal input mode of counter |  | A-b / U-d/d-C |
| 8. | FILT | Filtration of input signals |  | on / oFF |
| 9. | DP | Number of decimals of the result |  | 0... 5 |
| 10. | SPD | Unit of velocity counter |  | 1.Sek / 2. Min /3. Hour |
| 11. | DISP | Default indications of the counter after its activation | $$ | PoS / SPEEd / CYCLE |
| 12. | MEM | Record of counter position |  | on / ofF |
| 13. | CLR | Counter zeroing mode |  | oFF / riS / FAL |
| 14. | RS1 | MODBUS address |  | 0-99 |
| 15. | RS2 | MODBUS baudrate |  | $\begin{gathered} 96000 / 19200 / 38400 \\ 57600 / 115200 \end{gathered}$ |
| 16. | BEP | Sound signal of buttons | $\begin{aligned} & \pm \\ & \stackrel{ \pm}{ \pm} \end{aligned}$ | On / ofF |
| 17. | LED | Brightness level of display |  | 0-9 |
| 18. | FAC | Restoring factory default settings |  |  |
| 19. | PAS | Password |  | X-0000 - non active |
| Menu exit/abortion |  | Parameter confirmation/abortion |  |  |

CAUTION: Appearing of blinking measured value on display preceded by $C$ means overfilling of result value (the result don't fit in 6 position display). To display older part of the result press ${ }_{\text {button }}$

### 3.2 Example of parameter change

After correct connection of external elements and switching power supply on MD150E counter is ready for operation with previously used settings, and in case of first operation - with factory settings.
In order to enter programming mode, press The display shows 1. P1, if the password is switched off or 0000 if it is active. In such case, in order to enter programming mode (at active password) enter the password and confirm it with the key

- With subsequent pressing of ${ }^{2}$ key you switch to next parameters and with pressing of key you return to previous parameters.
- At the selected parameter you want to change, press
- With key select display digit position you want to change and change its value with key. Confirm the entered value with key;
- Value of single digit parameters is selected with and keys;
- If you want to enter a negative value select the first digit (from the left) then press and hold key until the symbol "-" is displayed.
- With key you confirm the introduced change and with key you abort the change or exit the menu.

Prolonged pressing of $\qquad$ or
keys results in automatic increase/decrease of a given position/value.

## 4. Counter configuration

### 4.1 Inputs modes - Encoder / Up-Down / Step-Direction

Selection of input signal sources depends on application. User can use two differential input channels: $A+/ A-$ and $B+/ B-$ used for counting and RST signal for counter zeroing. One of three ways of signals interpretation is specified as Input mode parameter - 7. In, which enables setting modes presented below:

## A-B - encoder

A-B mode is designed for use with encoders, which generate signals on two channels shifted in phase. It enables to define direction of movement, and counting of all 4 slopes (square wave) allows to increase four times the real encoder resolution.


## U-D - up/down

At this mode pulses given on B channel increase counter value and given on A channel decrease counter value. You can't use this mode for encoders. This mode requires signals from two independent sources.


## D-C - Direction/Clock

d-C mode is specific to control of stepper motors and servo motors. B channel counts pulses, A channel switch counting direction. This mode is designed mostly for use with external devices or with sensors with mentioned above signals.



Picture. 6 Meaning of $A / B$ external signals in dependence on input mode (7. In parameter).

### 4.2 Calibration of counted pulses

5. DIV parameter allows conversion of received pulses into selected unit e.g. distance or rpm.

## Other parameters which influence on displayed value

6. OFFS - value offset causing adding for indication constant number value,
7. DP - allows to define number of decimals of displayed result. DP parameter also influence on range of 1. P1, 2. P2 and 6. OFFS parameters. If DP = 0, then P1, P2, OFFS settings can be changed only in an integer part in range from -99999 up to 999999 . When DP=4 parameters above could be changed in range from -99.9999 up to 99.9999.

### 4.3 Measurement of pulses frequency (velocity)

MD150E counter provides readout of counted pulses frequency, which allows e.g. to define rotational or linear speed of measured object with build-in sensor generating pulses. To provide correct velocity indication in set units (e.g.. in mm/sec., rpm./sec.) you should properly calibrate pulses according to Błąd! Nie można odnaleźć źródła odwołania. paragraph.

Furthermore 10. SPD parameter allows to define unit of displayed velocity in:

1. SEH -pulses / second (gate time $0,1 \mathrm{sec}$.)
2. nln - pulses / minute (gate time 1 sec .)
3. HoUr - pulses / hour (gate time 60 sec .)

## CAUTION!

During external zeroing of the counter (or counter operation mode with automatic zeroing), when zeroing occur more often than gate time of velocity measurement, the velocity won't be updated.

### 4.4 Filtration of input signals

8. FILT parameter provides activation of filtration for A, B counting signals and reset signal RST. Filtration prevents accidental counting of pulses (or counter reset by RST input) during operation in noise environment or while counting of pulses from irregular slopes.

|  | Filtration deactivated <br> OFF | FILT $=$ |
| :--- | :--- | :--- |
| Filtration activated $->$ FILT= ON |  |  |
| A/B Inputs | Inputs frequency. max. 2Mhz | Inputs frequency. max. 125Khz |
| RST Input | Resetting pulse $>1 \mathrm{mS}$ | Resetting pulse $>10 \mathrm{~ms}$ |

Table 1.Inputs parameters in dependence on set filtration.

### 4.5 Resetting of pulses and cycles counter

Reset by keyboard : Press and hold (ESC) button by 3 sec . On display appears Reset inscription.

Reset by external signal RST: State of pulses and cycles counter can be reset by signal given on resetting input RST. There is an additional possibility to set signal slope, on which should occur counter reset or blocking of external reset function. For this aim is designed 13. CLR parameter, which can take values listed below:

1. oFF - external reset turned off
2. rIS - reset on rising slope (signal change from 0 to $+5 . .+24 \mathrm{~V}$ )
3. FAL - reset on falling slope (signal change from $+5 . .+24 \mathrm{~V}$ to OV )

### 4.6 Record of counter state

MD150E provides saving of current pulse counter state which is accessible after next counter activation. For this purpose use 12. MEM parameter. When that parameter is set on "On" the current value of the counter will be saved before its turning off and will appear on display after next turning on.

## CAUTION!

Cycle counter state (L) is not saved.

### 4.7 Relay outputs and operation modes

MD150E counter has two relay outputs PK1 and PK2, which can be turned on/off in dependence on counter state and operation mode. For configuration relay outputs you can use parameters listed below:

1. P1 - P1 setting
2. P2 - P2 setting
3. PTIM - relay turn-on duration (in milliseconds)
4. PMOD - operation mode
CAUTION!
P1 and P2 settings can take negative values, but it is useful only in some cases (see -> operation
modes)

PMOD operation mode defines way of turning on/off of relay outputs, automatic counter reset at specified value and increasing of cycle counter. There are available operation modes listed below:
$>$ Mode 0 (nodE 0)-Cyclic mode with automatic reset

At this mode reset of the counter occur after reaching P1 setting. Each zeroing of the counter also causes increasing cycle counter (L). At the same time PK1 follows into active state for time specified by PTIM parameter, or for non defined time when PTIM $=0$.

If $\mathbf{P 1}>\mathbf{P 2}$ condition is fulfilled, $\mathbf{P K 2}$ output will be active in range of $\mathbf{P 1} \div \mathbf{P} 2$ indications. In other condition PK2 stayed off-line.


PK1 output activates PTIM time, while counter will exceed value of P1 setting. At the same time pulses counter is reset and cycle counter increases (L).
PK2 output will be activated when counter value will be located between P1 and P2 settings.

Mode 1 (nodE 1) - Absolute with two thresholds
Activation of PK1 and PK2 outputs occurs after reaching P1 and P2 values, which can be positive or negative.

## Mode 2 (nodE 2) - Absolute with thresholds and margin

At this mode $\mathbf{P K 1}$ output is active when counter value is in range $(\mathbf{P 2} \mathbf{- P 1}) \div(\mathbf{P 2}+\mathbf{P 1})$. If $\mathbf{P 2}<0, \mathbf{P K 2}$ output will be active after reaching P1 setting (positive or negative).

Mode 3 (nodE 3) - Cyclic with cycle counting
At this mode counter reset occur after reaching P1 setting. At the same time PK1 output follows into active state for time specified by PTIM parameter for non defined time when PTIM $=0$. Each zeroing is counted by cycle counter (L). If cycle counter (number of zeroing of pulses counter) reach value set by P2 parameter, PK2 output will be activated.


PK1 output is activated for PTIM time when counter will reach P1 value. At the same time pulses counter is reset and cycles counter increases (L).
PK2 output is activated when cycles counter reach P2 value and it is deactivated when counter is reset by external signal or by keyboard.

This mode is dedicated for application in cutting machines for counting length and number of cut elements.


Picture. 7 Example of length measurement application with MD150E used for counting material cut offs in a production line.

## Mode 4 (nodE 4) - Absolute controlled by velocity

Activation of PK1 and PK2 outputs follows when velocity counter exceed (pulses frequency) values of P1 and P2 settings.

## 5. Password protection

Access to the process display settings can be password protected (parameter 17. PAS). There are 3 protection levels available. Protection level is set with the first digit, and the last 4 digits are used for password entry.


If the digital processing unit is password protected, then after switching to protected settings the display shows 0000 value - enter previously set password. The password can be deactivated by switching the parameter 19. PAS and setting 0000 value.


## 6. USB and RS485 Modbus interfaces

### 6.1 USB interface

USB interface is used for connection of MD150E counter with MD150E-PC software (device configuration, recording of measurements) and for updating of internal software. MD150E process display must be powered in order to facilitate connection via USB.

CAUTION
USB interface is prone to interference in the power supply grid and to electromagnetic interference occurring in industrial environments. In case of connection problems during communication of the digital processing unit with MD150E-PC software, apply additional protective elements in the form of:

- Powering of MD150E digital processing unit from an independent power supply source,
- Application of network filters upstream of the indicator supply feeder.
- Use of USB cable of length $<1,5 \mathrm{~m}$ equipped with ferrite beads at the cable beginning and its end.
- Use of optically insulated USB hubs at PC side.

In the conditions of severe interference (e.g. high interference of power grid) the communication may not be possible.

### 6.2 RS485 (MODBUS-RTU) interface

MD150E counter is equipped with RS485 interface. It can be used for connection with PLC controller, HMI panel or other device supporting MODBUS-RTU protocol.
Default transmission parameters:

- Speed: 38400bps, Bits: 8, Stop Bits: 1, parity: none
- Address Modbus: 1

Transmission speed and MD150E counter address in MODBUS-RTU network can be set with the following parameters:
12. RS1 - velocity setting MODBUS (9600, 19200, 38400, 57600, 115200)
13. RS2 - address setting MODBUS (1...99)

### 6.2.1 Description of MODBUS protocol

Implemented MODBUS functions

| Function no (hex) | Description |
| :---: | :---: |
| $1(0 \times 01)$ | Reading of outputs status (relays) |
| $3(0 \times 03)$ | Reading X registers |
| $5(0 \times 05)$ | Recording of single Bit |

Type of used variables

| Variable name | Description | Size <br> (Bytes) | Number of occupied registers | Range |
| :---: | :---: | :---: | :---: | :---: |
| INT | 2 Bytes number with sign | 2 | 1 | -32768-+32767 |
| DINT | 4 Bytes number with sign | 4 | 2 | $-2^{31} \ldots\left(2^{31}-1\right.$ |
| REAL | Floating point number | 4 | 2 | $\begin{array}{lllll} 1.18 * 10^{-38} \ldots 3.40^{*} 10^{38}, & 0, & -3.40 * 10^{38} & \ldots & - \\ 1.18^{*} 10^{-38} \end{array}$ |

Map of MD150E records

| Address | Name | Mode | Variable type (MODBUS function) | Description |
| :---: | :---: | :---: | :---: | :---: |
| 0-1 (*1-2) | COUNTER_VAL | R | DWORD (0x03) | Readout of pulses counter value (non calibrated value) |
| 2 (*3) | CYCLE_VAL | R | INT (0x03) | Readout of cycles counter value - L |
| 4-5 (*5-6) | COUNTER _DISP | R | REAL (0x03) | Readout of pulses counter value indicated by display (floating point number) |
| 6-7 (*7-8) | SPEED _DISP | R | REAL (0x03) | Velocity readout indicated by display- U (floating point number) |
| 5000 (*5001) | COUNTER_RESET | W | BYTE (0x05) | Reset of cycles and pulses counter |
| 5002 (*5003) | PK_OUT | R | BYTE (0x01) | Readout of relay outputs status (bit 0:PK1, bit 1:PK2) |
| 5004 (*5005) | INPUTS | R | BYTE (0x01) | Readout of inputs state (bit 0: INA. bit 1: INB, bit 2:RST) |

* for devices with address starting with 1 value (offset address +1)

CAUTION: 4-Byte number of type REAL or DINT is contained in two registries. The first registry contains younger part of the number, the second - its older part. In order to read REAL or DINT number value correctly, read two registries $(X, X+1)$ then conduct appropriate conversion.

Conversion of 2 registries (4 Byte) into 32 Bit number (REAL, DINT)

| Register HI | <-> Byte1 |
| :--- | :--- |
| Register LO | <-> ByteO |
| Register_X+1 HI | <-> Byte3 |
| Register_X+1 LO | <-> Byte2 |

Number_32_bit $=$ Byte $3 \ll 24+$ Byte2 $\ll 16+$ Byte $1 \ll 8+$ Byte 0
or Number_32_bit = Register_2 + Register_3<<16

## Example of MODBUS communication table

Readout of counter state (non calibrated) - COUNTER_VAL (Function: 03, Register address: 0)

| Request (MODBUS MASTER $\rightarrow$ MD150E) |  | Response (MD150E $\rightarrow$ MODBUS MASTER) |  |
| :---: | :---: | :---: | :---: |
| Device address | $0 \times 01$ | Device address | $0 \times 01$ |
| Function | $0 \times 03$ | Function | $\mathbf{0 \times 0 3}$ |
| Hi registry address | $0 \times 00$ | Number of Bytes | $0 \times 04$ |
| Lo registry address | $0 \times 00$ | Register 0x02 Hi | REAL (Byte 1) |
| Number of Hi registries | $0 \times 00$ | Register 0x02 Lo | REAL (Byte 0) |
| Number of Lo registries | $0 \times 02$ | Register 0x03 Hi | REAL (Byte 3) |
| CRC Hi | $0 \times C 4$ | Register r 0x03 Lo | REAL (Byte 2) |
| CRC Lo | $0 \times 0 \mathrm{~B}$ | CRC Hi | 8 bit |
|  |  | CRC Lo | 8 bit |

Readout of cycle counter - CYCLE_VAL (Function: 03, Register address: 2)

| Request (MODBUS MASTER $->$ MD150E) |  | Response (MD150E -> MODBUS MASTER) |  |
| :---: | :---: | :---: | :---: |
| Device address | $0 \times 01$ | Device address | $0 \times 01$ |
| Function | $0 \times 03$ | Function | $\mathbf{0 \times 0 3}$ |
| Hi registry address | $\mathbf{0 \times 0 0}$ | Number of Bytes | $0 \times 02$ |
| Lo registry address | $\mathbf{0 \times 0 2}$ | Register 0x00 Hi | INT (Byte 1) |
| Number of Hi registries | $0 \times 00$ | Register 0x00 Lo | INT (ByteO) |
| Number of Lo registries | $\mathbf{0 \times 0 1}$ | CRC Hi | 8 bit |
| CRC Hi | 8 bit | CRC Lo | 8 bit |
| CRC Lo | 8 bit |  |  |

Counter reset- COUNTER_RESET (Function: 05, Register address: 5000)

| Request (MODBUS MASTER $\rightarrow$ MD150E) | Response (MD150E) -> MODBUS MASTER) |  |  |
| :---: | :---: | :---: | :---: |
| Device address | $0 \times 01$ | Device address | $0 \times 01$ |
| Function | $0 \times 05$ | Function | $\mathbf{0 \times 0 5}$ |
| Hi registry address | $\mathbf{0 \times 1 3}$ | Address of Hi registries | $\mathbf{0 \times 1 3}$ |
| Lo registry address | $0 \times 88$ | Address of Lo registries | $\mathbf{0 x 8 8}$ |
| Register 0x00 Hi | $0 \times$ FF | Register 0x00 Hi | $0 \times$ FF |
| Register 0x00 Lo | $0 \times 00$ | Register 0x00 Lo | $0 \times 00$ |
| CRC | 16 bits | CRC | 16 Bits |

## 7. Technical parameters

| Description | Parameter |
| :---: | :---: |
| Power supply | Standard version <br> 12 ... 36V DC, recommended 24 VDC, min. 250 mA + current <br> consumption <br> MD150E-230 version: <br> 85 ... 260V AC, 10W, 47-440Hz |
| Sensor power supply output | 5V DC, max. 500 mA 15 V DC, max. 500 mA (only for 230 V version, please contact with WObit technical support) |
| Counter inputs A/B | Differential, opt insulated Low level: OV (max. 2V), High level: +24V (5...24V) |
| Reset input RST | Low level: OV (max. 2V), High level: +24V (5...24V) |
| Max. frequency for counter inputs A,B | 2Mhz (off-line filtration) 125 Khz (filtration activated) |
| Min. length of reset signal RST | 1ms (off-line filtration) 10ms (filtration activated) |
| Relay outputs PK1, PK2 | $2 \times 1 \mathrm{~A} / 125 \mathrm{VAC}, 2 \mathrm{~A} / 30 \mathrm{VDC}$ |
| Interfaces | RS485 MODBUS-RTU, default parameters 38400bps, 8:n:1, USB: 1.1, 2.0 |
| Operation temperature range | $0 . .50^{\circ} \mathrm{C}$ |
| Display | 6 digits, height 13.5 mm |
| Housing | Height: 45 mm Width: 92 mm Length: 81 mm |
| Weight | 200g (300g for 230 V version) |
| IP class | IP40, for front panel- IP65 |
| Universal password | 3145 |

