Read this document carefully before using this device. The guarantee will be expired by damages if you don't attend to the directions in the user manual. Also we don't accept any compensations for personal injury, material damage or capital disadvantages.

## ENDA EDP2041 DIGITAL POTENTIOMETER

Thank you for choosing ENDA EDP2041 potentiometer.

- $35 x 77 \mathrm{~mm}$ sized.
- 4 digits display.

Easy to use by front panel keypad.

- Communication via RS-485 Modbus protocol or synchronous running between two or more potentiomers (Optional).
- Preset value can be adjusted from external buttons.

Display scale can be adjusted between -1999 and up to 9999 .
Decimal point can be adjusted between 1 . and 3 . digits.
$-0-10 \mathrm{~V}, 0-20 \mathrm{~mA}$ a and 4-20mA output with adjustable minimum and maximum values.

- 'Soft on' and 'soft off' properties can be selected.

- Parameter access protection on 3 levels.
- CE marked according to European Norms.

| Order Code : EDP2041- |  |
| :---: | :---: |
|  | 1 |
| 1-Supply Voltage |  |
| 230VAC... 230 V AC | 2-Modbus Selection |
| 24VAC..... 24 V AC | RS........RS-485 Modbus Included |
| SM..........10-30V DC | Blank.....N/A |
| 8-24V AC |  |

## TECHNICAL SPECIFICATIONS

| ENVIRONMENTAL CONDITIONS |  |
| :---: | :---: |
| Ambient/storage temperature | $0 \ldots+50^{\circ} \mathrm{C} /-25 \ldots+70^{\circ} \mathrm{C}$ (without icing) |
| Max. relative humidity | $80 \%$ Relative humidity for temperatures up to $31 \%^{\circ} \mathrm{C}$, decreasing linearly to $50 \%$ at $40^{\circ} \mathrm{C}$. |
| Rated pollution degree | According to EN 60529 Front panel : <br>  <br>  <br> Rear panel : |
| Height | Max. 2000m |
| KEEP AWAY device from exposed to corrosive, volatile and flammable gases or liquids and DO NOT USE the device in similar hazardous locations. |  |
| ELECTRICAL CHARACTERISTICS |  |
| Supply | 230 V AC $+10 \%-20 \%, 50 / 60 \mathrm{~Hz}$ or 24 V AC $\pm 10 \% 50 / 60 \mathrm{~Hz}$ or optional $10-30 \mathrm{~V}$ DC / 8-24V AC $\pm 10 \%$ SMPS |
| Power consumption | Max. 7VA |
| Wiring | $2.5 \mathrm{~mm}{ }^{2}$ Screw Connections |
| Date retention | EEPROM (Min. 10 years) |
| EMC | EN 61326-1: 2013 (Performance criterion B for the EMC standards) |
| Safety requirements | EN 61010-1: 2012 (pollution degree 2, overvoltage category II, measurement category I) |
| INPUTS |  |
| Upwards input (UP) | Contact input or max. 24VDC logic input (active low) |
| Downwards input (DOWN) | Contact input or max. 24VDC logic input (active low) |
| OUTPUT |  |
| 0-10V output | Digitally adjusted maximum 10 mA , max. 10 V potentiometer output. <br> Accuracy :\%0.1 Resolution : 1 mV <br> Fluctuation: Maximum 30 mV <br> Rise time from 0 to 10 V is maximum 300 ms |
| OUTPUT |  |
| 0-20mA output | Digitally adjusted maximum 12V, max. 20 mA potentiometer output. <br> Accuracy: \%0.1 Resolution : $2 \mu \mathrm{~A}$ <br> Fluctuation: Maximum 60 $\mu \mathrm{A}$ <br> Rise time from 0 to 20 mA is maximum 300 ms |
| HOUSING |  |
| Housing type | Suitable for flush-panel mounting according to DIN 43700. |
| Dimensions | W77xH35xD71mm |
| Weight | Approx. 350g (after packing) |
| Enclosure material | Self extinguishing plastics |
| Avoid any liquid cont DO NOT clean the devi | act while the device is switched on. ice with solvent (thinner, gasoline, acid etc.) and / or abrasive cleaning agents. |

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1) Indicates the adjusted potentiometer value in "Running Mode" Parameter's name, value or parameter unit can be displayed in "Programming Mode"
2) Increment key in "Running Mode"

Increment or parameter selection key in "Programming Mode"
Provides to return to the "Running Mode" during "Programming Mode" by using together SET key.
3) Decrement key in "Running Mode"

Provides to parameter selection and decrements the selected parameter value in "Programming Mode".
4) Provides to selecting and setting the "Running Mode" and "Programming Mode" parameters Provides menu selection in "Programming Mode"

1) Digital display
( 2 ), ( 3 ),(4) Keypad
$12,5 \mathrm{~mm} 4$ digits 7 segment red LED display
Micro switch

## DIMENSIONS




To remove the device from panel :

- While pushing the the flush-mounting clamp
in direction 1 , pull out in direction 2 .



## Note :

1) Panel thickness should be maximum 7 mm . 2) There must be at least 60 mm free space behind the device, otherwise it would be difficult to remove it from the panel.

## CONNECTION DIAGRAM

ENDA EDP2041 is intended for installation in control panels. Make sure that the device is used only for intended purpose. The electrical connections must be carried out by a qualified staff and must be according to the relevant locally applicable regulations. During an installation, all of the cables that are connected to the device must be free of electrical power. The device must be protected against inadmissible humidity, vibrations, severe soiling.Make sure that the operation temperature is not exceeded. The cables should not be close to the power cables or components.


NOTE :


ENDA INDUSTRIAL ELECTRONICS SN: $x x x x x x x x x$



ENDA industrial eLectronics sn: xxxxxxxxx


Equipment is protected throughout by DOUBLE INSULATION

## Note

1) Mains supply cords shall meet the requirements of IEC 60227 or IEC 60245 . 2) In accordance with the safety regulations, the power supply switch shall bring the identification of the relevant instrument and it should be easily accessible by the operator.

## SYNCHRONIZED OPERATING CONNECTION



NOTE :

- d.Rdr. parameter should be selected $\left[. P_{o t}\right.$ in master potentiometer. In this case $d . A d r$. parameter of other potentiometers aren't used. But be sure that $\left[. P_{o t}\right.$ isn't selected in slave potentiometers to prevent confusion. Settings of slave potentiometers change proportional to setting of master potentiometer. For example; When Max. output of master potentiometer is changed from 10 V to 5 V , max. output of slave potentiometers decrease half of previous value proportional to this. If previous output of slave potentiometer is 6 V , it decreases 3 V . P.on.c parameter of slave potentiometer should be selected ofF in order to understand master potentiometer when slave is energized.
- Computer should be used to change only a few potentiometers. In this case, there is not master potentiomer. Output of the required potentiometer is changed according to $d . R d r$. parameter.

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 adjustable preset value appears as above

SET $\quad$ sET $\quad$ key is pressed while holding down to | key |
| :--- |
| the programming mode is entered |

 the programming mode is entered key to the program menu by pressing $\nabla$ key is pressed in combination with ste $\Delta$ keys and the information is recorded.
Default
Parameters
$B$ L.ScL. $\begin{aligned} & L . S c L .=L \text { Lowe } \\ & (H S C L i-10) .\end{aligned}$
Scale the lower value of the output,based on o. $t \mathrm{YP}$. parameter selection, it is $0 V, 0 \mathrm{OAA}$ or 4 mA
See NOTE 1 for programming.

H.bc L.: Upper value of the scale.


Scale the upper value of the output based on, o.t $\mathcal{Y}$. parameter Scale the upper value of the output based on, o. $\mathcal{S}$. pr. parameter
selection;it is 10 V or 20 mA . $H . S[L$. and $L . S C L$. difference can not be greater than 9999 . See NOTE 1 for programming. Adjustable between $L . S \subset L$. and ( $H$, it $1,-10$ ). See NOTE 1 for programming
 See NOTE 1 for programming.d.Rdr. $=$ Device address for ModBus.


Adjustable between $1-247$ or selectable $c$. . ot. When $c . P$ ot. is
selected, the device will be master potention selected, the device will be master potentiometer and slave
potentioneters can be adiusted dependent on it. potentiometers
See NOTE 1 for programming 4 This parameter is active device with RS485 communication option
bRiud = Baud rate for the RS485 connection. Adjustable;off,2400,480,99600,19200 and 38400 .
$\triangle$ This parameter is active device with $R 4885$ communication option

## $0 . c \cap F$.

 optioReturn to
the menu.

## Parameter Adjustment Method

## NOTE 1 Lo.L. SET

For adjusting a selected parameter first press and hold $\quad$ key. Then, by using
$\nabla \Delta$
keys, adjustment can be made.
If increment key is pressed and held 0.6 seconds, the value of the selected parameter changes rapidly. If waited enough, the value increases 100 at each step. After 1 second following the release of the key, initial condition is returned. The same procedure is valid for the decremen

## Default

SET
ofF Pon.C. Pon.C. $=$ Selection of the output parameter behavior


Attention: If this parameter is selected, the set value that warrent that lowerer limit value is indicated. pressed at first. In addition, if sincreasing or dec veaseasing that value is wanted the set value is equalized to lower limit value and then adjustment can be done.
Str.= When first energized, output is increased slowly from the voltage or current that lower limit value is indicated to the voltage or current that set value is indicated during $r t$ ? See NOTE 1 for programming.
o.E.EY = Adjusted type of the output to preset value with button.

S.on $=$ Output is increased to voltage that set value is displayed with $\Delta$ button during r.t See NOTE 1 for programming.
d 5 Rb o.d.LY o.d.EY = Adjusted type of the output to lower limit value with $\quad$ button.
$d \leq R b=$ Output can not be adjusted to lower limit value with button
$E$ nb. = Output can be adjusted to lower limit value with button.
b. $\mathrm{F} F=$ Output is increased to voltage that lower limit value is displayed with $\square$ button See NOTE 1 for programming.
dSAB E.E.E S. $\begin{gathered}\text { E.E.EY }=\text { Returning method of the output } \\ \text { o.E.E } \\ \text { is set like the output parameter. }\end{gathered}$
dSAb E.d.LS. $\begin{aligned} & \text { E. } . t \leq Y=\text { Returning method of the output to } \\ & \text { preset value with the external "Down" input }\end{aligned}$
AD. preset value with the external "Down" inpu.
3 r.t :

30 d.t
Adjustable between time for output. Adjustable between $1-250$ seconds. Output is
increased slowiy to the lower Iimit value during adjusted time.


.t. $t=$ Decreasing time for output value | Adjustable between time for output valu |
| :--- |
| Output is decrease | alue is decreased slowly the lower limit value during adjusted time.

$P$, r. $t$ = Increasing and decreasing speed It is adjustedl $d \dot{C}$ Rb. , $1,10,100$ ve 1000 values. $d \leq A b$ is selected, the preset value Selected according to the value increase or
decrease the preset buttons for fast switchin decrease the preset buttons for fast switching
mode, the preset value speedy is increased or decreased "one by one",10 at each step, 100
at each step. 1000 at each step. at each step, 1000 at each step.
$B-I B$ o.t YP. o.t YP = Output type selection parameter

$$
\begin{aligned}
& \text { bECu. } \quad \begin{array}{l}
\quad-20=4-20 \mathrm{~mA} \text { output usable } \\
4-20
\end{array} \\
& \text { Return to }+\quad 0-20=0-20 \mathrm{~mA} \text { output usable } \\
& \left.\begin{array}{ll}
\text { Return to } \\
\text { the menu }
\end{array}\right) \text { See NOTE } 1 \text { for programming }
\end{aligned}
$$



OUTPUT DIAGRAM

| Ponit. | off | on | b.ber. |
| :---: | :---: | :---: | :---: |
|  |  |  |  |
| o.E.ES | d 58. | $E \cap b$. | S.on |
| o.d.t ! | d勺R6. | Enb. | S.off |
| $\begin{gathered} \text { PRESET. } \\ \text { O. Lo.l \%. } \end{gathered}$ | Can not control with buttons. |  |  |
| E.E.ES | dbRb. | Enb. | b.on |
| E.d.t . | d勺Rb. | Enb. | b.off |
| PRESET <br> O Lol, <br> UP input <br> DOWN input |  |  |  |

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## ENDA EDP2041 DIGITAL POTENTIOMETER MODBUS PROTOCOL ADDRESS MAP

## 1．1 Memory map for Holding Registers

| Parameter Number | Holding Register addresses Decimal（Hex） |  | Data <br> Type | Data Content | Parameter Name | Read／Write <br> Permission | Default Parameters |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| H0 | 0000d | （0000h） | Word | Percentage of the external control．Adjustable between \％ 0.00 and \％100．0 |  | Readable／Writable | 10000 |
| H1 | 0001d | （0001h） | Word | Preset value | ロrらビ | Readable／Writable | 1000 |
| H2 | 0002d | （0002h） | Word | Decimal point | d．Юпト． | Readable／Writable | 0 |
| H3 | 0003d | （0003h） | Word | The lower value of the scale | L．JEL． | Readable／Writable | 0 |
| H4 | 0004d | （0004h） | Word | The upper value of the scale | HSEL． | Readable／Writable | 9999 |
| H5 | 0005d | （0005h） | Word | The lower limit of the preset value | Lo．l ol． | Readable／Writable | 0 |
| H6 | 0006d | （0006h） | Word | The upper limit of the preset value | H ו．L ו． | Readable／Writable | 2000 |
| H7 | 0007d | （0007h） | Word | Device address for Rs485 network connection（Adjustable between 1－247．） If set to＂ 0 ＂，the control potentiometer mode is entered． | d．Ror． | Readable／Writable | 1 |
| H8 | 0008d | （0008h） | Word | Baud rate selection（ $0=$ None； $1=2400 \mathrm{bps} ; 2=4800 \mathrm{bps} ; 3=9600 \mathrm{bps}$ ； 4＝19200bps； $5=38400 \mathrm{bps}$ ） | ロRud． | Readable／Writable | 3 |
| H9 | 0009d | （0009h） | Word | The first opening the control parameter $0=a F F \quad 1=a n \quad 2=b \zeta r$ | Ponit． | Readable／Writable | 0 |
| H10 | 0010d | （000Ah） | Word | Output upper arrow button to fetch the value of the preset selection $0=d b R b .1=\varepsilon \cap b .2=5.0 \cap$ ． | －．E．LU | Readable／Writable | 0 |
| H11 | 0011d | （000Bh） | Word | Output lower arrow button to fetch the value of the lower limit selection $0=d \zeta$ Rb． $1=E \cap b ., 2=\zeta . \circ F F$ ． | －．0．L | Readable／Writable | 0 |
| H12 | 0012d | （000Ch） | Word | Time to increase the output voltage | $r . t$ ו． | Readable／Writable | 30 |
| H13 | 0013d | （000Dh） | Word | Time to decrease the output voltage | d．t ו． | Readable／Writable | 30 |
| H14 | 0014d | （000Eh） | Word | Preset the value of the increament and decrement rate or cancel the setting $0=$ cancel， $1=1,2=10,3=100,4=1000$ ． | P．ıt． | Readable／Writable | 1 |
| H15 | 0015d | （000Fh） | Word | Output type selection parameter $0=0-10 \mathrm{~V}$ output， $1=4-20 \mathrm{~mA}$ output ， $2=0-20 \mathrm{~mA}$ output | －．L〕P． | Readable／Writable | 0 |
| H16 | 0016d | （0010h） | Word | User security parameter configuration menu（ $0=$ Menu invisible， $1=$ Menu programmable， 2 or $3=$ Menu only traceable）． | UíSÉ． | Readable／Writable | 1 |
| H17 | 0017d | （0011h） | Word | Output security parameter configuration menu（ $0=$ Menu invisible， $1=$ Menu programmable， 2 or $3=$ Menu only traceable）． | －L．ちí． | Readable／Writable | 1 |
| H18 | 0018d | （0012h） | Word | Function control parameter <br> （23040d（5A00h）value is entered，any function executed． <br> （23041d（5A01h）value is entered，the default values will be restored． |  | Readable／Writable | 0 |
| H19 | 0019d | （0010h） | Word | Returning method of the output to preset value with the external＂Up＂input． $0=d$ SAb． $1=E \cap b .2=5.0 n$ ． | E．E．E．3 | Readable／Writable | 0 |
| H20 | 0020d | （0011h） | Word | Returning method of the output to preset value with the external＂Down＂input． $0=d b$ Rb． $1=E \cap b ., 2=b . \circ F F$ ． | E．d．L． | Readable／Writable | 0 |

1．2 Memory map for Coils

| Parameter <br> Number | Input Register <br> addresses <br> Decimal（Hex） | Data <br> Type | Data Content | Parameter <br> Name | Read／Write <br> Permission | Default <br> Parameters |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{1 0}$ | 0000 d | $(0000 \mathrm{~h})$ | Word | Instant set value | $\boldsymbol{\square}$ | Only readable |
| $\mathbf{1 1}$ | 0001 d | $(0001 \mathrm{~h})$ | Word | $\%$ of value the analog output $(\% 0.00-\% 100.00$ sensitivity $)$ | Only readable | $\boldsymbol{-}$ |

1．3 Memory map for Discrete Input

| Parameter Number | Discrete input addresses | Data <br> Type | Data Content | Parameter Name | Read／Write <br> Permission | Default Parameters |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| D0 | （0000）h | Bit | State of the external down button（ $0=$ OFF ， $1=\mathrm{ON}$ ） | － | Only readable | － |
| D1 | （0001） h | Bit | State of the external up button（ $0=$ OFF ， $1=\mathrm{ON}$ ） | ■ | Only readable | － |

## 2．MODBUS ERROR MESSAGES

Modbus protocol has two types error，communication error and operating error．Reason of the communication error is data corruption in transmission．Parity and CRC control should be done to prevent communication error．Receiver side checks parity and CRC of the data．If they are wrong，the message will be ignored．If format of the data is true but function doesn＇t perform for any reason，operating error occurs．Slave realizes error and sends error message．Most significant bit of function is changed＇ 1 ＇to indicate error in error message by slave．Error code is sent in data section．Master realizes error type via this message．

## ModBus Error Codes

| Error Code | Name | Meaning |
| :---: | :---: | :--- |
| $\{01\}$ | ILLEGAL FUNCTION | The function code received in the query is not an allowable action for the slave．If a Poll Program <br> Complete command was issued，this code indicates that no program function preceded it． |
| $\{02\}$ | ILLEGAL DATA ADDRESS | The data address received in the query is not an allowable address for the slave． |
| $\{03\}$ | ILLEGAL DATA VALUE | A value contained in the query data field is not an allowable value for the slave． |
| Message example； |  |  |

## Message example；

Structure of command message（Byte Format）
Structure of response message（Byte Format）

| Device Address |  | $(0 \mathrm{~A}) \mathrm{h}$ |
| :--- | :---: | :---: |
| Function Code |  | $(01) \mathrm{h}$ |
| Beginning address <br> of coils． | MSB | $(04) \mathrm{h}$ |
|  | LSB | $(\mathrm{A} 1) \mathrm{h}$ |
| Number of coils（N） | MSB | $(00) \mathrm{h}$ |
|  | LSB | $(01) \mathrm{h}$ |
| CRC DATA | LSB | $(\mathrm{AC}) \mathrm{h}$ |
|  | MSB | $(63) \mathrm{h}$ |


| Device Address |  | （0A）h |
| :---: | :---: | :---: |
| Function Code |  | $(81) \mathrm{h}$ |
| Error Code |  | $(02) \mathrm{h}$ |
| CRC DATA | LSB | $(\mathrm{BO}) \mathrm{h}$ |
|  | MSB | $(53) \mathrm{h}$ |

As you see in command message，coil information of（4A1）h＝ 1185 is required but there isn＇t any coil with 1185 address． Therefore error code with number（02）（Illegal Data Address） sends．

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