

MI454

Potenciometer and TAP position programmable transducer

FEATURES

- Measuring of resistance on potentiometers and tap position
- Programmable input and output
- Low power consumption
- Universal AC/DC or AC Auxiliary power supply
- Accuracy class: 0.5
- Serial communication RS232 or RS485 (very high speed data rate: up to 115,200 bit/s, MODBUS protocol)
- Housing for DIN rail mounting
- Correspond to EN 60770-1: 1999



Picture 1: Programmable DC current transducer MI454

APPLICATION

Measuring transducer MI454 is designed to convert the wiper position of potentiometer or slide wire into an accurate proportional DC current or DC voltage signal. Typically these kinds of transducers are used for measuring of resistance on TAP position changers, used on high voltage transformers or to measure variable resistance on 3 wire system. The analogue output signal is proportional to the measured value and it is appropriate for regulation of analogue and digital devices.

LAYOUT AND MODE OF OPERATION

Resistance on the input terminals is measured with U-I method. Enforced current causes a voltage drop (A - Picture 2) on the measured resistor which is supplied to the programmable amplifier B. After A/D conversion the signal is computed in microprocessor C. The measured value determined by the microprocessor is assigned to the programmable analogue output E. Communication D enables programming of the measuring transducer and monitoring of the measuring resistance on the input terminal.

Communication, analogue output and auxiliary power supply are electrically insulated from other system by means of separation transformer.

VERSIONS

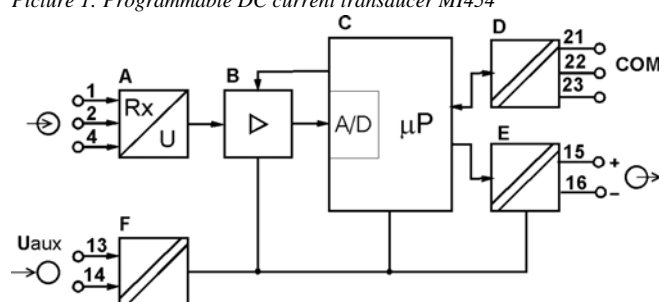
The following transducer versions are available (Table 1).

	Input [Ω]	Number of steps	Measuring voltage	Output	Supply	Communication
Programmable	100 to 500 k	Adjustable: 0 – linear (potenciometer) from 1 to 100 steps (TAP position)	< 2,2 V	5 mA 20 mA 10 V	Universal or AC: 57 V 100 V 230 V 400 V 500 V	RS232 or RS485
Fixed configuration	100, 1 k, 2 k, 5 k, 10 k, 20 k, 50 k, 100 k, 200 k, 500 k ³⁾	0 - linear	< 2,2 V	1 mA 5 mA 10 mA 20 mA 4...20 mA	Universal or AC: 57 V 100 V 230 V 400 V 500 V	RS232, RS485 or without communication
	300, 1 k, 2 k, 5 k, 10 k, 20 k, 50 k, 100 k, 200 k, 500 k ³⁾	10 steps		1 V 10 V other on request		

Table 1: Versions of MI454

³⁾ – Other versions on request, measuring current compliance with range

Transducers are mounted on standard rail 35 x 15 mm (according to DIN EN 50022).



Picture 2: Block diagram

PROGRAMMING

Input and output values are programmed¹⁾ by setting software MiQen via RS232 or RS485 communication. Before setting the transducer, output value must be selected by the jumpers on the output module²⁾. It is possible to chose between three ranges 0...±10 V, 0...±5 mA and 0...±20 mA. Within this three ranges it is possible to set any linear output characteristic.

¹⁾ – Programming is not possible in versions without communication

²⁾ – Qualified person only

TECHNICAL DATA

GENERAL:

- Measured quantity: resistance ratio
- Measured principle: microprocessor sampling

INPUT:

- Input range limit values: Measuring voltage: 0...100 Ω to 0...500 kΩ < 2,2 V
- Number of steps: 0 – linear (potentiometer) from 1 to 100 steps (TAP position)
- Minimal step: 30 Ω
- Lead resistance < 50 Ω per lead
- Consumption: < 0.5 VA

ANALOGUE OUTPUT:

Programmable DC current output:

- Output I_{OutN} (output range end value):
- Output range values ⁴⁾: 0...1 mA to 0...5 mA or, 0... 5 mA to 0... 20 mA
- Burden voltage: 15 V
- External resistance: $R_{Bmax} \cdot [k\Omega] = \frac{15V}{I_{OutN} [mA]}$

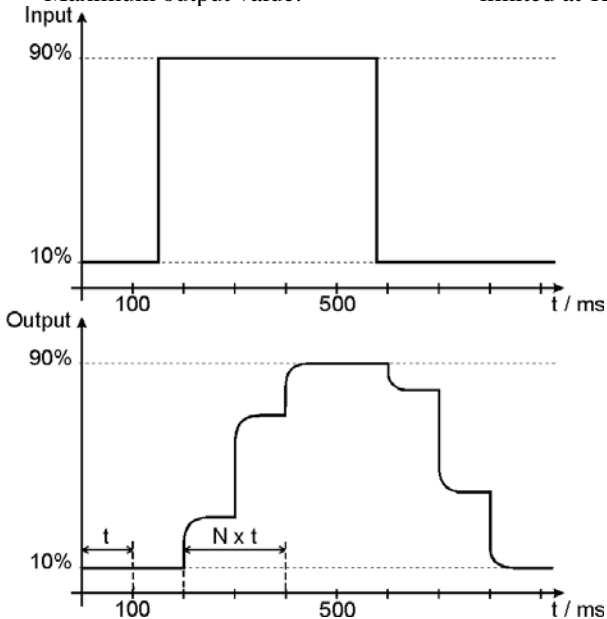
⁴⁾ - Depends of set jumpers on output module

Programmable DC voltage output:

- Output U_{OutN} (output range end value):
- Output range values 0...1 V to 0...10 V
- Burden current: 20 mA
- External resistance: $R_{Bmin} \cdot [k\Omega] = \frac{U_{OutN} [V]}{20mA}$

General:

- Response time: programmable from 0.5 s to 60 s
- Residual ripple: < 1 % p.p.
- Maximum output value: limited at 125 %



Picture 3: Output transfer characteristic

N – Number of sliding windows
t – Sampling time

The output may be either short or open-circuited and it is electrically insulated from all other circuits (floating). All the output range end values can be reduced subsequently using the programming software, but a supplementary error results.

ACCURACY:

- Reference value: Input range end value
- Accuracy class: Resistance 0.5
- Analogue output: Resistance 0.5
- Communication: Resistance 0.5

Reference conditions:

- Ambient temperature: 15...30 °C
- Input: 0...100 % R_N

Influence quantities:

- Temperature influence: ±0.15% / 10K °C
- Long-term stability: ±0.15%

POWER SUPPLY:

Auxiliary AC/DC voltage (universal):

- Rated voltage (U_r): 24...300 V DC, 40...276 V AC
- Frequency range: 40...70 Hz
- Power consumption: < 3 VA

Auxiliary AC voltage:

Rated voltage (U_r)	Rated operating range
57.74 V	80...120 % U_r
100 V	
230 V	
400 V ⁵⁾	
500 V ⁵⁾	

⁵⁾ – to 300 V installation category III, from 300 to 500 V installation category II – see chapter Regulations.

Table 2: Rated AC voltage for Auxiliary power supply

- Frequency range: 45...65 Hz
- Power consumption: < 3 VA

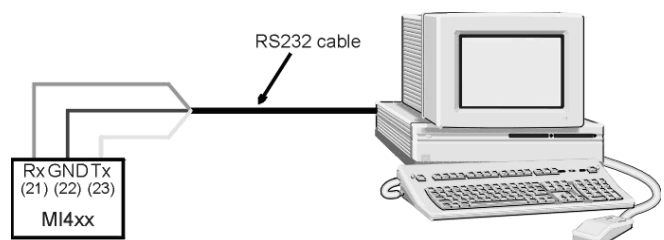
COMMUNICATION (OPTIONAL):

RS232

- Connection type: Point to point
- Signal levels: RS232
- Maximum cable length: 15 m
- Connector: Screw terminals
- Isolation: 3.7 kV rms for 1 minute between all terminals and all other circuits, except between communication terminals and output terminals, 2 kV rms for 1 minute
- Transmission mode: Asynchronous
- Message format: MODBUS RTU
- Data rate (very high speed): 1,200 to 115,200 bits/s
- RS232 connections

MI454	9 pin D connector (PC)	25 pin D connector (PC)
Rx (21)	Tx (3)	Tx (2)
⊥ (22)	GND (5)	GND (7)
Tx (23)	Rx (2)	Rx (3)

Table 3: RS232 connections



Picture 4: Connection of MI454 on PC via RS232 communication

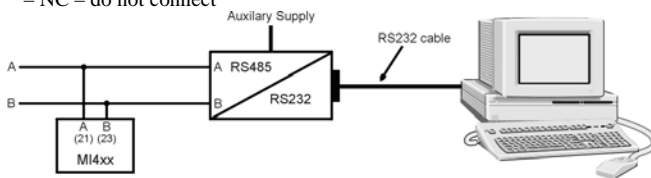
RS485

- Connection type: Multi-drop (32 connections per link)
- Signal levels: RS485
- Cable type: Screened twisted pair
- Maximum cable length: 1000 m
- Connector: Screw terminals
- Isolation: 3.7 kV rms for 1 minute between all terminals and all other circuits, except between communication terminals and output terminals, 2 kV rms for 1 minute
- Transmission mode: Asynchronous
- Message format: MODBUS RTU
- Data rate (very high speed): 1,200 to 115,200 bits/s
- RS485 connections

MI454	RS485
A (21)	DATA +
C (22)	NC ⁶⁾
B (23)	DATA -

Table 4: RS485 connections

⁶⁾ – NC – do not connect



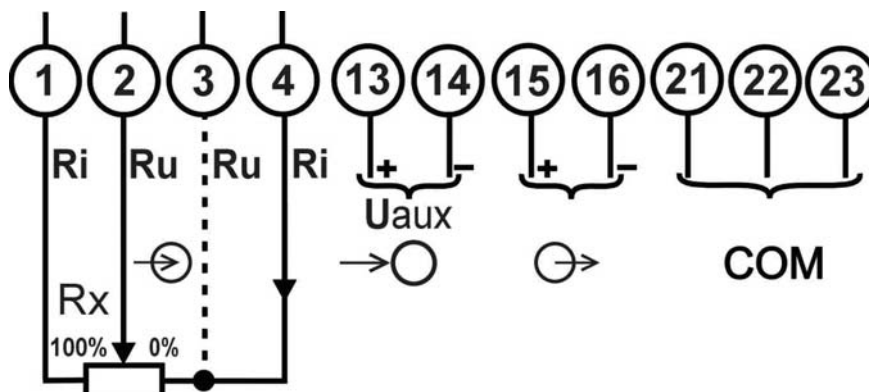
Picture 5: Connection of MI454 on RS485 communication line

HOUSING:

- Material of housing: PC/ABS unflamable, according to **UL 94 V-0**
- Mounting: For rail mounting, 35 x 15 mm according to **DIN EN 50022**: 1978
- Enclosure protection: IP 50 (IP 20 for connection terminals) according to **EN 60529**: 1989
- Weight: Approx. 300 g

CONNECTION

The connection terminals marking can be found on the front plate. For measuring of resistance lower than 200 Ω, it is recommended to connect contact 3 as shown below, to reduce influence of connection wires.



Picture 6: Connection diagram

CONNECTION TERMINALS:

- Permissible cross section of the connection leads: ≤ 4.0 mm² single wire
2 x 2.5 mm² fine wire

REGULATIONS:

- Protection: Protection class **II**
300 V rms, installation category **III**
500 V rms, installation category **II**
Pollution degree 2
- Test voltage: 3.7 kV rms according to **EN 61010-1**: 1990

ENVIRONMENTAL CONDITIONS:

- Climatic rating: Climate class 2 acc. to **EN 60688**: 1992
- Operating temperature: -10 to +55 °C
- Storage temperature: -40 to +70 °C
- Annual mean relative humidity: ≤ 75% r.h.

EU DIRECTIVES CORRESPONDING FOR CE MARKING

Low voltage directive **73/23/EEC**:

EN 61010-1: 1993 and **EN 61010-A3**: 1995

Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1: General requirements

EMC directive **89/336/EEC**:

EN 61326-1: 1997

Electrical equipment for measurement, control, and laboratory use

EMC requirements, Part 1: General requirements.

Commentary: If strong HF electromagnetic fields are expected in the place where transducer will be used, usage of 5mA analogue output is recommended, because in that case field influence on the transducer is the lowest.

SPECIFICATION AND ORDERING INFORMATION

For ordering it is necessary to declare type of the transducer (MI454), measuring range, output quantity and range, type of power supply and type of communication.

ORDERING CODE:

MI454 *b* Ω; *c*; *d*...*e* F; *G*(*h* V); *I*

MI454	Value	Code	
<i>b</i>	Measuring range: 0...100 Ω to 0...500 kΩ	$100 \Omega \leq b \leq 500 \text{ k}\Omega$	
<i>c</i>	Number of steps (TAP position): 0 - linear	$0 \leq c \leq 100$	
	1 to 100 steps		
<i>d</i>	Start value of output signal: 0...20 - current output 0...10 - voltage output	$0 \leq d \leq 20$	
<i>e</i>	End value of output signal: 0...20 - current output 0...10 - voltage output	$0 \leq d \leq 20$	
<i>F</i>	Type of output signal: current - mA	mA	
	voltage - V	V	
<i>G</i>	Type of power supply: universal power supply	U	
	AC power supply	A	
<i>h</i>	Value of power supply voltage (only for AC power supply)	57 V	57
		100 V	100
		110 V	110
		230 V	230
		300 V	300
<i>I</i>	Type of communication	RS 232	2
		RS 485	4
		no communication	0

Table 5: Ordering information

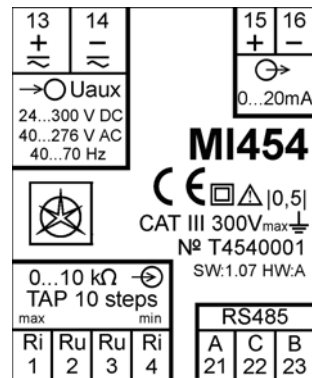
ORDERING EXAMPLE

Measuring transducer for TAP position MI454, with measuring range 0...10 kΩ, 10 steps, output range 0...20 mA, 110 V AC power supply and communication RS232.

MI454 10 kΩ;10; 0...20 mA; A 110 V; 2

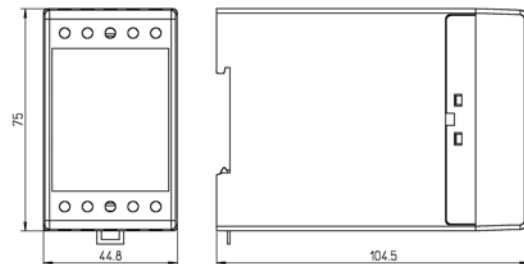
MARKING

One label at the front of housing (Picture 7):



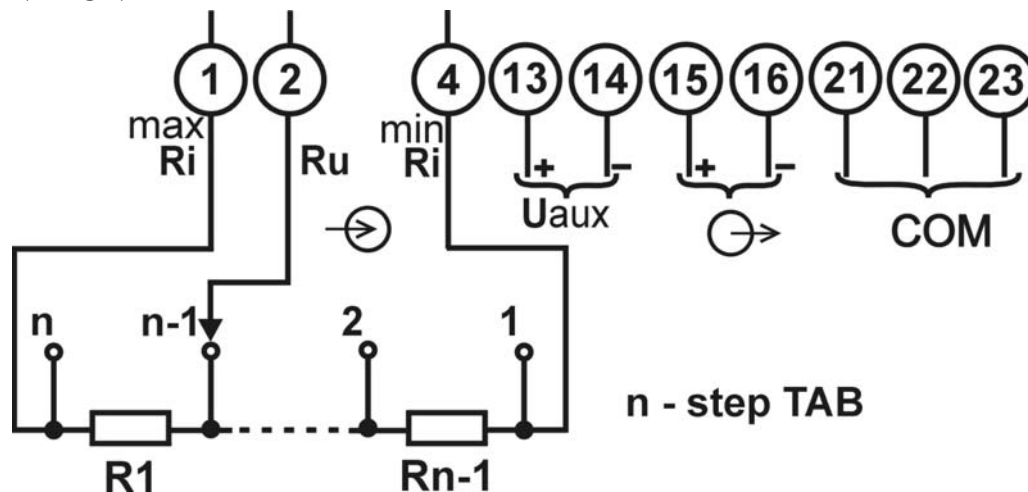
Picture 7: Example of label for MI454 transducer

DIMENSIONAL DRAWING



Picture 8: Dimensional drawing (all dimensions are in mm)

STEP DEFINITION



Picture 9: Example of n step TAB use

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