MI456
Programmable transducers for DC voltage

Iskra MIS, d.d.

FEATURES

- Measuring of DC voltage
- 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

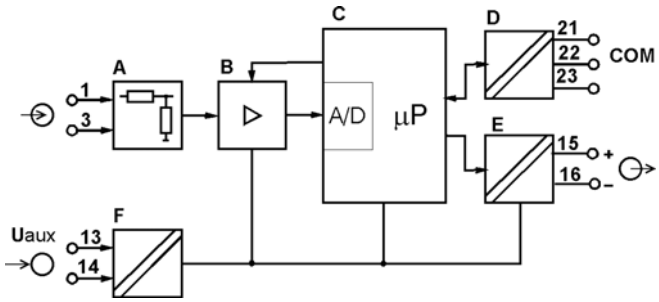
Picture 1: Programmable DC voltage transducer MI456

APPLICATION

Measuring transducer MI456 is designed for use in industrial process for conversion of DC voltage in to appropriate DC current or DC voltage signal. The analogue output signal is proportional to the measured value and it is appropriate for regulation of analogue and digital devices with reasonable dependence on environmental conditions, where they are planed to be used.

LAYOUT AND MODE OF OPERATION

Input signal is electrically isolated from the system by means of high resistance divider A (Picture 2) and amplified in 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 DC input voltage.
Communication, analogue output and auxiliary power supply are electrically insulated from other system by means of separation transformer.



Picture 2: Block diagram

PROGRAMMING

Input and output values are programmed[1)] by setting software MiQen via RS232 or RS485 communication. Before setting the transducer, output value must be selected by the jumpers on the output module[2)]. It is possible to chose between three ranges 0…±10 V, 0…±5 mA and 0…±20 mA. Within this three ranges is possible to set any linear or bent (with maximum 5 break points) output characteristic.

[1)] – Programming is not possible in versions without communication
2) – Qualified person only

VERSIONS

The following transducer versions are available (Table 1).

	Input	Input impedance	Output	Supply	Communication	Bent characteristic of analogue output
Programmable	50 mV to 1 V	> 2,5 MΩ	±5 mA ±20 mA ±10 V	Universal or AC: 57 V 100 V 230 V 400 V 500 V	RS232 or RS485	Programmable via communication
	1 to 50 V	250 kΩ				
	50 to 300 V	2,5 MΩ				
Fixed configuration	50, 100, 500 mV, 1V [3)]	> 2,5 MΩ	1 mA 5 mA 10 mA 20 mA 4...20 mA 1 V 10 V other on request	Universal or AC: 57 V 100 V 230 V 400 V 500 V	RS232 , RS485 or without communication	To be specified at the placing order
	1.5, 2, 2.5, 4, 5, 6, 10, 15, 20, 40, 50 V [3)]	250 kΩ				
	60, 100, 150, 200, 250, 300 V [3)]	2,5 MΩ				

Table 1: Versions of MI456
[3)] – Other versions on request, input impedance compliance with range

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

TECHNICAL DATA

GENERAL:

- Measured quantity: DC voltage
- Measured principle: microprocessor sampling

INPUT:

- Three versions of inputs [4] with programmable ratings:

Measuring range limit values:	Input impedance:
0...50 mV to 0...1 V	> 2,5 MΩ
0...1 V to 0...50 V	250 kΩ
0...50 V to 0...300 V	2,5 MΩ

- Consumption: < 0.5 VA
- Overload capacity: according to **EN 60688**: 1992

Measured quantity Un	Number of applications	Duration of one application	Interval between two successive applications
1.2 x Un	—	continuously	—
2 x Un	10	1 s	100 s

Table 2: Overload capacity:

[4] – Specification with order

ANALOGUE OUTPUT:

Programmable DC current output:

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

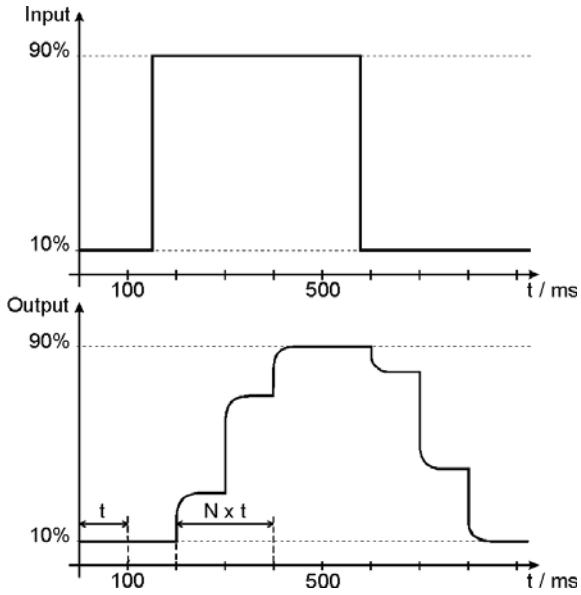
[5] - Depends of set jumpers on output module

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: $R_{Bmin}.[k\Omega] = \frac{U_{OutN}\,[V]}{20mA}$

General:

- Response time: programmable from 0.5 s to 3 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 end value
- Accuracy class [6]:

Analogue output:	Voltage	0.5 c
Communication:	Voltage	0.5

[6] – To calculate intrinsic error, see chapter intrinsic-error (for analogue outputs) on this page.

Reference conditions:

- Ambient temperature: 15…30 °C
- Input: 0…100 % Un

Influence quantities:

- Temperature influence: ±0.15% / 10K °C
- Long-term stability: ±0.15%
- Influence of serial disturbance 1Vac for ranges from 300V to 1V: <0.25%
- Influence of serial disturbance 100mVac for ranges from 1V to 100mV: <0.25%

Intrinsic-error (for analogue outputs):

For intrinsic-error for analogue outputs with bent or linear-zoom characteristic multiply accuracy class with correction factor (c).

Correction factor c (the highest value applies):

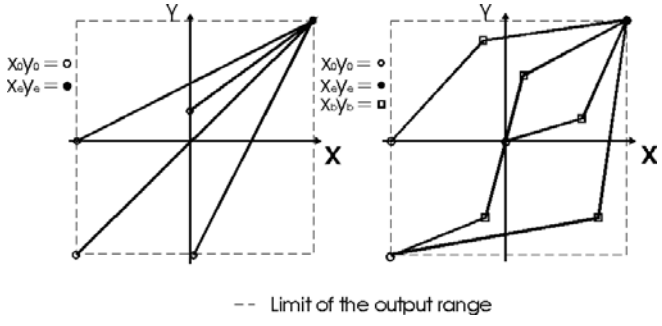
Linear characteristic

$$c = \frac{1 - \frac{y_0}{y_e}}{1 - \frac{x_0}{x_e}} \quad \text{or} \quad c = 1$$

Bent characteristic

$x_{b-1} \le x \le x_b$ b – number of break point (1 to 5)

$$c = \frac{y_b - y_{b-1}}{x_b - x_{b-1}} \cdot \frac{x_e}{y_e} \quad \text{or} \quad c = 1$$



Picture 3: Examples of settings with linear and bent characteristic

POWER SUPPLY:

Auxiliary AC/DC voltage (universal):

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

Auxiliary AC voltage:

Rated voltage (Ur)	Rated operating range
57.74 V 100 V 230 V 400 V [7)] 500 V [7)]	80…120 % Ur

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

Table 3: Rated AC voltage for Auxiliary power supply

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

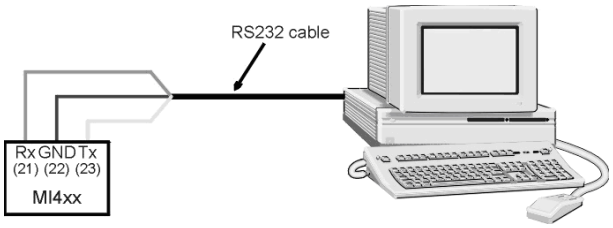
COMMUNICATION (OPTIONAL):

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

MI456	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 4: RS232 connections



Picture 5: Connection of MI456 on PC via RS232 communication

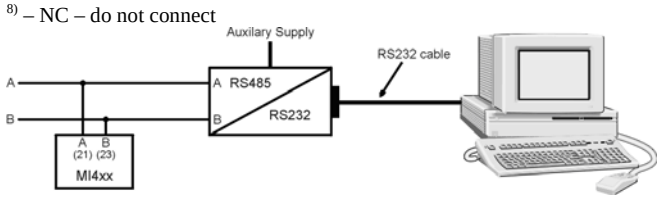
RS485

- 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

MI456	RS485
A (21)	DATA +
C (22)	NC [8)]
B (23)	DATA -

Table 5: RS485 connections

[8)] – NC – do not connect



Picture 6: Connection of MI456 on RS485 communication line

HOUSING:

- Material of housing: PC/ABS uninflammable, 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

CONECTION TERMINALS:

- Permissible cross section of the connection leads: ≤ 4.0 mm^2 single wire, 2 x 2.5 mm^2 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

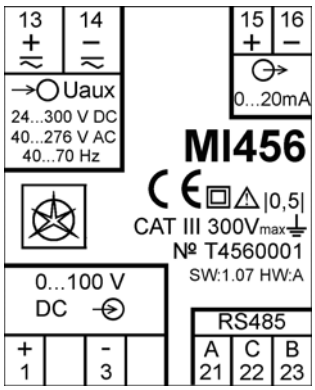
EMC directive **89/336/EEC**:
EN 61326-1: 1997
Electrical equipment for measurement, control, and laboratory use
EMC requirements, Part 1: General requirements.

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.

MARKING

Measuring transducers with linear characteristic:

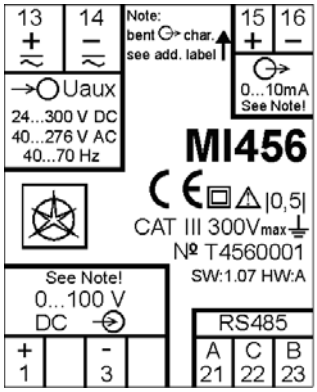
One label at the front of housing (Picture 7a):



Picture 7a: Example of label for transducer with linear characteristic

Measuring transducers with bent characteristic:

One label at the front of the housing and additional label at the top of the housing (Picture 7b):

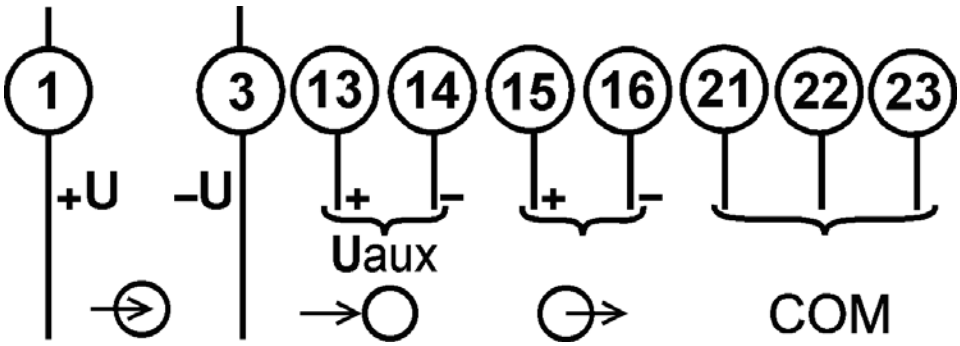


Break point	Input value [V]	Output value [mA]
start point	0	0
1	100	2
2	200	8
3	-	-
4	-	-
5	-	-
end point	400	10

Picture 7b: Example of label for transducer with bent characteristic

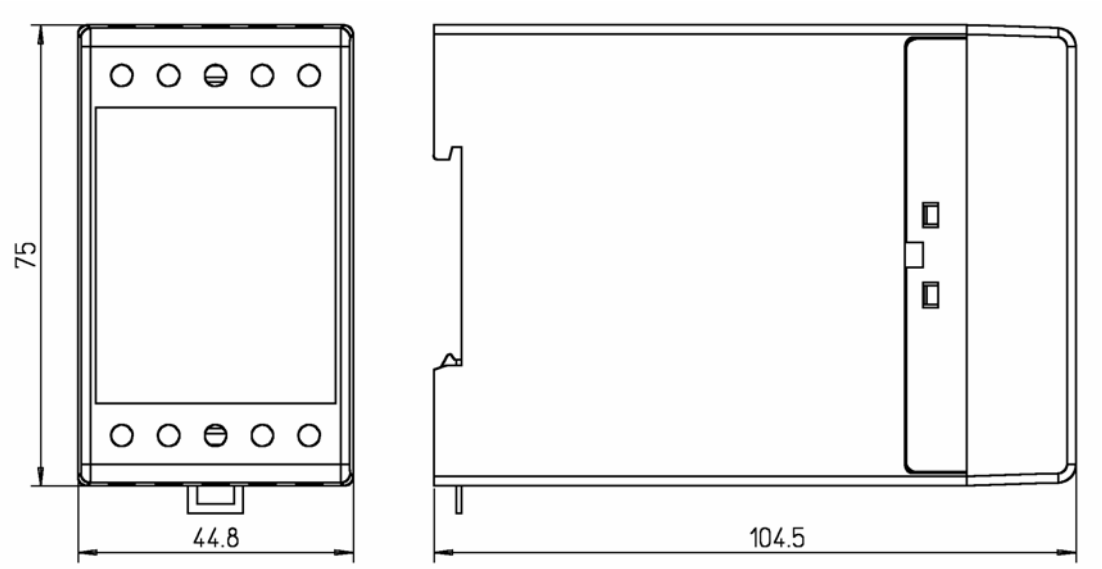
CONNECTION

Transducer is intended for connection in low voltage network.
The connection terminals marking can be found on the front plate.



Picture 8: Connection diagram

DIMENSIONAL DRAWING



Picture 9: Dimensional drawing (all dimensions are in mm)

SPECIFICATION AND ORDERING INFORMATION

For ordering it is necessary to declare type of the transducer (MI456), measuring range, output quantity and range, type of power supply, type of communication and shape of output characteristic.

ORDERING CODE:

MI456 ***b* V; *c…d* E; F(*g* V); H; *I***

MI456		Value	Code
b	Measuring range:	0…50 mV to 0…1 V	50 mV ≤ *b* ≤ 1 V
		0…1 V to 0…50 V	1 V ≤ *b* ≤ 50 V
		0…50 V to 0…300 V	50 V ≤ *b* ≤ 300 V
c	Start value of output signal	-20…20 - current output -10…10 - voltage output	-20 ≤ *c* ≤ 20
d	End value of output signal	0…20 - current output 0…10 - voltage output	1 ≤ *d* ≤ 20
E	Type of output signal	current - mA	mA
		voltage - V	V
F	Type of power supply	universal power supply	U
		AC power supply	A
g	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
H	Type of communication	RS 232	2
		RS 485	4
		no communication	0
I	Type of output characteristic	linear	L
		[9] bent 1…5 (number of break points)	1 ≤ *I* ≤ 5

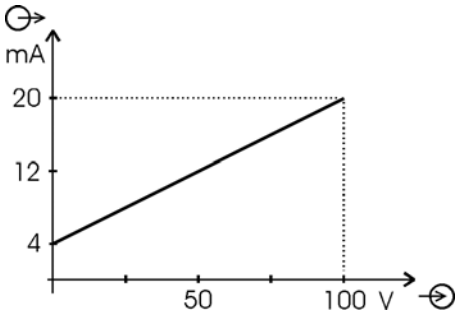
Table 6: Ordering information

[9] - For ordering code for bent characteristic see additional ordering information Table 7.

ORDERING EXAMPLE FOR TRANSDUCER WITH LINEAR OUTPUT CHARACTERISTIC

Measuring transducer MI456, with measuring range 0…100 V DC, output range 4…20 mA, 110 V AC power supply, communication RS232 and linear output characteristic (Graph 1).

MI456 100 V; 4…20 mA; A 110 V; 2; L



Graph 1: Example of linear output characteristic

Additional ordering information

For ordering transducer with bent characteristic it is necessary to declare breaking points in output characteristic (maximum 5 breaking points).

Ordering code for transducers with bent output characteristic:

MI456 b V; c…d E; F(g V); H; I ***(j_1/k_1; j_2/k_2;…)***

MI456		Value	Code
j	value of input quantity	depends of measuring range	-1/-50/-400 ≤ *j* ≤ 1/40/400 (depends of measuring range)
k	value of output quantity when input value is *j*	-20…20 (depends of output range)	-20 ≤ *k* ≤ 20

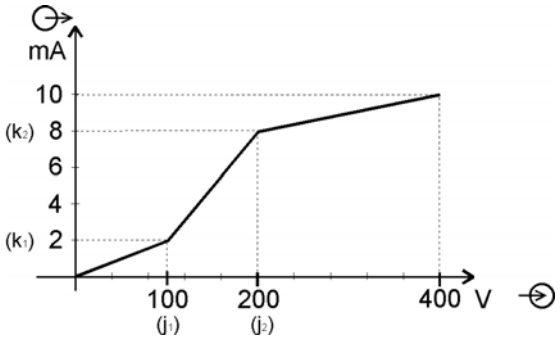
Table 7: Ordering information for bent characteristic

The sequence of breaking points must rise with measured quantity.

ORDERING EXAMPLE FOR TRANSDUCERS WITH BENT OUTPUT CHARACTERISTIC

Measuring transducer MI456, with measuring range 0…300 V, output range 0…10 mA, universal power supply, communication RS485 and bent output characteristic. The transducer is zooming the range from 100 V to 200 V (Graph 2)

MI456 300 V; 0…10 mA; U; 4; 2(100/2; 200/8)



Graph 2: Example of bent output characteristic with two breaking points.

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