

# Modbus Universal AI/DI Module DMB 96500



Read these instructions before using the product and retain for future information.

## DMB 96500

### ► Before Startup



When operating the module, certain parts can carry dangerous voltage! Ignoring the warnings can lead to serious injury and/or cause damage!

The module should only be installed and put into operation by qualified staff. The staff must have studied the warnings in these operating instructions thoroughly.

The module may not be put into operation if the housing is open.

In applications with high operating voltages sufficient distance and isolation as well as shock protection must be ensured.

Safe and trouble-free operation of this device can only be guaranteed if transport, storage and installation are carried out correctly and operation and maintenance are carried out with care.



Appropriate safety measures against electrostatic discharge (ESD) should be taken during range selection and assembly on the transmitter.

### ► Short description

The Modbus Universal AI/DI Module is intended to be used with a wide range of industrial sensors. All parameter can be set via Modbus RTU Interface. A subset of the most common settings is available via DIP switches.

The conversion result can be read over the Modbus RTU (RS485) interface. For further description of the Modbus Interface see: <http://4ez.de/601>

The 2-way isolation guarantees reliable decoupling of the sensor circuit from the processing circuit and the power supply circuit. Power supply and Modbus RTU can be connected via the connection terminals or via the In-Rail-Bus connector (see accessories).

### ► Configuration and startup

#### Configuration via DIP-switch and/or Modbus RTU

Modbus settings and sensor settings can be made independently via DIP-switch and/or Modbus RTU.

#### Configuration via Modbus RTU

All settings can be made via the Modbus RTU interface. For this all switches of the corresponding DIP-switch must be switched off (PC mode). S1 – Modbus settings / S2 – sensor settings

A manual including the complete register map is available at: <http://4ez.de/601>.

#### Configure with DIP switch

Via DIP switch you can set many of the device parameter according to the table below. Further settings can be made via Modbus RTU.

#### ► Mounting and electrical connection

The isolation transmitter is mounted on standard 35 mm DIN rail.

Terminal assignments	
1 RTD / R / Pot / TX+ / Namur+	5 Modbus A
2 RTD / R / Pot / U+ /	6 Modbus B
3 RTD / R / Pot / TX- / I+ / TC+ / mV+	7 Supply +
4 RTD / R / Pot / U- / I- / TC - / mV-	8 Supply - / Modbus C

#### ► Settings

Set the DIP switches as indicated in the following table:

DIP switch S1										• = ON
1	2	3	4	5	6	7	8	9	10	Address
•										9600
										19200
										38400
•										115200
										Parity Even
										Parity None
										4
										5
										... 127
										PC Mode

Factory settings: all switches in position OFF (PC Mode), the factory preset in PC-Mode is: Address 1, 19200 Baud, Parity Even.

DIP switch S2							• = ON
	1	2	3	4	5	6	7
PC-Mode							
USER SETTING 1							•
USER SETTING 2						•	
USER SETTING 3						•	•
USER SETTING 4					•		
USER SETTING 5					•	•	
USER SETTING 6					•	•	
USER SETTING 7					•	•	•
USER SETTING 8					•		
USER SETTING 9					•		•
USER SETTING 10					•	•	
USER SETTING 11					•	•	•
USER SETTING 12					•	•	
USER SETTING 13					•	•	•
USER SETTING 14					•	•	•
USER SETTING 15					•	•	•
±1 V					•		
±10 V mit TX					•		•
±100 V					•		•
±300 V					•		•
±1 mA					•	•	
±20 mA mit TX					•	•	•
±100 mA					•	•	•
Shunt ± 50 mV					•	•	•
Shunt ± 100 mV					•	•	•
Shunt ± 500 mV					•	•	•
Pt100					•		
Pt200					•		•
Pt500					•		•
Pt1000					•		•
Pt2000					•		•
Pt10000					•		•
JPt50					•	•	•
JPt100					•	•	•
Ni100					•		
Ni120 (Tk6370)					•		•
Ni200					•	•	•
Ni500					•		•
Ni1000					•		•
Ni1000 (Tk6370)					•	•	•
Ni1000 (Tk5000)					•	•	•
TC sensor type A					•	•	
TC sensor type B					•	•	•
TC sensor type C					•	•	•
TC sensor type D					•	•	•
TC sensor type E					•	•	•
TC sensor type J					•	•	•
TC sensor type K					•	•	•
TC sensor type L					•	•	•
TC sensor type N					•	•	•
TC sensor type R					•	•	•
TC sensor type S					•	•	•
TC sensor type T					•	•	•
TC sensor type U					•	•	•

DIP switch S2 (continuation)							• = ON
	1	2	3	4	5	6	7
R ≤ 500 Ω						•	
R ≤ 5 kΩ						•	•
R ≤ 20 kΩ						•	•
R ≤ 100 kΩ						•	•
Pot ≤ 500 Ω						•	•
Pot ≤ 5 kΩ						•	•
Pot ≤ 20 kΩ						•	•
Pot ≤ 100 kΩ						•	•
KTY210, KTY230, KTY21-6, KTY23-6						•	•
KTY21-5, KTY23-5						•	•
KTY21-7, KTY23-7						•	•
KTY81-110, KTY81-120, KTY81-150, KTY82-110, KTY82-120, KTY82-150						•	•
KTY81-121, KTY82-121						•	•
KTY81-122, KTY82-122						•	•
KTY83-110, KTY83-120, KTY83-150						•	•
KTY83-121						•	•
KTY83-122						•	•
KTY83-151						•	•
KTY83-152						•	•
KTY84-130, KTY84-150						•	•
KTY84-151						•	•
KTY84-152						•	•
KT100, KT110, KT130, KTY10-6, KTY10-62, KTY11-6, KTY13-6, KTY16-6, KTY19-6M, KTY19-6Z, ST-13, ST-15, ST-16, ST-20M, ST-20Z						•	•
KTY10-5, KTY11-5, KTY13-5						•	•
KTY10-7, KTY11-7, KTY13-7						•	•
KTY81-210, KTY81-220, KTY81-250, KTY82-210, KTY82-220, KTY82-250						•	•
KTY81-221, KTY82-221						•	•
KTY81-222, KTY82-222						•	•
KTY81-251, KTY82-251						•	•
KTY81-252, KTY82-252						•	•
KTY82-151						•	•
KTY82-152						•	•
F 1 Hz						•	•
F 10 Hz						•	•
F 100 Hz						•	•
F 1 kHz						•	•
F 10 kHz						•	•
F 200 kHz						•	•
PWM 1 Hz						•	•
PWM 10 Hz						•	•
PWM 100 Hz						•	•
PWM 1 kHz						•	•
PWM 10 kHz						•	•

DIP switch S2				• = ON		
RTD / KTY / R / Pot	TC CJC	U / I	F / PWM	8	9	10
4-wire	internal	DC	NAMUR			
3-wire	external Pt100 2-wire	AV (fast)	SN / Kontakt			•
2-wire	external Pt100 3-wire	AV (normal)	S0		•	
	external Pt1000 2-wire	AV (slow)	PNP		•	•
	external Pt1000 3-wire	RMS (fast)	NPN	•		
	OFF	RMS (normal)	Logic 5V	•		•
		RMS (slow)		•	•	

Factory settings: all switches in position OFF (PC Mode)

### LED indication

LED		Announcement
Green	continuous	Power LED
Green	flashing (1.5 Hz)	Input outside the measuring range
Green	flashing (5 Hz)	"Here I am"-mode active
Yellow	flashing	Modbus communication
Red	continuous	Device error
Red	flashing	Configuration error
Red	double flashing	Sensor break

Note: The red LED lights shortly at startup. This is not an error.

### U / I Calculation options

#### RMS and Average (AV)

An RMS or an average calculation can be applied to the voltage, current and shunt voltage measurement modes. The suffixes **slow**, **normal** and **fast** describe the time span over which the input values are averaged (**fast** = 20 ms, **normal** = 100 ms, **slow** = 500 ms). The RMS calculation is also available with 3 different gate times (**fast** = 200 ms, **normal** = 500 ms, **slow** = 1000 ms). A longer gate time results in a better noise reduction. However, this also increases the response time.

### Technical Data

Input		
Sensor / input signal	Measuring error	TC <sup>1)</sup>
Pt100	0.1K + 0.05% m.v.	0.02 K/°C
Pt200	0.3K + 0.05% m.v.	0.02 K/°C
Pt500	0.2K + 0.05% m.v.	0.02 K/°C
Pt1000	0.1K + 0.05% m.v.	0.02 K/°C
Pt2000	0.2K + 0.05% m.v.	0.02 K/°C
Pt10000 acc. IEC 60751	0.2K + 0.05% m.v.	0.06 K/°C
JPt50 (TK3916) acc. JIS C 1604	0.2K + 0.05% m.v.	0.03 K/°C
JPt100 (TK3916) acc. JIS C 1604	0.1K + 0.05% m.v.	0.02 K/°C
Ni100	0.1K + 0.05% m.v.	0.02 K/°C
Ni120	0.1K + 0.05% m.v.	0.02 K/°C
Ni200	0.1K + 0.05% m.v.	0.02 K/°C
Ni500	0.5K + 0.05% m.v.	0.02 K/°C
Ni1000	0.25K + 0.05% m.v.	0.02 K/°C
KTY (86 types)	0.1K + 0.05% m.v.	0.02 K/°C
Measuring rate Pt, Ni, KTY	4 / s	
Resistor 500 Ω, 5 kΩ, 20 kΩ, 100 kΩ	0.05 % full scale	100 ppm/K
Pot 500 Ω, 5 kΩ, 20 kΩ, 100 kΩ	0.05 %	100 ppm/K
Measuring rate Resistance / Pot	25 / s	
Cable resistance	< 100 Ω, programmable for 2-wire	
Connection / Sensor current	2-, 3-, 4-wire / 0.2 mA, 10 μA	
TC sensor type A	0.5K + 0.08% m.v.	0.1 K / °C
TC sensor type B	0.5K + 0.08% m.v.	0.15 K / °C
TC sensor type C	0.5K + 0.08% m.v.	0.1 K / °C
TC sensor type D	0.5K + 0.08% m.v.	0.1 K / °C
TC sensor type E	0.5K + 0.08% m.v.	0.05 K / °C
TC sensor type J	0.5K + 0.08% m.v.	0.05 K / °C
TC sensor type K	0.5K + 0.08% m.v.	0.05 K / °C
TC sensor type L	0.5K + 0.08% m.v.	0.05 K / °C
TC sensor type N	0.5K + 0.08% m.v.	0.05 K / °C
TC sensor type R	0.5K + 0.08% m.v.	0.1 K / °C
TC sensor type S	0.5K + 0.08% m.v.	0.1 K / °C
TC sensor type T	0.5K + 0.08% m.v.	0.05 K / °C
TC sensor type U	0.5K + 0.08% m.v.	0.05 K / °C
Measuring rate	4 / s	
Cold junction compensation	internal, external Pt100 / PT1000, programmable, uncompensated	
Current ± 1 mA, ± 20 mA, ± 100 mA	0.05 % full scale	100 ppm/K
Voltage ± 1 V, ± 10 V, ± 100 V, ± 300 V	0.05 % full scale	100 ppm/K
mV-Shunt ± 50 mV / ± 100 mV, ± 500 mV	0.05 % full scale	100 ppm/K
Measuring rate Current / Voltage	100 / s	
Input resistance	Voltage: >100 kΩ, Current: <55 Ω	
Measuring modes	DC, Average, RMS	
Additional measuring error in RMS mode (40 Hz to 500 Hz)	2 % m.v.	
Frequency ≤ 1 Hz (gate time 1000 s)	0.1 % full scale	100 ppm/K
Frequency ≤ 10 Hz (gate time 100 s)	0.1 % full scale	100 ppm/K
Frequency ≤ 100 Hz (gate time 10 s)	0.1 % full scale	100 ppm/K
Frequency ≤ 1 kHz (gate time 1 s)	0.1 % full scale	100 ppm/K
Frequency ≤ 10 kHz (gate time 100 ms)	0.1 % full scale	100 ppm/K
Frequency ≤ 200 kHz (gate time 10 ms)	0.1 % full scale	100 ppm/K
PWM ≤ 1 Hz (gate time 1000 s)	0.1 % full scale	100 ppm/K
PWM ≤ 10 Hz (gate time 100 s)	0.1 % full scale	100 ppm/K
PWM ≤ 100 Hz (gate time 10 s)	0.1 % full scale	100 ppm/K
PWM ≤ 1 kHz (gate time 1 s)	0.1 % full scale	100 ppm/K
PWM ≤ 10 kHz (gate time 100 ms)	0.1 % full scale	100 ppm/K
PWM measuring range	1 to 99 %	
Binary input types for frequency and PWM measurement mode	NAMUR, SN, NPN, PNP, Push-Pull, S0-Switch type B	
Push-Pull voltage level	3.3 V to 5 V	
NPN-Pullup	3.2 kΩ, always active	
PNP-Pulldown	11 kΩ, always active	

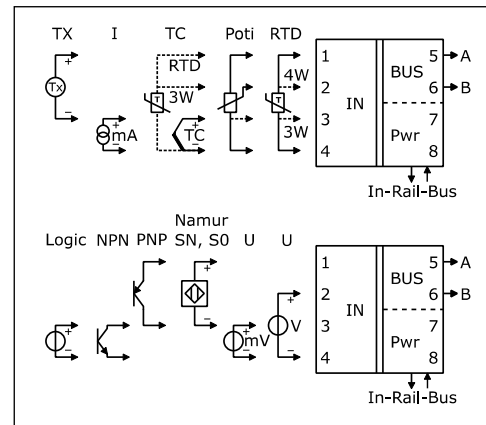
1) Average TC in specified operating temperature range, given in units of displayed error [K] per change in ambient temperature [°C]

### Technical Data

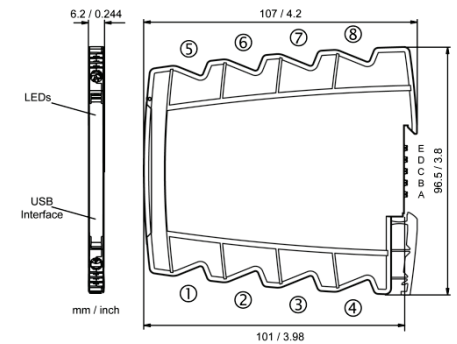
Output	
Protocol	Modbus RTU via RS485
Module addressing	1 to 247
Response delay	1 to 1000 ms, programmable
Baud rate	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 112500
Configuration	Parity: Even, Odd, None
Connectivity	Up to 247 DRAGO Modbus devices without additional repeater (1/8 Load)
Indication	Yellow LED on front panel
Measurement range	0 to 115 % (current and voltage modes)
General data	
Sampling rate	Up to 100 /s (depending on the applied measurement mode)
Test voltage	3 kV, 50 Hz, 1 min. Input against output / power supply
Working voltage <sup>1)</sup> (Basic insulation)	600 V AC/DC for overvoltage category II and contamination class 2 acc. to EN 61010-1
Protection against dangerous body currents <sup>2)</sup>	Protective Separation by reinforced insulation acc. to EN 61010-1 up to 300 V AC/DC for overvoltage category II and contamination class 2 between input and output / power supply.
Ambient temperature	Operation -25 °C to +70 °C (-13 to +158 °F) Transport -40 °C to +85 °C (-40 to +185 °F) and storage
Power supply	24 V DC 16.8 V to 31.2 V, approx. 1.3 W
EMC <sup>3)</sup>	EN 61326-1
Construction	6.2 mm (0.244") housing, protection type: IP 20 mounting on 35 mm DIN rail acc. to EN 60715
Connection terminals (see order information)	- Screw terminals (plus-minus clamp screws) - Cage clamp terminals (Push-In)
Weight	Approx. 70 g

- As far as relevant the standards and rules mentioned above are considered by development and production of our devices. In addition relevant assembly rules are to be considered by installation of our devices in other equipment. For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent situated devices.
- Minor deviations possible during interference

### Block Diagram



### Dimensions



### Connection data

Connection	Screw terminals	Push-In terminals
Wire cross-section stranded ferruled	0.5 mm <sup>2</sup> - 2.5 mm <sup>2</sup> AWG 20 - 14	0.5 mm <sup>2</sup> - 1.5 mm <sup>2</sup> AWG 20 - 16
Wire cross-section solid wire	0.5 mm <sup>2</sup> - 2.5 mm <sup>2</sup> AWG 20 - 14	0.5 mm <sup>2</sup> - 2.5 mm <sup>2</sup> AWG 20 - 14
Stripped length	8 mm / 0.3 in	8 mm / 0.3 in
Screw terminal torque	0.6 Nm / 5 lbf in	-

### Order Information

Modbus Universal AI/DI Module	Order No.
Screw terminals	DMB 96100 B
Push-In terminals	DMB 96104 B

### LIMITED WARRANTY

DRAGO Automation GmbH hereby warrants that the Product will be free from defects in materials or workmanship for a period of **five (5) years** from the date of delivery ("Limited Warranty"). This Limited Warranty is limited to repair or replacement at DRAGO's option and is effective only for the first end-user of the Product. This Limited Warranty applies only if the Product:

- is installed according to the instructions furnished by DRAGO;
- is connected to a proper power supply;
- is not misused or abused; and
- there is no evidence of tampering, mishandling, neglect, accidental damage, modification or repair without the approval of DRAGO or damage done to the Product by anyone other than DRAGO.

Delivery conditions are based upon the „GENERAL CONDITIONS FOR THE SUPPLY OF PRODUCTS AND SERVICES OF THE ELECTRICAL AND ELECTRONICS INDUSTRY“, recommended by the Zentralverband Elektrotechnik- und Elektronikindustrie (ZVEI) e.V. .

Subject to change!

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