11 UNIVERSAL MIXED MODULE - UM900

11.1 GENERAL INFORMATION

The universal mixed module is a combination of digital I/O modules and analog I/Omodules.
The status of digital I/O points are indicated using Status LEDs. A Status LED labeled "RUN" shows if D/A and A/D conversion is running.

11.2 TECHNICAL DATA

Module ID	UM900
Model Number	2UM900.6
Description	2010 Universal Mixed Module, 8 inputs, 24 VDC, 1 msec, 8 transistor outputs, 24 VDC, 0.5 A, 4 inputs, +/- 10 V, 12 Bit, 4 inputs, 0 to 20 mA, 12 Bit, 2 outputs, +/- 10 V, 12 Bit, 2 outputs, 0 to 20 mA, 11 Bit, Order terminal blocks separately!
C-UL-US Listed	Yes
B&R ID Code	$21
Base Plate Module	BP200, BP201, BP210
Inputs/Outputs	8 digital inputs 8 digital outputs 4 analog inputs 2 analog outputs
Electrical Isolation Input - PCC Output - PCC Group 1 - Group 2 Analog - Digital	 Yes Yes Yes Yes

Module ID	UM900	
Digital Inputs	8	
in 2 Groups of	4	
Input Voltage Nominal Maximum	 24 VDC 30 VDC	
Input Resistance	4 kΩ	
Switching Threshold LOW Range Switching Range HIGH Range	 <5 V 5 to 15 V >15 V	
Switching Delay log. 0 - log. 1 log. 1 - log. 0	 Typ. 1 msec / max. 1.2 msec Typ. 1 msec / max. 1.2 msec	
Input Current at Nominal Voltage	5 mA	
Maximum Peak Voltage	500 V for 50 µsec max. every 100 msec	
Connection	Sink	
Digital Outputs	8	
in 2 Group to	4	
Type	Transistor	
Switching Voltage Minimum Nominal Maximum	 18 VDC 24 VDC 30 VDC	
Continuous Current	0.5 A (simultaneousness 100 %)	
Leakage Current when Turned Off	0.3 mA	
Switching Delay log. 0 - log. 1 log. 1 - log. 0	 Typ. 5 µsec / max. 110 µsec Typ. 60 µsec / max. 100 µsec	
Switching Frequency (resistive load)	Max. 500 Hz	
Short Circuit and Overload Protection	Yes	
Starting after Overload Cutoff	Automatic within seconds (depending on module temperature)	
Short Circuit Current	0.75 to 1.5 A	
Protective Circuit Internal External	 Against overvoltage peaks up to 55 V (VDE 160) Against reverse polarity of the 24 V supply on the module Only if required (Surge)	
Reverse Voltage when Switching Off Inductive Loads	45 to 55 V	
Connection	Source	
Analog Inputs	4 (measurement range set with software)	
Input Signal Nominal Min./Max.	 -10 to +10 V -20 to +20 V	 0 to 20 mA -30 to +30 mA
Resolution	12 Bit	
Conversion Time for all Channels	≤1 msec	
Differential Input Resistance	Approx. 1 MΩ	----
Load	----	50 Ω
Voltage Drop at 20 mA	----	1 V

Module ID	UM900	
Analog Inputs		
Input Filter	Cutoff frequency: 400 Hz	
Measurement Precision Basic Precision at 20 °C Precision (0 to 60 °C) Common Mode Rejection	 ±0.25 % ±0.5 % 40 dB / 50 Hz	 ±0.25 % ±0.375 % 40 dB / 50 Hz
Analog Outputs	2 (voltage / current according to connection)	
Output Signal	-10 to +10 V	0 to 20 mA
Resolution	12 Bit	11 Bit
Conversion Time for all Channels	≤1 msec	
Output Filter	Cutoff frequency: 1 kHz	
Maximum Load per Output	10 mA (load ≥ 1 kΩ)	----
Short Circuit Protection (current limit)	Max. ±15 mA	----
Load	----	max. 600Ω
Precision Basic Precision at 20 °C Precision (0 to 60 °C)	 ±0.25 % ±0.5 %	 ±0.5 % ±0.75 %
Power Consumption	Max. 8 W	
Dimensions (H, W, D) [mm]	285, 40, 185	

11.3 STATUS LEDS

—< •— Indicates the status of the terminal block. i.e. if this LED is lit, either there is no terminal block connected or the terminal block is improperly connected. If the terminal block is not connected, (—< •— is lit), all outputs are turned off and held to 0 V.

RUN Indicates that the analog/digital converter is running and the module is being accessed via the I/O bus. The RUN LED goes out if the terminal block is removed.

OVL1/2 Overload: This LEDs indicates that the overload or short circuit cutoff is activated for the respective LED group. If e.g. LED OVL1 is lit, that means at least one of the digital outputs from 1 to 4 has been turned off (see section "Overload Protection for Digital Outputs").

AI1 ... AI4 These LEDs are lit if the respective analog input is set for current measurement (the measuring resistance is turned on).

1 ... 8 DIGITAL OUT: LEDs 1 to 8 show the logical state of the respective digital outputs.

1 ... 8 DIGITAL IN: LEDs 1 to 8 show the logical state of the respective digital inputs.

11.4 REMOVING POWER ON DIGITAL OUTPUTS

By removing the terminal block, the terminal block contacts of the output module is turned off. This prevents any wear on the contacts because the terminal block is always inserted or removed without power. The logical state is retained when the terminal block is removed, i.e. immediately after re-inserting the terminal block, the outputs can continue from where they left off.

11.5 OVERLOAD PROTECTION FOR DIGITAL OUTPUTS

The overload protection is activated in the following instances:

- Junction temperature exceeds the allowed limits (typ. 150 °C, min. 135 °C, Max. 175 °C).
  Causes: Short circuit, overload or high environmental temperature.
- The 24 V supply voltage (terminal block side) is less than typ. 13 V (min. 10 V, Max. 14.5 V)

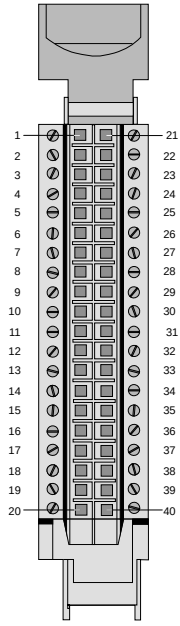
The affected output remains with the power off until ...

... the junction temperature is again within the allowed limits (hysteresis typ. 20 °C). This happens within seconds.

... the supply voltage is again within the allowed limits (typ. > 14.5 V).

... the terminal block is properly connected.

11.6 TERMINAL ASSIGNMENTS



TB140

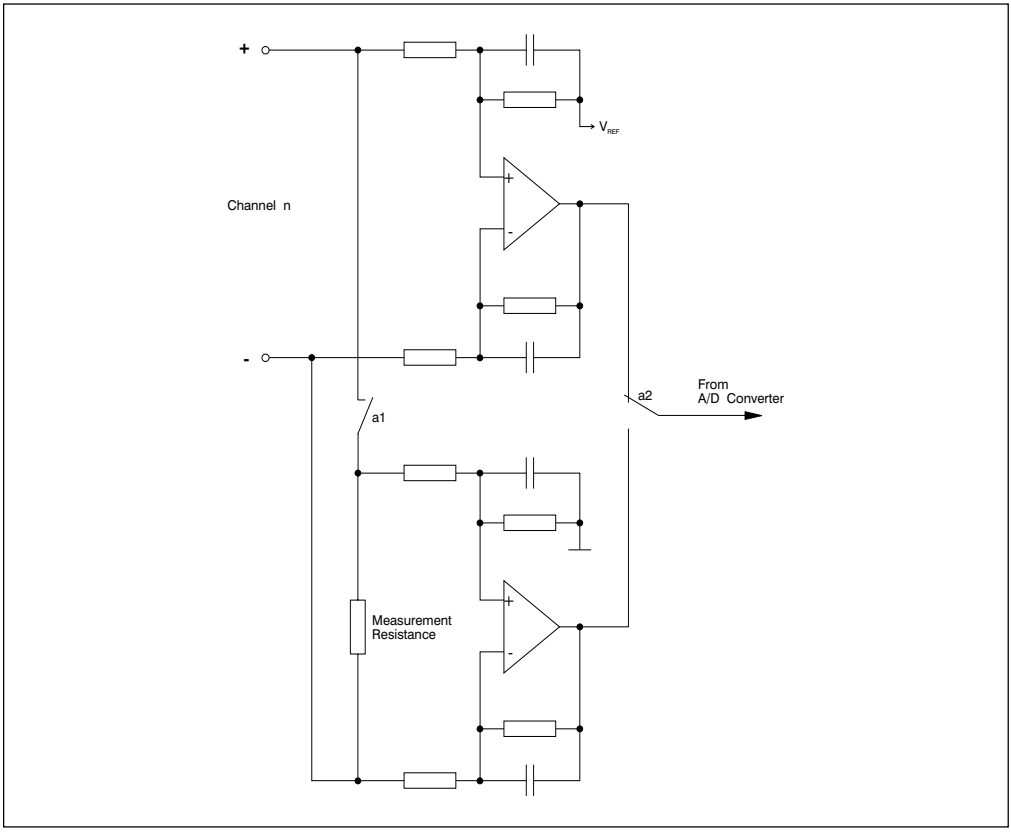
Terminal	Analog Inputs	Terminal	Analog Inputs
1	+ Input A1	21	+ Input A3
2	- Input A1	22	- Input A3
3	+ Input A2	23	+ Input A4
4	- Input A2	24	- Input A4
5	Shield	25	Shield
	Current Outputs		**Voltage Outputs**
6	+ Output I1	26	+ Output U1
7	- Output I1	27	- Output U1
8	+ Output I2	28	+ Output U2
9	- Output I2	29	- Output U2
10	Shield	30	Shield
	Digital Inputs/Outputs Group 1		**Digital Inputs/Outputs** Group 2
11	Input D1	31	Input D5
12	Input D2	32	Input D6
13	Input D3	33	Input D7
14	Input D4	34	Input D8
15	+24 V (1)	35	+24 V (2)
16	Output D1	36	Output D5
17	Output D2	37	Output D6
18	Output D3	38	Output D7
19	Output D4	39	Output D8
20	GND1 / COM1	40	GND2 / COM2

Connecting the Signal Cable

Shielded cable must be used for analog output modules. The connection is made exactly the same as for modules AO300 and AO725.

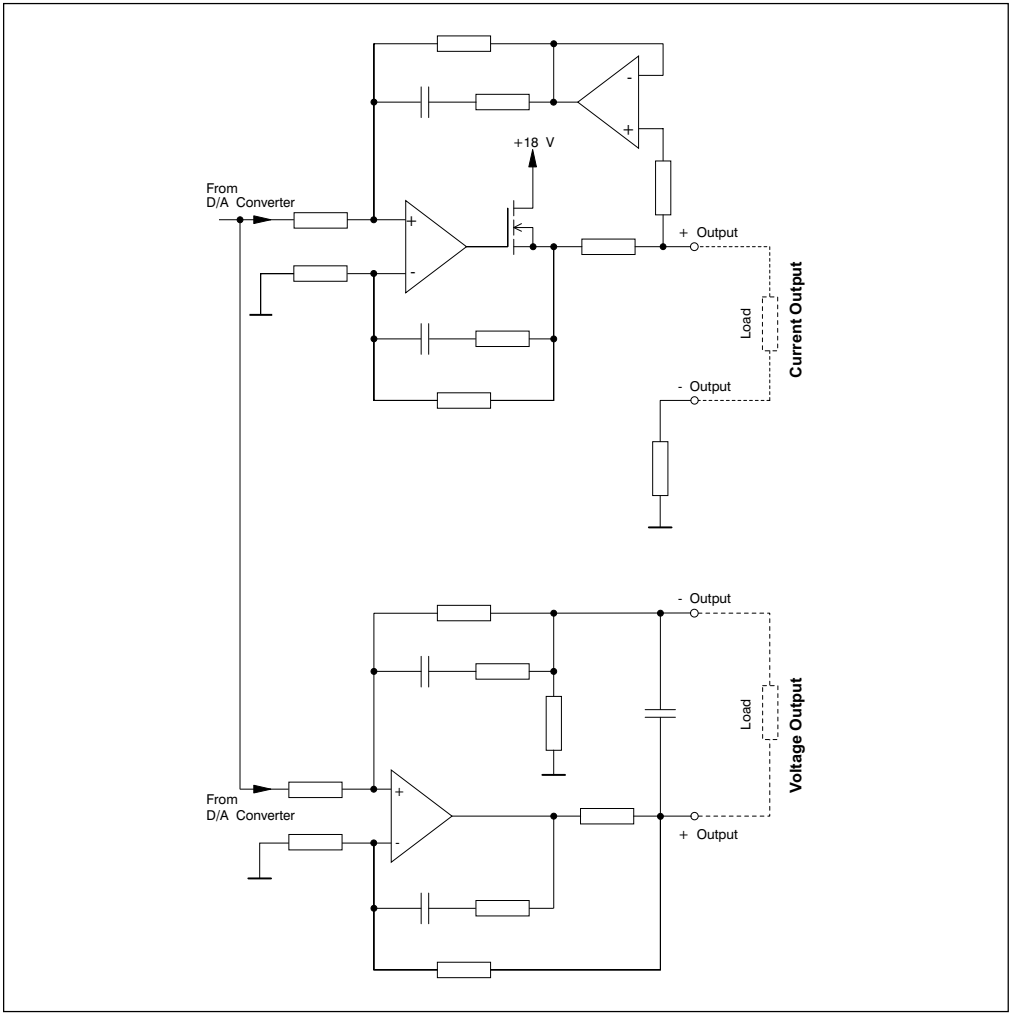
11.7 ANALOG INPUTS

The measurement range for the analog inputs can be set with a configuration register in the status area. Two bits are reserved for each channel. One bit switches on the shunt resistance (50 Ω) for each relay. The second bit changes the measurement range (also see section "Configuration Register").



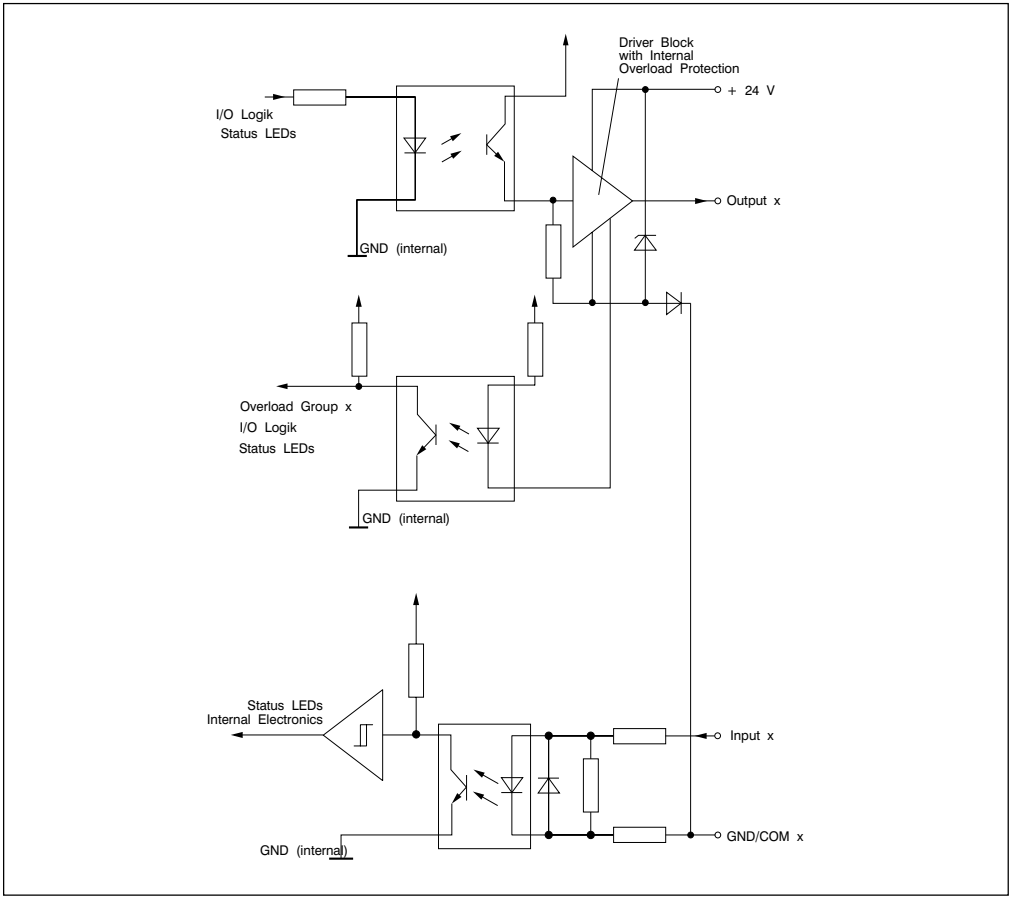
11.8 ANALOG OUTPUTS

Two analog outputs are available, whereas each channel is available on the terminal block as current and voltage output. If analog output 1 is written to by the CPU, the output voltage (Output U1) and output current (Output I1) change to correspond to the value written.



11.9 DIGITAL INPUTS/OUTPUTS

The digital inputs/outputs are divided into two groups, whereas each group contains both inputs and outputs. The groups are electrically isolated from each other. Pin +24 V supplies the outputs with voltage. Pin GND / COM is used as the reference potential (supply) for the outputs and also as common for the inputs.



11.10 PROGRAMMING

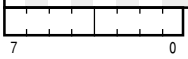
The digital/analog I/O are addressed directly via their variable names in the application program. The relationship between the I/O on a certain module and the variable names is defined in the variable declaration. The declaration is made exactly the same way for every programming language using a table editor.

11.11 VARIABLE DECLARATION

Function	Variable Declaration				
	Scope	Data Type	Length	Module Type	Channel
Read Single Digital Input (Channel x)	tc_global	BIT	1	Digit. In	129 ... 136
Read Digital Inputs as Byte Bit 0 ... DIN 1 Bit 7 ... DIN 8	tc_global	BYTE	1	Transp. In	16
Single Digital Output (Channel x)	tc_global	BIT	1	Digit. Out	129 ... 136
Digital Outputs as Byte Bit 0 ... DOUT 1 Bit 7 ... DOUT 8	tc_global	BYTE	1	Transp. Out	16
Single Analog Input (Channel x)	tc_global	INT16	1	Analog In	1 ... 4
Single Analog Output (Channel x)	tc_global	INT16	1	Analog Out	1 ... 2
Read Status Register	tc_global	BYTE	1	Status In	0
Change Measurement Range by Writing to the Configuration Register	tc_global	BYTE	1	Status Out	1

Status Register

REGISTER READ	Bit	Description
	7	AI4 - Additional information
	6	AI3
	5	AI2
	4	AI1
	3	OVL2 - Overload in digital group 2 (DOUT 5 - 8)
	2	OVL1 - Overload in digital group 1 (DOUT 1 - 4)
	1	RUN - Analog section
	0	FKL - Terminal block status



AIx The additional information contains the settings for the four analog inputs.
0 ..... High resistance input (voltage measurement)
1 ..... 50Ω - Input (current measurement)

OVL2 Overload in digital group 2 (DOUT 5 - 8).
0 ..... OK
1 ..... Overload

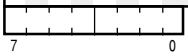
OVL1 Overload in digital group 1 (DOUT 1 - 4).
0 ..... OK
1 ..... Overload

RUN Status of the analog section.
0 ..... Not active
1 ..... Active

FKL 0 ..... Terminal block is connected properly.
1 ..... No terminal block connected.

Configuration Register

REGISTER	WRITE	Bit	Description
		7	ANI4 - Change measurement range for channel 4
		6	ANI4
		5	ANI3 - Change measurement range for channel 3
		4	ANI3
		3	ANI2 - Change measurement range for channel 2
		2	ANI2
		1	ANI1 - Change measurement range for channel 1
		0	ANI1



ANI4 00 ..... ±10 V (default)
11 ..... 0 to 20 mA

ANI2 00 ..... ±10 V (default)
11 ..... 0 to 20 mA

ANI3 00 ..... ±10 V (default)
11 ..... 0 to 20 mA

ANI1 00 ..... ±10 V (default)
11 ..... 0 to 20 mA

Settings 01 or 10 are not allowed!

11.12 RELATIONSHIP BETWEEN INPUT VOLTAGE/INPUT CURRENT AND CONVERTER VALUE

The converter value (INT16 format) changes in steps of 16 (..., -16, 0, 16, 32, ...).

Converter Value			
Hexadecimal	**Decimal**	**Input Current**	**Input Voltage**
8000	-32768	----	≤ -10 V
FFF0	-16	----	-4.88 mV
0000	0	0 A	0 V
0010	16	9.766 µA	4.88 mV
7FF0	32752	≥ 20 mA	≥ 10 V

11.13 RELATIONSHIP BETWEEN NUMBER VALUE AND OUTPUT CURRENT/OUTPUT VOLTAGE

Number Value			
Hexadecimal	**Decimal**	**Output Current**	**Output Voltage**
8000	-32768	0 A	-10 V
C000	-16384	0 A	-5 V
FFF0	-16	0 A	-4.88 mV
0000	0	0 A	0 V
0008	8	0 A	0 V
0010	16	9.76 µA	4.88 mV
4000	16384	10 mA	5 V
7FF0	32752	20 mA	10 V
7FF8	32760	20 mA	10 V