MT 5011   for RS 232
MT 5012   for RS 485
MT 5013   for TTY, Current Loop

Digital Indicating Devices

with serial input

Instruction Manual

ERMA

Electronic GmbH

Warranty

For delivered products our "Allgemeine Lieferungs- und Zahlungsbedingungen" are effective. In no event ERMA-Electronic or its suppliers shall be liable for any other damages whatsoever (including, without limitation, damages for loss of business profits, business interruption or other pecuniary loss) arising out of or inability to use this product.

All products from ERMA-Electronic are warranted against defective material and workmanship for a period of two (2) years from date of delivery. If it is necessary to return the product to ERMA, the sender is responsible for shipping charges, freight, insurance and proper packaging to pre-vent breakage in transit. ERMA's warranty does not apply to defects resulting from action of the buyer, such mishandling, improper interfacing, operation outside of design limits, improper repair or unauthorized modification.

Trademarks

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Contents

1. Description

The digital panel meters **MT 5011, MT 5012 and MT 5013** are universal instruments for displaying serial transmitted ASCII-Codes.

Following interfaces are available:

MT 5011:   RS 232 signal input
MT 5012:   RS 485 signal input
MT 5013:   TTY (Current Loop, 20 mA) signal input

Following characters can be displayed:

- -, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

- blank, decimal point

- "+" is shown as a blank

Standard hardware

- Three digital inputs

- Dual setpoint controller with relay outputs

Standard software

- Programmable baud rate (1200, 2400, 4800, 9600 Baud)

- 3 selectable address characters

- Possibility to mask out max. 127 characters

- Display test

2. Safety instructions

This instrument is produced in accordance with Class II of IEC 348 and VDE 0411. When delivered the instrument has been tested to meet all functions described. Before installing the instrument please read the mounting and servicing instructions.

We have no liability or responsibility to customer or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused directly or indirectly by equipment or software sold or furnished by us. Read the installation instruction carefully. No liability will be assumed for any damage caused by improper installation.

Inspect the instrument module carton for obvious damage. Be shure there are no shipping and handing damages on the module before processing. Do not apply power to the instrument if it has been damaged.

ERMA's warranty does not apply to defects resulting from action of the buyer, such as mishandling, improper interfacing, operation outside of design limits, improper repair or unauthorized modifications.

2.1. Explanation of symbols

Caution	Attention	Instruction	Hint

Caution: **Dangerous!**

Attention: Will cause **damage**.

Instruction: If not noticed, **trouble** may occur.

Hint: Useful hints for **better operation**.

3. Mounting

3.1. Place of operation

Attention must be paid to the protection against humidity, dust and high temperatures at the place of operation.

3.2. Panel mounting

3.2.1. Panel for switch board

- For mounting in switch boards, insert the case into the panel cutout (according to DIN 43700: $138,0^{+1,0}$ x $68,0^{+0,7}$ mm) from the front, using a fresh gasket for sealing as required. Click into and place at each side the two fastening clips (M2,5 x 50 mm).

- Tighten the screws alternately, using enough pressure to get good retention and sealing at the panel.
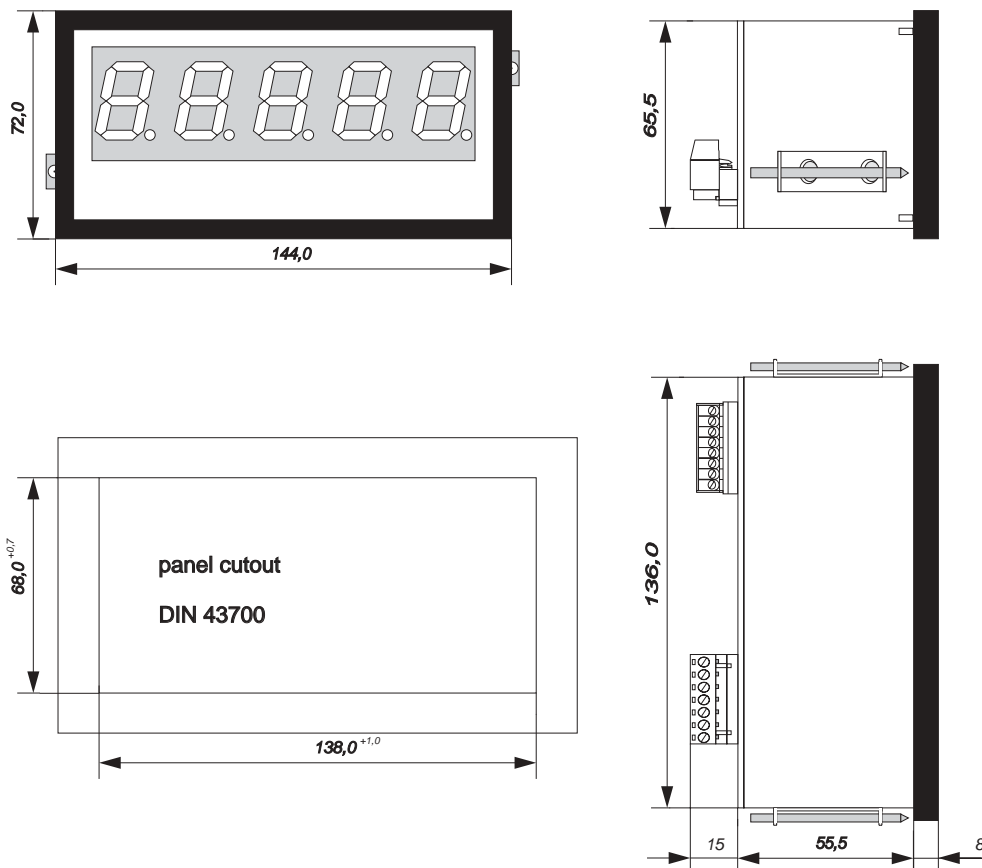
3.2.2. Panel for mosaic systems

- Insert the case into one of the following mosaic-systems:

  a) Mosaic-system 8RU (M50x25) from Siemens

  b) Mosaic-system from Subklev
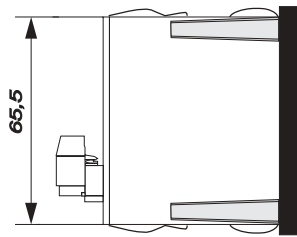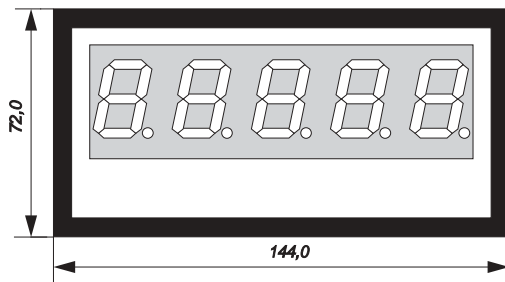
mosaic-system:

Siemens 8RU (M50x25)

Subklev
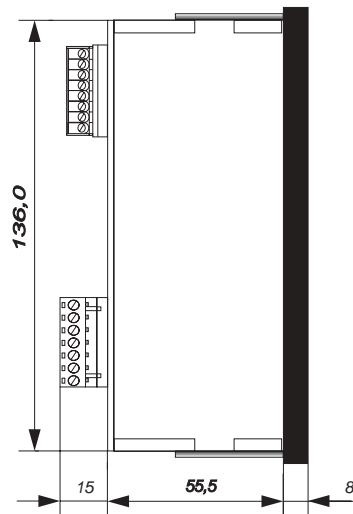
4. Electrical connections

4.1. General instructions

- It is forbidden to plug or unplug connectors with voltage applied
- Attach input and output wires to the connectors only without voltages applied
- Cords must be provided with sleeves
- Attention must be paid that the power supply voltage applied will agree with voltage noticed at the name plate.
- The instrument has no power-on switch, so it will be in operation as soon as the power is connected.

4.2. Hints against noisy environment

All inputs and outputs are protected against noisy environment and high voltage spikes. Nevertheless the location should be selected to ensure that no capacitive or inductive interference can have an effect on the instrument or the connection lines.

It is advisable:

- To use shielded cables.
- The wiring of shields and ground (0V) should be star-shaped.
- The distance to interference sources should be as long as possible. If necessary, protective screen or metal enclosures must be provided.
- Coils of relays must be supplied with filters.
- Parallel wiring of input signals and AC power lines should be avoided.

4.3. *Connection and pin assignment*

All inputs and outputs are connectors, designed as plug-in screw terminals.
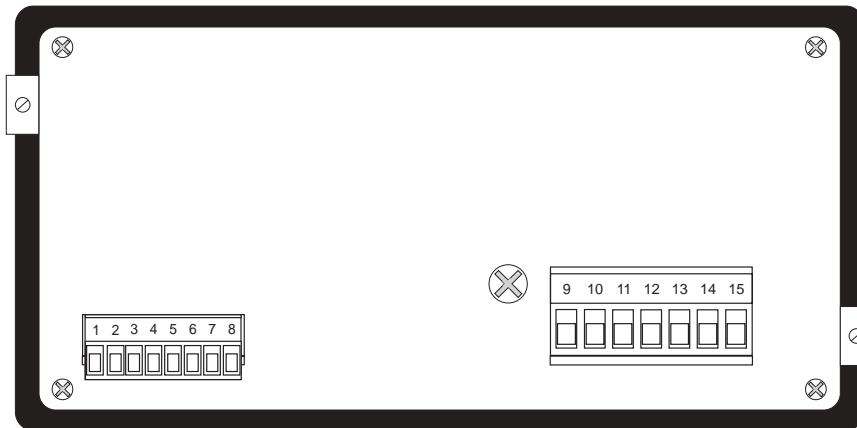
Pin assignment:

1	n.c.	9	alarm 1
2	n.c.	10	alarm 1
3	digital input 1/display test	11	alarm 2
4	digital input 2	12	alarm 2
5	digital input 3	13	ground
6	MT 5011: n.c. MT 5012: RS 485-input, A(+) MT 5013: n.c.	14	supply voltage (-)
7	MT 5011: RS 232-input TxD MT 5012: RS 485-input, B(-) MT 5013: TTY-signal (+)	15	supply voltage (+)
8	MT 5011: RS 232-input GND MT 5012: RS 485-input GND MT 5013: TTY-signal (-)		

4.4. *Connection of serial input signals*

4.4.1. Connection of RS 232-signals for MT 5011

RS232-interface
TxD
GND

7: TxD
8: GND
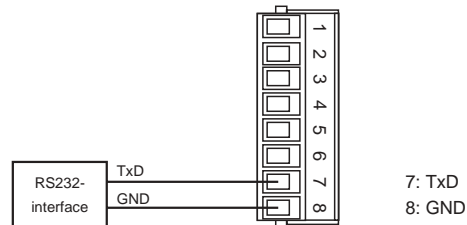
4.4.2. Connection of RS 485-signals for MT 5012

RS 485 A(+)
RS 485 B(-)
(GND)

6: RS 485, A(+)
7: RS 485, B(-)
8: GND
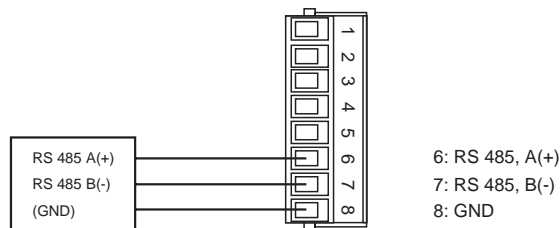
4.4.3. Connection of Current Loop signals for MT 5013

TTY-interface
TTY +
TTY -

7: TTY +
8: TTY -

4.5. *Digital inputs*

3: input 1

8: GND
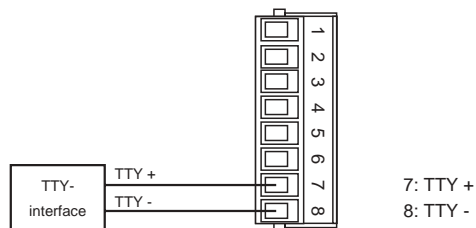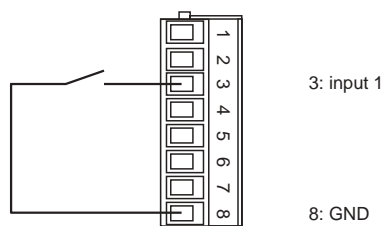
Digital input 1

- active => connecting screw terminal 3 to 8
- connecting to ground, low-active

Digital input 2

- active => connecting screw terminal 4 to 8
- connecting to ground, low-active

Digital input 3

- active => connecting screw terminal 5 to 8
- connecting to ground, low-active

4.6. Connection of alarm outputs

9: alarm 1
10: alarm 1
11: alarm 2
12: alarm 2
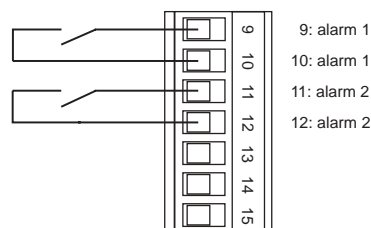
4.7. Connection of power supply voltage

DC-supply
18-36 V/DC

13: Ground
14: GND
15: 18..36V/DC
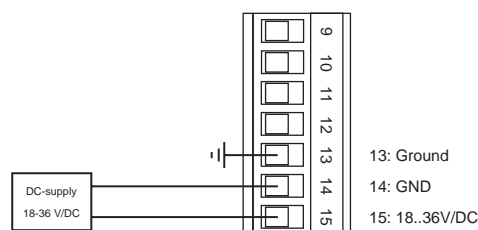
5.   *Start-Up*

Attention must be paid that the power supply voltage applied will agree with the voltage noticed at the name plate.

Switch the power supply on (supply voltage applied to 14 (-) and 15 (+)).

When delivered, the instrument is programmed with a standard configuration (default configuration). According to his measuring task, the customer can change the standard configuration by programming.

Attention: When the instrument is built-in a machine and the customer wants to change the configuration, attention must be paid, that no damage will occur to the machine!

6. *Procedure of programming*

The procedure of programming is organized in different steps and can be carried out via the screw terminals 3, 4 and 5 at the rear of the instrument. It is advisable to connect a push button to the screw terminals 3 - 5.

3: "P"-button
4: "+"-button
5: "-"-button

8: GND
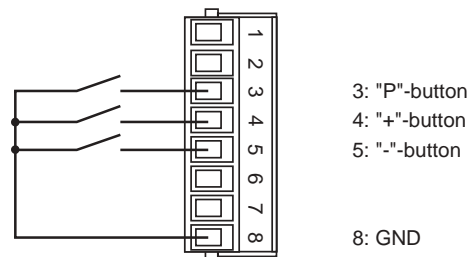
Push Button	Pressing
screw terminal 3 "**P**" - button	selection of - programming level - parameter
screw terminal 4 "**+**" - button	increase of - programming level - number of parameter - parameter
screw terminal 5 "**-**" - button	decrease of - programming level - number of parameter - parameter

Activating the programming routine

- Press "P"-button together with "+"-button
- The display shows "P-00"

Leaving the programming routine

- Press "+"-button or "-"-button until the display shows "PEnd"

- Confirm the display "PEnd" by pressing "P"-button

- Return to normal measuring

Selection of a programming level

- Selecting a programming level by pressing the "+"-button or "-"-button

- Confirm the selected programming level by pressing the "P"-button

- The display shows the parameter number of the selected programming level
  e.g.: "0-00" => Parameter 0 of programming level 0
  e.g.: "3-00" => Parameter 0 of programming level 3

Leaving a programming level

- Press "+"-button or "-"-button until the display shows "xEnd"
  e.g.: "0End" =>leaving programming level 0
  e.g.: "3End" =>leaving programming level 3

- Confirm the display "xEnd" by pressing "P"-button

- The display shows the programming level
  e.g. "P-00" => programming level 0
  e.g. "P-03" => programming level 3

Selection of a parameter

- Selection the parameter by pressing "+"-button or "-"-button

- Confirm the parameter by pressing "P"-button

- The display shows the last programmed value of the selected parameter

Change and confirm a selected parameter

- Change the parameter by pressing the "+"-button or "-"-button

- Confirm the parameter by pressing "P"-button

The display shows the programming level and the number of the parameter
e.g.: "0-05" => Parameter 5 of programming level 0
e.g.: "3-03" => Parameter 3 of programming level 3

6.1. Summary of the programming level

The parameters of the panel meter are organized in different programming levels.

P-00: Programming level for general configuration of the panel meter
This level is used to adapt the panel meter and the serial interface.

P-03: Programming level for the alarm configuration
All settings for the alarms can be changed in this programming level.

6.2. Programming level for configuration P-00

Param.	Description	Range	Default Value
0-00	Reserve: no function	-	-
0-01	Reserve: no function	-	-
0-02	Selection of baud rate: 0 -> 9600 Baud 1 -> 4800 Baud 2 -> 2400 Baud 3 -> 1200 Baud	0 .. 3	0
0-03	Brightness of the display 0 -> Brightness 50 % 1 -> Brightness 100 %	0 .. 1	1
0-04	1.address character, decimal selectable	1 .. 127	2
0-05	2.address character, decimal selectable	0 .. 127	48
0-06	3.address character, decimal selectable	0 .. 127	49
0-07	Number of characters to mask out	0 .. 127	0
0-08	Reserve: no function	-	-
0-09	Reserve: no function	-	-
0End	Leaving programming level P-00		

6.3.   Programming level of alarms P-03

Param.	Description	Range	Default Value
3-00	Configuration of alarm 1 0 -> alarm 1 off 1 -> contact closed by high limit 2 -> contact closed by low limit	0 .. 2	0
3-01	Alarm 1, alarm value	-999 .. 9999	0
3-02	Alarm 1, hysteresis	0 .. 99	0
3-03	Configuration of alarm 2 0 -> alarm 2 off 1 -> contact closed by high limit 2 -> contact closed by low limit	0 .. 2	0
3-04	Alarm 2, alarm value	-999 .. 9999	0
3-05	Alarm 2, hysteresis	0 .. 99	0
3-06	Reserve: no function		
3-07	Reserve: no function		
3-08	Reserve: no function		
3-09	Reserve: no function		
3End	Leaving programming level P-03		

If other characters as -, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 are transmitted, the alarm values **must** be deactivated.

6.3.1. Alarm high setpoint

Alarm active
to high limit

Alarm value +
hysteresis

Alarm value

Alarm value -
hysteresis

Alarm watched
signal

6.3.2. Alarm low setpoint

Alarm active
to low limit

Alarm value +
hysteresis

Alarm value

Alarm value -
hysteresis

Alarm watched
signal
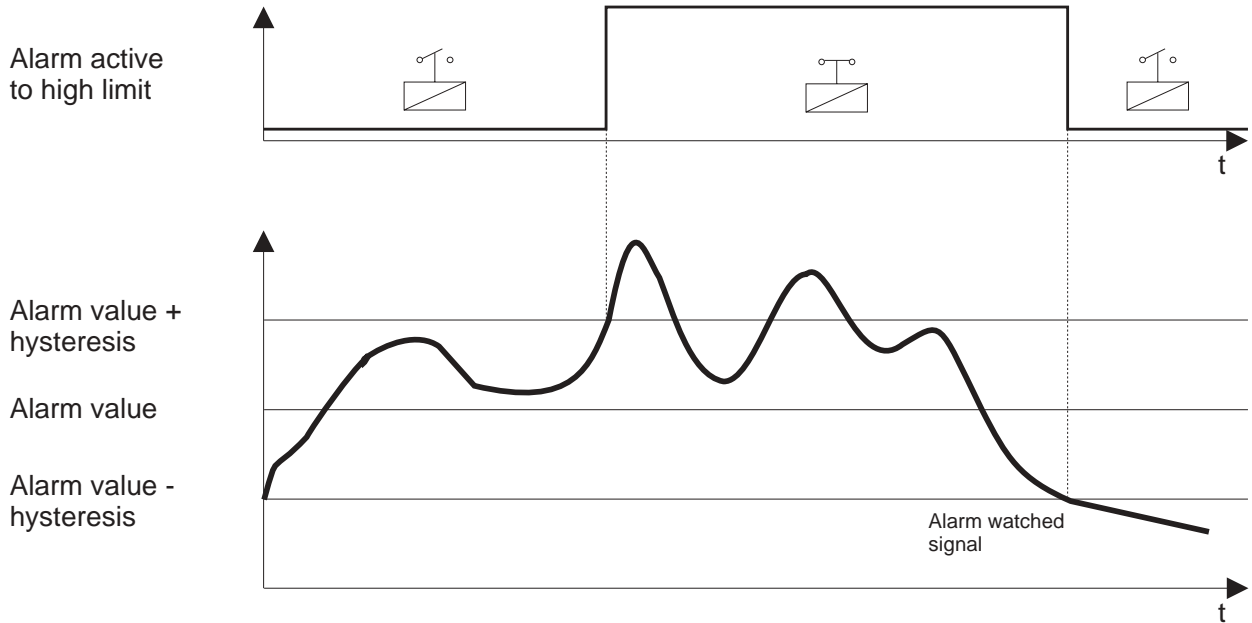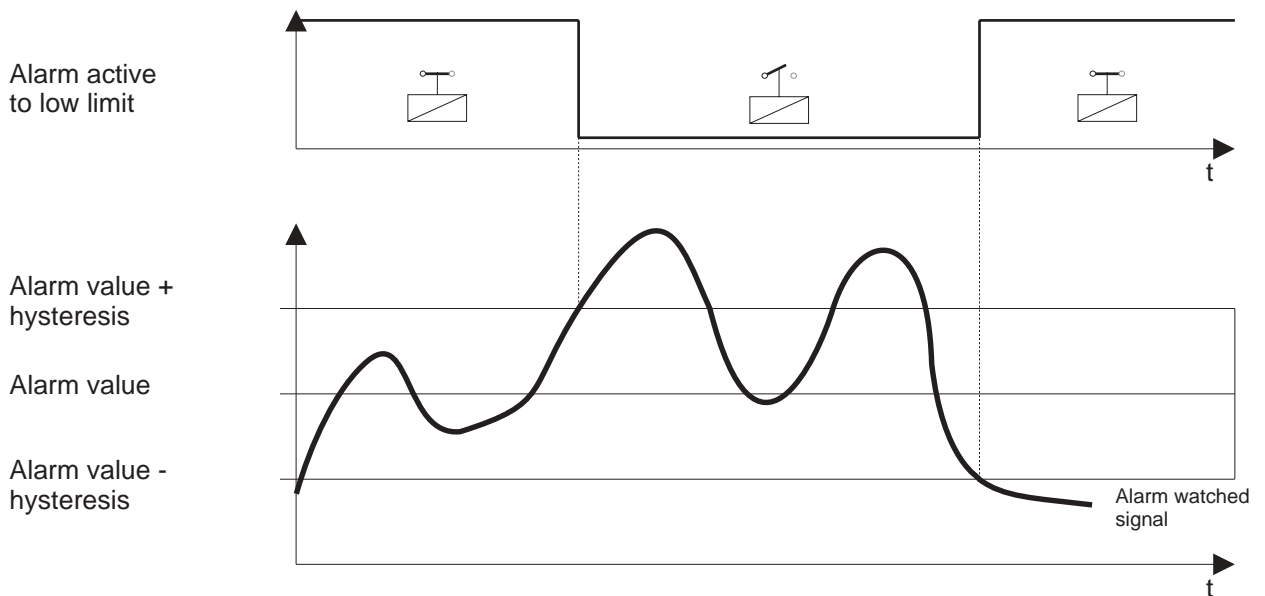
6.4. Programming quick reference

Press "P"-button and "-"-button

operation level	P

- ⓐ ← P-00 + → P-01 + → P-02 + → P-03 + → PEnd → ③ +
- ③ ← P-00 → P-01 → P-02 ⑨ P-03 → PEnd ← ⓐ
- ②

0-00	Reserve
0-01	Reserve
0-02	Baud rate
0-03	Brigthness
0-04	1. address character
0-05	2. address character
0-06	3. address character
0-07	Number of characters to mask out.
0-08	Reserve
0-09	Reserve
0End	① +

3-00	configuration of alarm 1
3-01	alarm 1, alarm value
3-02	alarm 1, hysteresis
3-03	configuration of alarm 2
3-04	alarm 2, alarm value
3-05	alarm 2, hysteresis
3-06	reserve
3-07	reserve
3-08	reserve
3-09	reserve
3End	⑦ +

Description	
P ≡	pressing "P"-button (screw terminal 3)
+ ≡	pressing "+"-button (screw terminal 4)
- ≡	pressing "-"-button (screw terminal 5)

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7.   Utilization of the serial interface

7.1.   Data format

The format of transmission is built up as listed below:

1 Startbit	8 Databits	2 Stopbits

The baud rate of the interface can be set in parameter 0-02. Following baud rates are available: 1200, 2400, 4800 or 9600 baud.

7.2.   Transfer characteristic

Transmissions are built up as listed below:

AC1	AC2	AC3	Y .. Y	XXXXX

List of characters:

AC1: First address character, decimal adjustable from 1 to 127
       Recommended adjustment: 2_D (corresponding STX)

AC2: Second address character, decimal adjustable from 1 to 127
       Recommended adjustment: 48_D - 57_D a. 65_D - 70_D (corr. 0 - 9 a. A - F)

AC3: Third address character, decimal adjustable from 1 to 127
       Recommended adjustment: 48_D - 57_D u. 65_D - 70_D (corr. 0 -9 u. A - F)

The first address character must be programmed. In addition the second and the third address character can be programmed. Setting the corresponding parameters to 0, the second and the third address character are deactivated.

Y..Y: Number of characters which can be masked out, adjustable from 0 to 127.

The 5 characters following the last address character will be displayed. There can be a maximum of 127 other characters between the address characters and the real characters that will be displayed.

XXXXX: Characters which will be displayed
(only following characters are approved)
-, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9,
A, B, C, D, E, F
blank, decimal point
"+" is shown as a blank

! In addition to the 5 characters, one decimal point can be displayed.

Example:

The signal sequence 123.5F of the following transmission should be displayed.

The transmission is built up as listed below:

"**<STX>Te**mperature is *123.5F*"

The **address characters** are STX, T and e.

Decimal values:

	ASCII-character	Decimal value
Parameter 0-04	**STX**	2
Parameter 0-05	**T**	84
Parameter 0-06	**e**	101

The number of characters that are masked out is 13.
The parameter 0-07 have to be programmed with 13.

By starting the transmission, **123.5F** will be displayed.

8.   Software functions

8.1.   Display test

When activating the display test all segments of the display are light on. The display shows "**8.8.8.8.8.**"

Activating the display test:

• By activating the digital input 1, connecting screw terminal 3 and 8

9.   Technical Specifications

Display range	: 5 characters
Communications protocol	: 1 start bit, 8 data bits, 2 stop bits
	1200, 2400, 4800 or 9600 Baud
Input	
MT 5011	: RS 232
MT 5012	: RS 485
MT 5013	: TTY, (Current Loop, 20mA)
Digitale inputs	: 10 kΩ pull-up +5 V
Low-level	: < 0,4 V
High-level	: > 3,5 V, max. 30 V
Display	: 5 decades, 25 mm, red
optional	: green
Power supply	: 18 to 36 V DC (isolated)
power consumption	: max. 65 mA (red display)
	: max. 75 mA (green display)
optional	: 12 V DC, ± 10 % (isolated)
	: 5 V DC, ± 10 % (isolated)
Alarms	
relay output AC	: max. 5 A, 250 V, 1250 VA
relay output DC	: max. 5 A, 250 V, 100W
Case	: 144 x 72 x 63,5 mm
depth	: < 72 mm (incl. plug-in screw terminal)
protection case, at the front	: IP 40
protection case, connection	: IP 20
EMC	: in conform with 89/336/EWG
Operating temperature	: 0 bis 50 °C

10. Ordering Information

MT 501X -						Case	
						0	Panel mounting
						1	Panel-clip
					Front becel color		
					0	Black	
				Front design			
				0	Without front foil		
				1	Front foil ERMA-METER		
				2	Front foil NEUTRAL		
			Display color				
			0	Red			
			1	Green			
		Power supply					
		0	5 V DC, ± 10 % (isolated)				
		1	12 V DC, ± 10 % (isolated)				
		2	18 to 36 V DC (isolated)				

Pay attention to the ordering number. Please order MT 5011, MT 5012 or MT 5013. (Dependent on the signal input)

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11. Supplement A - ASCII-table

Dec.	Charac.	Dec.	Charac.	Dec.	Charac.	Dec.	Charac.
0	NUL	32	SP	64	@	96	`
1	SOH	33	!	65	A	97	a
2	STX	34	"	66	B	98	b
3	ETX	35	#	67	C	99	c
4	EOT	36	$	68	D	100	d
5	ENQ	37	%	69	E	101	e
6	ACK	38	&	70	F	102	f
7	BEL	39	´	71	G	103	g
8	BS	40	(	72	H	104	h
9	HT	41	)	73	I	105	i
10	LF	42	*	74	J	106	j
11	VT	43	+	75	K	107	k
12	FF	44	,	76	L	108	l
13	CR	45	-	77	M	109	m
14	SO	46	.	78	N	110	n
15	SI	47	/	79	O	111	o
16	DLE	48	0	80	P	112	p
17	DC1	49	1	81	Q	113	q
18	DC2	50	2	82	R	114	r
19	DC3	51	3	83	S	115	s
20	DC4	52	4	84	T	116	t
21	NAK	53	5	85	U	117	u
22	SYN	54	6	86	V	118	v
23	ETB	55	7	87	W	119	w
24	CAN	56	8	88	X	120	x
25	EM	57	9	89	Y	121	y
26	SUB	58	:	90	Z	122	z
27	ESC	59	;	91	[	123	{
28	FS	60	<	92	\	124	¦
29	GS	61	=	93	]	125	}
30	RS	62	>	94	^	126	~
31	US	63	?	95	_	127	(DEL)

12. Notices

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