

Operating Instructions

Tachometer TA 201

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General

Meanings of symbols used in these operation instructions:

Explanation of symbols:

- This symbol represents an activity to be carried out
- This symbol represents supplementary technical information



This symbol indicates instructions or information which is of particular importance to ensure the correct use of the TA 201



This symbol indicates important additional information.

Italics

To permit you to find information quickly, key terms are indicated on the left-hand column in italics.

1. Safety remarks

The electronic tachometer is constructed in line with the state of the art. Only ever use the TA 201

- when in a technically flawless condition,
- in accordance with its intended application
- and paying attention to safety and potential hazards, in accordance with the operating instructions.

Use in accordance with the intended application

The electronic tachometer may only be used as a built-in device in interior working environments in production lines in the metal, wood-working, plastics, paper, glass and textile industries.

The TA 201 may only be operated when correctly installed.

The TA 201 may only be operated in accordance with the data provided in chapter 6.



The TA 201 is not approved for use in potentially explosive atmospheres, in the medicinal appliance sector or in spheres of application specifically mentioned in VDE 0411 Part 100.



If the TA 201 is used for the control of machines or operating processes in which failure or an operating error at the TA 201 could result in damage to the machine or injury to operating staff, the necessary safety precautions must be taken.

Organizational measures

Ensure that the operating staff have read and understood the operating instructions, in particular the chapter „Safety remarks“. In addition to these operating instructions, general statutory and other binding directives and regulations governing the prevention of accidents and environmental protection must be observed and adhered to.

Safety-conscious operation

In the event of changes (including operating behaviour) which impair working safety, withdraw the TA 201 from service immediately.

Installation

When executing installation work at the TA 201, always switch off the electrical supply first. Installation may only be carried out by suitably qualified staff. Before putting the TA 201 into operation, check the position of the voltage selection switch, and ensure that the device is set for the required voltage.

2. Getting to know the TA 201

The TA 201 comprises

- two separate tachometer units, tachometer 1 with an internal phase evaluator
- programmable measurement functions

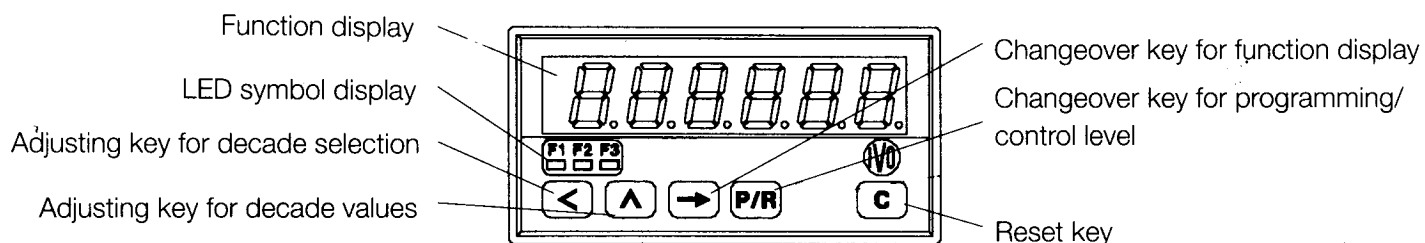
Components of the TA 201

Control panel

- Changeover key for function display
- Adjusting key for decade selection
- Adjusting key for decade values
- Changeover key for programming/control level
- Reset key

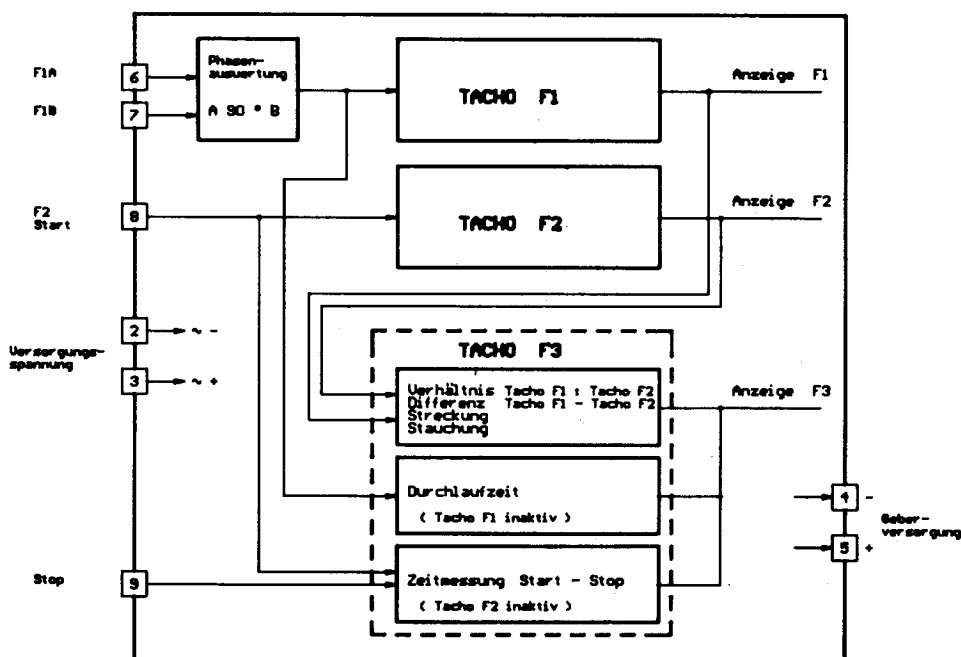
LED symbol display

- F1 Display tachometer 1
- F2 Display tachometer 2
- F3 Display of measurement function



2.1 Block diagram of the TA 201

The block diagram indicates the components of the TA 201, as well as terminals and connection points.



3. Connecting the TA 201

This chapter first describes terminal assignment of the TA 201, followed by some connection examples.

Chapters 3.1 to 3.3 provide concrete remarks and specifications regarding the individual terminals.

The electrical inputs and outputs are configured on two plug-in screw terminals. The two 9-pole screw-type terminal is coded without pole loss.

Connection examples Terminal assignment

Terminal	Function
1	Not assigned
2	Supply voltage
3	Supply voltage
4	Encoder supply 0 volts
5	Encoder supply +24 volts
6	Signal f1/A (track A)
7	Signal f1/B (track B)
8	Signal f2/Start
9	Signal Stop



To ensure compliance with shock hazard protection as per VDE 0411 Part 100, stranded conductors may only be connected using connector sleeves with insulating caps. Terminals which are not assigned in the factory must not be otherwise assigned by the user. We recommend shielding all encoder connecting leads and earthing the shield at both ends in order to avoid HF interference. The encoder connecting leads should not be laid in the same cable line as the power supply and the output contact leads.

3.1 Connecting the supply voltage

For alternating current connection

It is possible to switch between two different alternating voltage ratings as required using the voltage changeover switch accessible from the side of the device. The higher of the two alternating voltage ratings (48 V or 230 V) is set in the factory.

Supply voltage Alternating voltage	Recommended external fusing
24 V ± 10% 50/60 Hz	T 400 mA
48 V ± 10% 50/60 Hz	T 400 mA
115 V ± 10% 50/60 Hz	T 100 mA
230 V + 6%, -10% 50/60 Hz	T 100 mA

- Set the required alternating voltage at the voltage selector switch.
- Connect alternating voltage to terminals 2 and 3 in accordance with the terminal diagram of the TA 201

For direct voltage connection

Supply voltage Direct voltage	Recommended external fusing
24 V ± 10% max. 5 % RW	T 400 m

Connect an interference-free supply voltage, i.e. do not use the supply voltage for the parallel connection of drive systems, contactors, solenoid valves etc.

- Connect direct voltage in accordance with the terminal diagram of the TA 201



Fire protection: Operate the device using the recommended external fusing indicated in the terminal diagram. According to VDE 0411, in case of a fault 8 A / 150 VA (W) must never be exceeded.



3.2 Assigning the signal inputs

Terminals 6 to 9 are signal inputs. Terminals 6 (f1/A) and 7 (f1/B) are inputs for the tachometer display F1. The type of signal and signal logic are determined in lines 23 and 24 of the program.

Terminal 8 (f2/Start) serves

- as a signal input for tachometer display F2
- or as a start input for time measurements depending on the setting in line 21 of the program.

Terminal 9 (stop) is used as a stop input in the case of time measurements.

Input resistance	appr. 5 kOhm
Max. input level	+/-50 Volts
Max. frequency F1	10 kHz
Max. frequency F2	40 kHz/25 Hz

→ Assign terminals 6 to 9 accordingly.

For suitable pulse encoders, see the IVO encoder catalogue.

3.3 Connecting the encoder supply



Connect the encoder supply at terminals 4 and 5. However, do not use the encoder supply to supply unearthed inductances or capacitive loads.



The encoder supply is not short circuit-proof.

Terminal	Voltage	Maximum residual ripple	Maximum permissible current
4	0V	-	-
5	+24 VDC +10%/-50%	Depending on load	100 mA

3.4 Executing the test routine

The test routine is described below.

- Test start*
- Press keys **[<]** and **[P/R]** at the same time.
 - Switch on the TA 201 (hold down the above keys for this period)
 - All display segments are displayed automatically in sequence and so performance tested.

Test extension → Using the **[>]** key, test the keyboard and the inputs in turn.

t A S t E Keyboard test

i n A b c d Input test


- The inputs can be triggered simultaneously or individually. The display is active in the idle status.

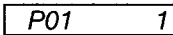
Display examples **P 0 1 1** Display: Program number and version number

9 4 Display: Program date

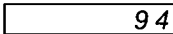
t e s t n Test of various input levels (operating points), signal forms and of the phase discriminator (test of numbers 1 to 9)

Test end The test routine can only be interrupted by switching off the device. After switching the mains supply back on, the TA 201 is automatically ready for operation.

Test program version Press the  key, switch on the TA 201 (hold the key down for this period).



Display: Program number and version number



Display: Program date

4. Working with the TA 201

Operation and application of the TA 201 are described in this chapter.

- After switching on the supply voltage, the TA 201 is automatically ready for operation.

Operating level On the operating level, it is possible

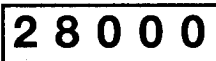
- to read tachometer display F1, e.g. supply speed;
- to read tachometer display F2, e.g. rpm;
- read the measurement display F3, e.g. ratio between F1:F2;

On the programming level, it is possible to disable all parameters (for more information, see also chapter 5, programming field 2.)

Operating/programming the TA 201


Tachometer display F1

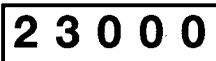
Read → Read the displayed value

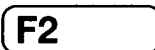





Tachometer display F2

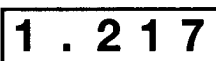
Read → Press the key 
→ Read the displayed value

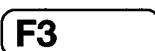




Measurement function F3

Read → Press the key 
→ Read the displayed value







5. Programming the TA 201

This chapter describes the process used to program the TA 201.


Programming level On the programming level, it is possible to adjust the operating parameters. The programming level is subdivided into three different programming fields.


1st programming field In the first programming field, it is possible to access and modify all the operating parameters. Those operating parameters which are disabled on the operating level are also displayed here. The first programming field consists of 3 lines.


2nd programming field In the second programming field, the individual operating parameters can be disabled and enabled for access to the operating level.
It is possible to access disabled operating parameters from the first programming field.

3rd programming field In the third programming field, it is possible to program all machine-related functions and values, as well as the interface parameters.

Key assignment For the individual programming fields, the assignment of keys is the same. There can be a difference between the key assignment used on the operating and programming level. For this reason, all functions are described here in full.


Function on the operating and programming level Key  Switches to the next operating parameter on the operating and programming level. For fast run-through, keep the key pressed down.

Function on the operating and programming level Key  Switches over between programming and operating level

Function on the operating and programming level Key  Selects the first or next required decade. The respective selected decade position flashes.

Function on the operating level Key  Deletes the display.

Function on the programming level Deletes the display. Reset to the value zero. Reset of possible programmed operating values.

Function on the operating level Key  When this key is pressed, the respective decade position switches on by one value.

Function on the operating and programming level When the key is pressed, the respective decade position switches on by one point until the maximum setting value is reached.

Programming set-up and the three programming fields are now described in order of their application.

Switching on the programming function

- Press the key **P/R**
- The system switches from the operating to the programming level
- The **Code** display appears.
The code exists for programming fields 1 - 3
- Enter the code **<** and **^**
- Press the key **->**



There is no code entered on delivery.

Incorrect code

- Entering an incorrect code:
- **Code** appears in the display after pressing the **P/R** key
 - After 15 seconds, the system switches automatically back to the operating level
 - Press the key **P/R**
 - Enter the correct code

Unknown correct code

- If you do not know the correct code:
- Send the TA 201 back to the manufacturer

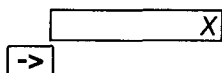
Correct code

- If the code is correct, press the key **->**
- The programming fields are then accessed one after the other

Programming field 1

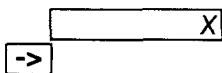
- For information on the displays and on modification of the individual values, see chapter 4.
- Press the key **->** again
 - Select the operating parameters. The respective LED flashes

Line 1



F1 display tachometer 1

Line 2

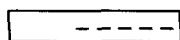


F2 display tachometer 2

Line 3



F3 display for the measurement function



- After completion of the first programming field, a dotted line appears in the display.

Programming field 2

In the second programming field, the letters StAt appear, standing for status selection.

- StAt appears in the display. The LED for the respective operating parameter flashes.

Meaning of the status numbers

0	Operating parameter can be selected, read and deleted in the operating level.
1	Operating parameter can be selected and read in the operating level.
2	Operating parameter is completely disabled for the operating level. If this operating parameter is selected, it is not displayed on the operating level but bypassed. The respective function is retained.

Modifying the status

- Enter the respective status number
- The altered status number is automatically stored when the next programming line is selected
- Press the key **->** again
- The status of every individual operating parameter is selected in sequence.

Line 11

S t A t	0
---------	---

 F1 display tachometer 1
-> 1
 2

Line 12

S t A t	0
---------	---

 F2 display tachometer 2
-> 1
 2

Line 13

S t A t	0
---------	---

 F3 display of measurement function
-> 1
 2

- After completion of this programming line, a dotted line appears in the display. The dotted line represents the end of the second programming field.



The default operating parameter status is zero.

Programming field 3 Programming field 3 begins with programming line 21. In this programming field, the programming lines are displayed in sequence. The default setting is always written s p a c e d o u t.

- ➔ Press the key [->] again, for fast run-through hold the key down.
- The programming lines are selected in sequence. To switch back through the program lines, hold down the [^] key at the same time.

The input is stored when you use the [P/R] key to switch back from the programming to the operating level.

Line 21

21	0
----	---

Ratio F1:F2
-> 1 Difference between F1 - F2 (with sign)
 2 Extension/compression (with sign)
 3 Throughfeed time of a defined path
 4 Time measurement via start and stop signal
 5 Time measurement of period duration
 6 Time measurement of pulse duration
 7 Pulse rate measurement

Line 22

22	0
----	---

Measurement function 0, 1 and 2
-> 1 Measurement function as in line 21
 1 F1 - F2 exchanged

Line 23

23	0
----	---

F1 signal type and max. frequency of F2
-> 1 Track A possibly with up/down, F2 40 kHz
 2 Track A 90° track B, F2 40 kHz
 3 Track A possibly with up/down, F2 25 Hz
 3 Track A 90° track B, F2 25 Hz

Line 24

24	0
----	---

Input logic
-> 1 PNP, switching voltage at appr. 11 V
 2 NPN, switching voltage at appr. 11 V
 3 PNP, switching voltage at appr. 5 V, or Namur with 8V external supply
 4 NPN, switching voltage at appr. 5 V, or Namur without intrinsic safety
 5 PNP, switching voltage at appr. 2.5 V
 5 NPN, switching voltage at appr. 2.5 V

Programming the TA 201

Line 25	<input type="text" value="25"/> <input type="text" value="b F 1"/>	Scale F1 (divider), e.g. speed measurement:	<u>Pulses/rev.</u> Circumference
	<input type="text" value="->"/>		
	<input type="text" value="1.0000"/>	1,0000	
	<input type="text" value="->"/>	0,0001-9999,99	
Line 26	<input type="text" value="26"/> <input type="text" value="b F 2"/>	Scale F2 (divider) e.g. rpm measurement:	Pulses/rev.
	<input type="text" value="->"/>		
	<input type="text" value="1.0000"/>	1,0000	
	<input type="text" value="->"/>	0,0001-9999,99	
Line 27	<input type="text" value="27"/> <input type="text" value="b F 3"/>	Scale F3 (multiplier) e.g. to 100,000 for display of an extension	/ compression in percentage terms
	<input type="text" value="->"/>		
	<input type="text" value="1.0000"/>	1,0000	
	<input type="text" value="->"/>	0,0001-9999,99	
Line 28		Update time (display repetition)	
		0 0,5 s	
	<input type="text" value="28"/> <input type="text" value="1"/>	1 s	
	<input type="text" value="->"/>	2 2 s	
		3 3s	
		4 5s	
		5 10s	
		6 20s	
		7 30s	
		8 60s	
Line 29		Time out F1 - F3 (see line 21) On standstill, after expiry of this period:	
		a reset to zero occurs	an update of the display occurs with
		with measurement functions 0 to 6	function 7 „pulse rate measurement“
	<input type="text" value="29"/> <input type="text" value="0"/>	1 s	0,1 s
		1 2 s	0,2 s
		2 3 s	0,3 s
		3 5 s	0,5 s
		4 10 s	1,0 s
		5 20 s	2,0 s
		6 30 s	3,0 s
		7 60 s	6,0 s
		8 Time-out not operational	
		9 Time-out not operational, with storage of F1, F2 and F3 in the event of a power failure.	
Line 30		Time unit F1	
	<input type="text" value="30"/> <input type="text" value="0"/>	1/min	
	<input type="text" value="->"/>	1 1/s	
		2 1/h	
Line 31		Time unit F2	
	<input type="text" value="31"/> <input type="text" value="0"/>	1/min	
	<input type="text" value="->"/>	1 1/s	
		2 1/h	
Line 32		Assignment of the slave pointer	
Line 36		Decimal point for F1	
	<input type="text" value="36"/> <input type="text" value="0"/>	No decimal point	
	<input type="text" value="->"/>	1 0.0	
		2 0.00	
		3 0.000	
Line 37		Decimal point for F2	
	<input type="text" value="37"/> <input type="text" value="0"/>	No decimal point	
	<input type="text" value="->"/>	1 0.0	
		2 0.00	
		3 0.000	



Line 38

Decimal point for F3
with scale factor 0, 1 or 2

(see line 21)
with scale factor 3, 4 5 or 6

38	0	No decimal point	59,59,59 min.
->	1	0.0	99.59.59 h
	2	0.00	
	3	0.000	

Line 39

Assignment of the basic display (reset after 15 s)

39	0	No switchover to the basic display
->	1	F1
	2	F2
	3	F3

Line 40

Code setting

40	Cod	
->		
40	0	0 No code
->		1 - 9999

- After completion of these programming lines, a dotted line appears in the display. The dotted line represents the end of the third programming field.

Switching back through the program lines

→ Hold down the key ^ and press the key -> again.

Switching off the programming mode

- Press the key P/R
- The TA 201 is now on the operating level again.

Reprogramming the TA 201 with the default setting

- Switch on the device and press the keys < and ^ at the same time.
- All values which have already been programmed are returned to the default settings. Display shows for a short time „Clr Pro“.

5.1 Programming

Line	Default setting	Customer program	Short form
01	0		Display tachometer F1
02	0		Display tachometer F2
03	0		Display tachometer F3
10	-----		Dashed line
11	SEAL 0	SEAL	Status for display tachometer F1
12	SEAL 0	SEAL	Status for display tachometer F2
13	SEAL 0	SEAL	Status for display tachometer F3
20	-----		Dashed line

21			Measurement functions
22			same, but inverted
23			Count mode tacho 1
24			Input logic
25			Scale F1
26			Scale F2
27			Scale for measurement functions
28			Update time F1, F2, F3
29			Time-out F1, F2, F3
30			Time unit tacho 1 (F1)
31			Time unit tacho 2 (F2)
36			Decimal point F1
37			Decimal point F2
38			Decimal point F3
39			Assignment of basic display
40			Code
65			Dashed line

5.2 Measuring speed and rpm

When using the TA 201 for measurement of revolutions per minute, the time unit for F1 (tachometer 1) is set for r.p.m. in line 30, and for F2 (tachometer 2) in line 31. The number of pulses per revolution (scale) is specified in line 25 for F1, in line 26 for F2.

Decimal places If you wish the display to include decimal places, this must be taken into account when setting the measurement and decimal point as follows:

1 decimal place	Scale x 0.1	Decimal point 0.0
2 decimal places	Scale x 0.01	Decimal point 0.00
3 decimal places	Scale x 0.001	Decimal point 0.000

<i>Rpm measurement</i>	Pulses/rev.	Scale (lines 25, 26)	Decimal point (lines 36, 37)	Display example
<i>Example</i>	1 rev = 1 pulse	1	none	9999 (rpm)
	1 rev = 1 pulse	0,1	0.0	999.9 (rpm)
	1 rev = 10 pulse	10	none	9999 (rpm)
	1 rev = 10 pulse	1	0.0	999.9 (rpm)

Speed measurement When using the TA 201 for speed measurement for m/min., the time unit for F1 and F2 is set in lines 30 and 31 (rpm), and the number of pulses per metre (scale) for F1 is located in line 25, for F2 in line 26.

Formula for calculation of the scale factor:

$$\frac{\text{Pulses/rev.}}{\text{Circumference}}$$



<i>Example</i>	Circumference (measuring wheel)	Pulses/Rev (encoder)	Scale (line 25, 26)	Decimal point (line 36, 37)	Display example
	0,5 m	1	$\frac{1}{0,5} = 2$	none	9999 (rpm)
	0,5 m	50	$\frac{50}{0,5} = 100$	none	9999 (rpm)

5.3 Measurement functions

The measurement functions are described below. These functions are selected in line 21.

For monitoring two speeds or rpm values or of one speed and one rpm value which you wish to display in the form of a ratio, differential or extension/compression value (discrepancy in percentage terms).

In the event of a percentage display, the scale is set with the factor 100. For decimal places, see above.

<i>Example</i>	Formula	rpm	Scale (line 27)	Decimal point (line 38)	Display
<i>Ratio</i>	F1 F2	F1=100 U/min F2=200 U/min	10	0.0	0.5
<i>Differential</i>	F1-F2	F1=200 U/min F2=100 U/min	1	none	100
<i>Extension/compression</i>	$\frac{F2-F1}{F1}$	F1=100 U/min F2=200 U/min	100	none	100 (%)
		F1=200 U/min F2=100 U/min	1000	0.0	-50.0 (%)

5.4 Time measurements

When using the TA 201 as a time measurement system, the user is offered the following functions, which can also be programmed in line 21. The time range and resolution are defined in line 38. The measurement result is displayed at F3.



After time-out, the display begins again at 00.00.00.

Path runthrough time

Measurement of the runthrough time (e.g. of a conveyor belt) required for a certain path (from A to B) taking into account the speed factor. The measurement result is displayed at F3. The speed can be picked up using an incremental pulse encoder with two signal tracks „A 90° B“ on tachometer F1.

In line 27, the required measurement path must be programmed.



For this application, F1 is bypassed. On selection of this application, „F1 OFF“ is displayed.

F2 can be used to display rpm or speed.

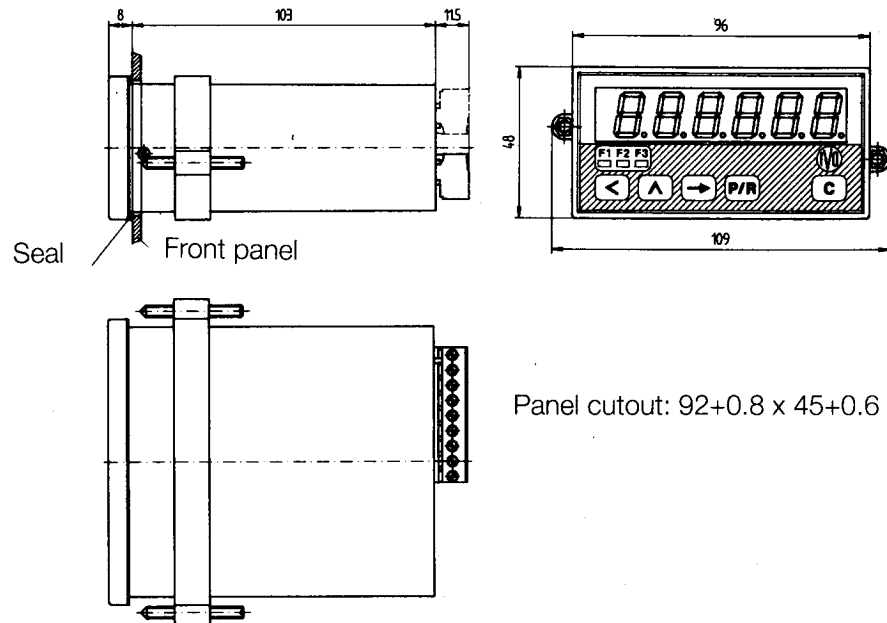
<i>Example</i>	Circumference (measuring wheel)	Pulses/Rev (encoder)	Scale (line 25)	Path (line 27)	Display range (line 38)
	0,5 m	50	$\frac{50}{0,5} = 100$	10.00 (m)	99.59.59 h

<i>Measurement using the start and stop signal</i>	Time measurement is initiated by a pulse at the input „F2/Start“ and terminated by a pulse at the input „Stop“. Both inputs respond to the front pulse flank. F2 indicates a currently running measurement process.
<i>Period duration</i>	Time measurement is started by the front pulse flank at the input „F2/Start“ and terminated with the subsequent front pulse flank. The measurement process can be interrupted by means of the „Stop“ input (gate function). F2 indicates a currently running measurement process.
<i>Pulse duration</i>	Time measurement is started by the front pulse flank at the input „F2/Start“ and terminated with rear pulse flank. The measurement process can be interrupted by means of the „Stop“ input (gate function). F2 indicates a currently running measurement process.
<i>Pulse rate measurement</i>	<p>The pulse rate measurement is started by the first pulse at the input „F1/A“ and terminated after recognition of a pulse rate pause.</p> <p>Standstill recognition automatically ensures an update of the display following every pulse rate. The pause time between pulse rates is programmed under „time out“ in line 29.</p> <p>Possible applications: For forward feed display and monitoring on punching machines etc.</p>

6. Technical data

Display	7-segment LED display, 6-digit, red with initial zero suppression with minus sign
Figure height	14 mm
Power supply	24/48 VAC $\pm 10\%$ 115 VAC $\pm 10\%$ / 230 VAC +6%, -10% 24 VDC $\pm 10\%$
Power consumption	7 VA, 5 W
Encoder output supply	+24 VDC + 10%/-50%, max. 100 mA
Programmable signal inputs	PNP, NPN
Input resistance	appr. 5 kOhm
Max. input level	+/- 50 V
Max. input frequency, F1, F2	10 kHz, 40 kHz
Precision	0.02% of the respective range limit value generally +/-1 digit
Signal outputs	optocoupler for limit values 1 and 2
Max. switching voltage	40 V
Max. switching current	15 mA
Max. residual voltage	< 1 V
Data storage	> 10 years (using EEPROM)
Fixture	By means of gripping frame
Dimensions	96 x 48 mm, housing for front panel mounting
Mounting depth	appr. 115 mm
Terminals	Plug-in screw-type terminals
Core cross-section	max. 1.5 mm
Housing material	Macrolon 6485
Front membrane	Polyester
Weight	AC version appr. 350 g DC version appr. 250 g
Protection class	Protection class II
Protection type as per DIN 40050	From front in mounted status with seal IP 54
Field of application	In accordance with pollution severity 2
Overvoltage/application category	Category II
Interference immunity	Severity 2 to 3
Ambient temperature	0 °C – +50 °C
Storage temperature	-20 °C – +70 °C
Humidity	max. relative humidity 80%, non-condensing

6.1 Measurements and mounting dimensions



6.2 Default setting

The TA 201 is supplied programmed with the following default parameters:

Measurement function	ratio F1 : F2
Signal type at F1	one track (up/down)
Input logic	PNP
Scale F1, F2, F3	1.000
Display update	every 1 seconds
Time-out	1 second
Time unit F1, F2	rpm
Decimal point F1, F2, F3	no decimal point
Assignment of basic display	no reset after 15 secs
Program protection code	no code set

6.3 Error indications

<i>Error codes of the TA 201</i>	Err 1 and Err 2	Hardware error, must be sent in for repair.
	Err 6	Input frequency at tachometer F1 is too high. The error code can be cancelled by pressing the C key.
	999999 flashes	Over-range of displays F1, F2, F3. Can also occur at low frequencies due to unfavourable parameter settings.

For example:

F1 = 100 Hz, bF = 0.01, unit = 1/h

$100/0.01 \times 3600 = \mathbf{3600000}$

Flashing of the numbers 999999 is automatically cleared after correcting the parameter or reducing the frequency.

Types and order designations

TA 201.001.AXA1

Supply voltage 24/28 VAC

TA 201.002 AXA1

Supply voltage 115/230 VAC

TA 201.003 AXA1

Supply voltage 24 VDC 5% Res. ripple