

T401 - T402

**Operating Instructions
383E-64618**

überreicht durch / present by :

SCHRIEVER & SCHULZ & Co. GmbH
Vertriebsbüro für Mess- & Regeltechnik seit 1958

Eichstr. 25 B · D 30880 Laatzen

Tel. ++49 (0) 511 86 45 41 / Fax ++49 (0) 511 86 41 56

schriever@schriever-schulz.de || www.schriever-schulz.de



T401 : One Channel tachometer with relay and 0/4-20 mA output : **383Z-05307**

T402 : One Channel tachometer with relay and 0/2-10 V output : **383Z-05308**

Contents :

1 SAFETY INSTRUCTIONS	3
2 FUNCTIONAL PURPOSE	3
3 SPECIFICATIONS	3
4 PRINCIPLE OF OPERATION	7
5 INSTALLATION	8
6 CONFIGURATION WITH PC SOFTWARE AND OPERATION	8
6.1 Software Concept	8
6.2 List of Parameters and Text Displays	8
6.3 Parameters	9
6.3.1 Machine Factor (Configuration – System – Machine Factor)	9
6.3.2 Minimum Measuring Time (Configuration – System – Fix Time)	9
6.3.3 Minimum Displayed Measured Value (Configuration – System – Min etc)	9
6.3.4 Definition of the Alarm (Configuration – System – Alarm Definition)	9
6.3.5 Sensor Current Minimum (Configuration – Sensor – Current Min)	9
6.3.6 Sensor Current Maximum (Configuration – Sensor – Current Max)	10
6.3.7 Measuring Range Starting Value (Configuration – Analog Output)	10
6.3.8 Measuring Range End Value (Configuration – Analog Output)	10
6.3.9 Output Range (Configuration – Analog Output)	10
6.3.10 Time Constant (Configuration – Analog Output)	10
6.3.11 Status of the Setpoints (Limits) (Configuration – Relay Control)	10
6.3.12 Mode of Operation of the Setpoints (Limits 1 and 2) (Configuration – Limits)	10
6.3.13 Relay Control (Configuration – Relay Control)	10
6.3.14 Selection of the Display Intervall (Settings – Display Interval)	11
7. OPERATING	11
7.1 Power-on	11
7.2 Measuring	11
7.3 Behaviour with activated Hold-Function (Acknowledge)	12
7.4 Sensor Failure	12
7.4.1 System Alarm	12
7.4.2 Power Failure	12
7.5 Communication with the PC	13
8 MECHANICAL CONSTRUCTION / HOUSING	14
9 CONNECTION DIAGRAMS	15
10 HARDWARE CONFIGURATION	16
11 MAINTENANCE / REPAIR	17
12 WARRANTY	17
13 DECLARATION OF CONFORMITY	18

1 Safety instructions



Certain components within the T401 – T402 tachometers are only under dangerous voltages if the connected circuits have dangerous potentials.

The instruments comply with Protection Class I . Hence it is mandatory to connect a protective earth on the PE-terminal. The instruments are designed and manufactured according to IEC-Publication 348 and they left the works in perfect condition.

These operating instructions contain information referring to risks, which must be strictly adhered to for safe operation of the instrument.

Instruments in a doubtful condition after electrical, climatic or mechanical overload must be immediately disconnected and returned to the manufacturer for repair.

2 Functional Purpose

T400 tachometers measure and monitor frequencies (speed proportional values) within the range 0 to 35 000 Hz

The family consists of the two types :

- **T401** One channel frequency/current-converter with output 0/4...20 mA and switching limit with relay
Article-No. **383Z-05307**
- **T402** One channel frequency/voltage-converter with output 0/2...10 V and switching limit with relay
Article-No. **383Z-05308**

3 Specifications

Reference-conditions: ambient temperature + 20 °C, power supply voltage within specifications.

Bandwidth	T401 - T402
Lowest Measuring Range	0 . . . 1.000 Hz
Highest Measuring Range	0 . . . 35.00 kHz

Measuring range and setpoints are entered directly in physical units (e.g. rpm) after the determination of the Machine Factor $M = \text{frequency (Hz)} / \text{measured value (rpm)}$

Analog output	
Execution T401 Current output	0 . . . 20 mA resp. 4 . . . 20 mA selectable for rising or falling transfer function Maximum Load 500 Ohm corresponding to a maximum of 10 V
Execution T402 Voltage Output	0 . . . 10 V resp. 2 . . . 10 V selectable for rising or falling transfer function Minimum Load 7 kOhm corresponding to a maximum of 1.4 mA
Maximum open-circuit Voltage :	12 V
Resolution	12 bit corresponding to 1 : 4096
Maximum Linearity Error	0.1 %
Accuracy Class	0.5 % referred to the analog output end of range value
Time constant	Hardware 11 ms, software selectable
Temperature Drift	typ. ± 100 ppm/K, max. ± 300 ppm/K

Response Time (step response)	<p>The minimum measuring time is programmable as a Fix Time of 2 / 5 / 10 / 20 / 50 / 100 / 200 / 500 ms / 1 / 2 / 5 second.</p> <p>- For input frequencies with a period shorter than the Fix Time : maximum: 2* Fix Time + max. period of the input frequency + 7.5 ms typical: Fix-Time + 1 period of the input frequency + 7.5 ms</p> <p>- For input frequencies with a period longer than the Fix Time : Maximum: period of the input frequency + 7.5 ms</p>
-------------------------------	--

Relay	
Hysteresis of setpoints	For each limit an upper and a lower setpoint may be set independently
Relay functions	Monostable change-over contacts relay, function individually selectable as „normal“ or „inverse“ and „without“ or “with” acknowledge resp. hold via binary input.
Relay output	<p>AC Load : max. 250 VAC, 1250VA.</p> <p>DC Load :</p> <div style="text-align: center;"> <p>The graph shows the maximum DC load breaking capacity for a resistive load. The y-axis represents DC voltage [Vdc] on a logarithmic scale from 10 to 300. The x-axis represents DC current [A] on a logarithmic scale from 0.1 to 20. The curve starts at 300 Vdc for 0.1 A and decreases to approximately 30 Vdc at 5 A. A vertical line at 5 A is labeled 'resistive load'.</p> </div>
Accuracy class	0.05% referred to the setpoint
Temperature tolerance	Max. ± 10 ppm
Time delay	<p>The minimum measuring time is programmable as a one period or a Fix-Time of 2 / 5 / 10 / 20 / 50 / 100 / 200 / 500 ms 1 / 2 / 5 second.</p> <p>- For input frequencies with a period shorter than the Fix Time, the delay time is : maximum : 2* Fix Time + max. period of the input frequency + 10.5 ms typical : Fix-Time + 1 period of the input frequency + 10.5 ms</p> <p>- For input frequencies with a period longer than the Fix Time, the delay time is : maximum : max. period of the input frequency + 10.5 ms</p>

Open Collector output	
External pull-up resistor	$R = U / 0.01$, I_c nominal = 10mA
Voltage	U = 5 – 30V
Insulation	1500VAC

<p>Sensor input :</p>	<p>Reference potential floating, galvanically separated from power supply and the outputs, especially the current/voltage output. The terminal for the cable shield is galvanically connected to the minus pole of the sensor supply.</p> <p><u>Input resistance:</u> 30 kOhm</p> <p><u>Built-in sensor power supply :</u> +14 V , max. 35 mA short-circuit proof, in case of activation of the protection, the circuit must be opened in order to rearm the protection.</p> <p><u>Built-in Pull-up (+14 V) resistor 820 Ohm</u> for connection of two-wire transmitters, J1 must be set on position 2. (see chapter 10).</p> <p><u>Frequency range (-3dB):</u> 0.01 Hz / 35 kHz</p> <p><u>Trigger level :</u> adaptive Trigger level, approximately $V_{in(peak)} / 4$, with minimum 500 mV (factory configuration) and maximum value 5V. The minimum value of the trigger level can be set down to 20 mV by moving strap J2.</p> <div data-bbox="539 815 1445 1532" style="text-align: center;"> <p>Minimum trigger level depending on the input signal Frequency</p> <table border="1"> <caption>Approximate data points from the trigger level graph</caption> <thead> <tr> <th>Frequency (Hz)</th> <th>Trigger level (Vpeak)</th> </tr> </thead> <tbody> <tr><td>0.005</td><td>80</td></tr> <tr><td>0.01</td><td>5</td></tr> <tr><td>0.1</td><td>0.5</td></tr> <tr><td>1</td><td>0.1</td></tr> <tr><td>5</td><td>0.02</td></tr> <tr><td>10</td><td>0.02</td></tr> <tr><td>100</td><td>0.02</td></tr> <tr><td>1000</td><td>0.02</td></tr> <tr><td>10000</td><td>0.05</td></tr> <tr><td>30000</td><td>50</td></tr> </tbody> </table> </div>	Frequency (Hz)	Trigger level (Vpeak)	0.005	80	0.01	5	0.1	0.5	1	0.1	5	0.02	10	0.02	100	0.02	1000	0.02	10000	0.05	30000	50
Frequency (Hz)	Trigger level (Vpeak)																						
0.005	80																						
0.01	5																						
0.1	0.5																						
1	0.1																						
5	0.02																						
10	0.02																						
100	0.02																						
1000	0.02																						
10000	0.05																						
30000	50																						

<p>Sensor monitoring</p>	<p><u>Monitoring of powered active sensors :</u> 2- and 3-wire sensors (selection via strap 1) with a current consumption $< I_{min}$ resp. $> I_{max}$ will be signalled defective according to behaviour description in chapter “Sensor Failure”. $0.5 \text{ mA} < I_{min} < 25 \text{ mA}$ $0.5 \text{ mA} < I_{max} < 25 \text{ mA}$ This supervision is activated, when “active sensor” type is activated.</p> <p><u>Monitoring of passive (electromagnetic/VR/Mag Pick-Up) sensors :</u> open circuit state of passive sensors. This supervision is activated, when “passive sensor” type is activated.</p> <p>Both monitoring functions can be switched off via the configuration SW.</p>
--------------------------	---

Binary input	<p>For external selection between two sets (A/B) of programmable relay controls and acknowledge functions : No external pull up needed : active low : U < +1.5V (Relay control parameter set „B“) high (open) : U > +3.5V (Relay control parameter set „A“)</p> <p>Common reference potential with negative pole of sensor supply The simple method to activate the binary input is to short circuit the +Bin input with the sensor supply reference 0VS.</p>
Data communication:	<p>Serial interface similar to EIA RS 232, but with a +5V-CMOS level 3-pole 3.5 mm stereo headphone connector on front side, common reference potential with negative pole of sensor supply</p>

Power supply T401 – T402	<p>10 ... 36 VDC Power consumption max. 10V/2.3W, 24V/2.6W, 36V/3W</p> <p>maximum allowable power supply interruption with</p> <table style="margin-left: 100px;"> <tr> <td>16 V :</td> <td>4 ms</td> </tr> <tr> <td>24 V :</td> <td>25 ms</td> </tr> <tr> <td>36 V :</td> <td>75 ms</td> </tr> </table>	16 V :	4 ms	24 V :	25 ms	36 V :	75 ms
16 V :	4 ms						
24 V :	25 ms						
36 V :	75 ms						

Climatic conditions	<p>KUE according to DIN 40 040 Operating temperature - 40 . . . + 85 °C Storage temperature - 40 . . . + 90 °C relative humidity 75% average over a year, up to 90% for 30 days max. condensation is to be avoided</p>
---------------------	--

Insulation	<p>Galvanic separation between : power supply, current output and the sensor power supply. Isolation 700 VDC / 500VAC. Relay contact isolation : 1500 VAC</p>
------------	--

Electro Magnetic Compatibility	Radiation in accordance with international standards, and EN 50081-2	
Conducted emissions	CISPR 16-1, 16-2 ;	
Radiated emissions	EN 55011	

Electro Magnetic Compatibility	Immunity in accordance with international standards, and EN 50082-2	
Electrostatic discharge	IEC 61000-4-2	Contact 6kV, air 8 kV
Electromagnetic fields	IEC 61000-4-3	30 V/m, non modulated and AM 80% at 1000Hz sinuswave
Conducted fast transient	IEC 61000-4-4	2 kV, repetition 5kHz duration 15 ms, period 300ms
Conducted slow transient	IEC 61000-4-5	Line / Line +/- 1kV, Line earth +/- 2kV, 1 per minute
Conducted high frequency	IEC 61000-4-6	3V eff (130 dBuV) 10kHz – 80 MHz, AM 80% 1000Hz sinuswave, power lines.
Pulse modul. Elec. field	ENV 50140	900 MHz (100% pulse mod. /200Hz), > 10V/m
Power frequency magnetic field	IEC61000-4-8	50Hz, 100 A/m 2 minutes

Standards
EN 50155
API 670
GL
UL
IEC 61508 SIL-2

4 Principle of Operation

T400 tachometers are controlled by a microprocessor. They work according to the period measurement principle with subsequent computing of the reciprocal value (computer principle).

The frequency is measured continuously. The number of cycles considered for one measurement depends on the minimum measuring time (=Fix Time) and the level of the input frequency, respectively on the limits to be monitored.

After entering the Machine Factor $M = f/n$

- with f (Hz) = signal frequency of the speed transmitter at a determined machine speed
- and n (rpm) = machine speed

the limits for the frequency relay and the measuring range for the frequency/current-converter can be entered directly in rpm.

The relation between the signal frequency (f) of a speed sensor and the rotational speed (n) of a pole wheel is the following:

$$f = n * p / 60 \quad \text{with} \quad f = \text{Frequency of the speed transmitter in Hz}$$

$$n = \text{Rotational speed of the pole wheel in rpm}$$

$$p = \text{Number of poles on the pole wheel}$$

Consequently for rotational speed measurement the machine factor $M = p/60$.

Instead of the rotational speed n , any frequency proportional physical quantity to be measured may be used in the above formula.

For the two limits on the frequency relay the **switch-on point** (= Limit high) and the **switch-off point** (= Limit low) can be entered separately, thus allowing for the realisation of practically any hysteresis:

With the binary input connected to 0V (=low) relay control parameter set „B“ is active.

With the binary input left open (=high) relay control parameter set „A“ is active.

Hold-Function: When selected; if the input frequency goes above the upper limit value (or below the lower limit value) the relay changes its state and will be held in this state unless it is reset, even if the input frequency later goes below the upper (or above the lower) limit value.

The configuration of the Relay Control, (Selection of Actuator) allows the relay's hold function to be independently selected for both parameter sets „A“ and „B“ -
activate/de-activate > upper limit value or < lower limit value

The relay is reset by momentarily opening and closing again of the binary input (if parameter set „B“ is activated) resp. by momentarily closing and opening again of the binary input (if parameter set „A“ is activated) for a time between 0.1 ... 0.3 s.

If the binary input is opened (resp. closed) for a time longer than 0.3 s, the parameter set „A“ (resp. „B“) will go active and the communicated values (also displayed on the PC) and the relay will go to the actual state corresponding to the parameter set „A“ (resp. „B“)

The input of all measuring parameters is made by the user, the manufacturer or the supplier via a PC and the RS232 interface according to order specifications.

All parameters are stored independent of the power supply by an EEPROM.

The green LED on the front only indicates whether the instrument is working correctly (LED bright) or is in error (LED dark).

5 Installation

The instrument shall be used only when mounted firmly and the supply line shall contain a switch or another adequate means for disconnection from power. Before switching on the apparatus, make sure the power supply is in the specified range. The shield of the sensor cable should be connected to terminal Sh for reasons of electromagnetic compatibility. This is internally connected to protective earth PE and to the negative pole of power supply.

6 Configuration with PC Software and Operation

6.1 Software Concept

Parameters are entered from a personal computer (PC) via the serial RS 232 - interface by means of a self-explanatory, user friendly programme menu. Several forms and tables allow for the easy selection from a choice of functions or parameters.

To activate **comms – settings – Interface – select COM1**.

6.2 List of Parameters and Text Displays

If you already have the configuration file, you can open it using the T400 windows software to view the parameters. Alternatively, connect a unit and go to **T400 – Read Parameters** to interrogate the T400 you have. Normal windows file handling applies.

You can print the parameters set out via **File – Print**.

Factory activated parameters respectively their values are indicated in bold letters

Instrument type
Manufacturing code
Software version
Date of calibration

Configuration < System >

Machine factor	1.0000E-07 ... 1.0000 ... 9.9999E+07
Minimum measuring time	2 / 5 / 10 / 20 / 50 / 100 / 200 / 500 ms / 1 / 2 / 5 s
Minimum indicated measured value	1.0000E-12 ... 1 ... 9.9999E+12
Alarm definition	ONLY system error/ System error OR Sensor monitoring

Configuration < Sensor >

Minimum sensor current	0.5 ... 5 ... 25,0 mA
Maximum sensor current	0.5 ... 25.0 mA
Sensor type	active / passive

Configuration < Analog output >

Measuring range starting value	0.0000 Hz ... max. 90% of measuring range end value
Measuring range end value	1Hz ... 2000.0 Hz ... 34.999 kHz
Output range	0 ... 20mA / 4 ... 20mA resp. 0 ... 10V / 2 ... 10V resp.
Time constant	0.0 ... 9.9s

Configuration < Limits >

Status of operation	On : relay status depends on the corresponding limit Off: limit is inactive resp. the relay is deenergized
Mode of operation	Normal / Inverse

Lower setpoint of limit 1 (e.g.)	200.00 Hz	(min value 0.1Hz)
Upper setpoint of limit 1 (e.g.)	300.00 Hz	(max value 35kHz)
Lower setpoint of limit 2 (e.g.)	400.00 Hz	(min value 0.1Hz)
Upper setpoint of limit 2 (e.g.)	500.00 Hz	(max value 35kHz)

Configuration < Relay selection >

Selection A/B (start activation)	None (always selection A) / Binary input
Delay	0 ... 2'000 s
Selection A	Alarm / Sensor monitoring / Limit 1 / Limit 2 / Window / On / Off
Selection B	Alarm / Sensor monitoring / Limit 1 / Limit 2 / Window / On / Off
Alarm	the relay depends only on alarm defined under < System >
Sensor monitoring	the relay depends also on sensor current limits defined under <Sensor>
Limit	the relay depends on setpoints defined under <Limit >
Window	the relay depends on the measured value within or out of the Window defined by limits 1 and 2
On	the relay is always energized
Off	the relay is always deenergized
Acknowledge A resp. B	without (no hold-function) / relay is hold if control is inactive

6.3 Parameters

Parameter configuration is via the RS232 interface by selecting the required programme menu and changing the appropriate parameters.



Warning: A new configuration only becomes effective after the parameters have been downloaded from the PC into the T401 – T402 EEPROM.
T400 – Write Parameters

6.3.1 Machine Factor (Configuration – System – Machine Factor)

After the input of a Machine Factor $M = f/n$

- with f (Hz) = signal frequency of the speed transmitter at a determined machine speed
- and n (rpm) = machine speed

The limits for the frequency relay and the measuring range for the frequency/current-converter can be entered directly in rpm.

6.3.2 Minimum Measuring Time (Configuration – System – Fix Time)

The minimum measuring time determines the minimum time, during which the input frequency is measured. By choosing a longer minimum measuring time, frequency jitter is filtered out, but that also results in a delayed response to a step change.

6.3.3 Minimum Displayed Measured Value (Configuration – System – Min etc)

For an input frequency below the minimum displayed measured value, the measured value displayed on the PC shows „0000“.

6.3.4 Definition of the Alarm (Configuration – System – Alarm Definition)

This function allows for the selection of only a system error or also a sensor current outside the defined limits of I_{min} and I_{max} . During an Alarm, the „OK“-LED is off and the 'Alarm' on the PC is shown as active.

6.3.5 Sensor Current Minimum (Configuration – Sensor – Current Min)

As long as the sensor current consumption is above the value I_{min} ., the sensor is considered to be working properly.

6.3.6 Sensor Current Maximum (Configuration – Sensor – Current Max)

As long as the sensor current consumption is below the value I_{max} , the sensor is considered to be working properly.

6.3.7 Measuring Range Starting Value (Configuration – Analog Output)

The measuring range starting value („Zero“) is the value corresponding to the starting value of the output range, e.g. 0 mA.

6.3.8 Measuring Range End Value (Configuration – Analog Output)

The measuring range end value („Full Scale“) means the value corresponding to the full scale value of the output range, e.g. 20 mA.

For a falling transfer function the measuring range end value has to be chosen smaller than the measuring range starting value.

6.3.9 Output Range (Configuration – Analog Output)

For standard converters this range is normally set to "0...20 mA" or "0...10V". A different output range may be selected out of the menu, according to the option of the instrument.

6.3.10 Time Constant (Configuration – Analog Output)

At the time of delivery the time constant for the current output is set to „0“.

In order to smooth out variations on the analog output signal, the selection of a larger time constant allows the activation of a software lowpass filter with the selected time constant.

6.3.11 Status of the Setpoints (Limits) (Configuration – Relay Control)

The relay output can be assigned to one of the two setpoints resp. Limits 1 or 2. For test purposes the Limits can also be deactivated.

6.3.12 Mode of Operation of the Setpoints (Limits 1 and 2) (Configuration – Limits)

Each setpoint is defined by an upper and a lower threshold value.

With the mode of operation set to „normal“, an input frequency rising above the upper threshold value activates the Limit and energizes the assigned relay. With the input frequency falling below the lower threshold value, the Limit is deactivated and the assigned relay is deenergized.

With the mode of operation set to „inverse“, an input frequency rising above the upper threshold value deactivates the Limit and deenergizes the assigned relay. With the input frequency falling below the lower threshold value, the Limit is activated and the assigned relay is energized.

6.3.13 Relay Control (Configuration – Relay Control)

The setpoints and the relay on the T 401- 402 are normally controlled by parameter set „A“. For testing, control or to gain an additional setpoint, a set „B“ may be activated via the binary input. Dependent on the status of the binary input, either connected to 0V (=low) or left open (=high) control set „B“ or „A“ is activated.

For reasons of safety, switching over from parameter set „B“ to set „A“ can be delayed by a selectable 0 to 2000 seconds.

All the functions in sets „A“ and „B“ may be defined independently.

With the modes of operation for Limits 1 and 2 identical (e.g. both „normal“ or both „inverse“), the relay control function „Window“ energizes the relay only when the measured value lies between the two Limits 1 and 2. With different modes of operation for Limits 1 and 2 (e.g. one „normal“ and the other „inverse“) the relay is deenergized if the measured value lies between the two Limits 1 and 2.

The binary input on the frequency relay is used for selecting between parameter set „A“ and „B“ but it may also be used for resetting the relay if a hold-function is selected. Once the relay control has been activated, the relay status no longer changes, irrespective of the input frequency. The relay may however be reset by momentarily opening resp. closing the binary input (for 0.1 to 0.3 s).

As soon as there is an alarm active, measurements are stopped and the relay is deenergized, independent of

the selected acknowledge function. After the disappearance of the error resp. alarm status the acknowledge function only considers the last correct measured value. Any violation of limit values during alarm are not considered.

6.3.14 Selection of the Display Interval (Settings – Display Interval)

The refresh cycle for the display of measured values and states on the PC can be selected in the range of ¼ to 10 seconds.

T400 – Start Reading Measure Data

7. Operating

7.1 Power-on

Analog Output:

After power-on, the output corresponds to the value determined as measuring range starting value until the first measurement has been completed.

Relay outputs with binary input **not activated**

After power-on, the relays stay deenergized or they assume the state defined under „Relay selection“.

The first positive edge of the input signal starts the first measurement interval.

After completion of the first measurement, those relays which are related to Limits, switch into their corresponding position.

If there is no input frequency, after a time of **2 sec (2*period of 1 Hz)** the relays switch into the state corresponding to "< setpoint low". (if 1 Hz is defined as minimum indicated measuring value)

Relay outputs with binary input **originally activated** (not yet implemented):

After power-on, the relays stay deenergized or they assume the state defined under relay selection, parameter function „B“.

An eventually defined bridging time is only starting when the binary input is deactivated, e.g. is opened.

During this time the relays are still controlled by the parameter function „B“.

After this time has elapsed, the relays assume the state defined under the parameter function „A“.

The first positive edge of the input signal starts the first measurement interval.

After completion of the first measurement, those relays which are related to Limits, switch into the position corresponding to the measured value.

If there is no input frequency, after a time of 2 sec (2*period of 1 Hz) the relays switch assume the state corresponding to "measured value below Limit low".

The delay time is zero, if there is no binary input selected or if the selected binary input is not activated. In that case the relays are instantly under control of parameter function „A“.

7.2 Measuring

Each measurement starts with a positive edge of the frequency input signal. After the selected Fix-Time has elapsed, the next positive edge of the input signal finishes the actual measurement and simultaneously starts the next measurement.

The total resultant measurement time is computed with a resolution of $\pm 0.4 \mu\text{s}$.

The calculation and control of the outputs immediately takes place at the beginning of the next measurement.

Transmission and display of the measured values and states on the screen of the PC are accomplished once during each display interval.

For input frequencies out of range, the analog output goes to the corresponding extreme value.

7.3 Behaviour with activated Hold-Function (Acknowledge)

Hold-Function with relay function „normal“ and with simultaneous selection of „Relay is held if active (inactive)“: If the input frequency goes above the upper limit value (or below the lower limit value) the relay changes its state and will be held in this state unless it is reset, even if the input frequency later goes below the lower (resp. the upper) limit value.

The LED displays only whether the instrument is working correctly (LED bright) or is in error (LED dark) The relay is reset by momentarily opening and closing again of the binary input (if relay control parameter set „B“ is activated) resp. by shortly closing and opening again of the binary input (if relay control parameter set „A“ is activated) for a time between 0.1 ... 0.3s.

If the binary input is opened (resp. closed) for a time longer than 0.3 s, the relay control parameter set „A“ (resp. „B“) becomes active and the values communicated (displayed on the PC) and the relay and the LED will, without further resetting via the binary input or by power-on-reset, go to the actual states corresponding to the relay control parameter set „A“ (resp. „B“)

7.4 Sensor Failure

For active sensors with amplifiers, sensor failure detection is based on current consumption monitoring. For these sensors, a loss of the sensor signal sets the output of T401 - T402 to the 0 rpm state . If false current consumption is detected, the sensor failure flag is set, and the device behaviour depends on the software configuration (See table below).

For passive electromagnetic sensors, sensor failure detection is based on open circuit state detection. If this state is detected, the sensor failure flag is set, and the device behaviour depends on the software configuration (See table below).

In case of sensor failure the output behaviour depends on the configuration :					
Alarm configuration		Outputs			
System	System or Sensor	LED	Analog output		Relay
			0...20mA/10V	4mA/2V..20mA/10V	
X		On	depending on configuration and sensor signal		
	X	Off	0mA/0V	0mA/0V	De-energized

7.4.1 System Alarm

If the microprocessor detects a RAM, ROM or EEPROM Checksum error, the measured value is set to 0 rpm and the output goes to its lowest level (0mA, or 4mA, or 0V, or 2V), and the relays get deenergized .

7.4.2 Power Failure

For power supply interruptions longer than the maximum allowable time, the analog output will go to 0mA resp. 0V and the relays become deenergized. When the supply voltage returns above the specified minimum level, the instrument will go through its initialization routines according to paragraph „Power-on“.

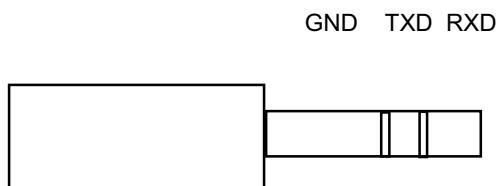
A break-down of the internal supply-voltage due to a power supply voltage below the specified minimum level will be detected as a power-failure.

7.5 Communication with the PC

Any communication via the serial RS 232 - interface is initiated by the PC.

Transmission speed: 2400 Baud
Parity - Bit: none
Data - Bits: 8
Stop-Bits: 2
Connector Type: 3.5 mm stereo headphone

Connection Diagram:




The connection diagram of the ear phone connector on the instrument displays the names with respect to the instrument port. The instrument's RXD has to be connected with the PC's TXD and vice versa. The T401 – T402 instrument does not generate the standard RS 232 signal (-12 ... +12V). Instead RXD has a 5V - CMOS level, which is compatible with most PCs, as long as the cable length is below 2 m.

8 Mechanical Construction / Housing

The housing consists of a frame in front with terminals and a protective cover with fixing elements for mounting rails. Internally the terminals have connectors with the mating part soldered onto the PCB. This allows the terminals to unplugged/plugged for easier connection.

Housing Material	Lower part and terminal frames made out of Makrolon 2800, UL 94 V-2, green	
Mounting	on rails according to EN 50 022-35 and DIN 46 277	
Terminals	with self-lifting connection plates for 2.5 mm ² wire or 1.5 mm ² flex AWG 24 – AWG 12	
Protection acc. to EN 60925 resp. IEC 925	Housing	IP 40
	Terminals	IP 20
Dimensions	<p>The technical drawings show two views of the housing. The left view is a side profile with a width of 22.50 and a height of 112.60. The right view is a front view with a width of 99.00 and a height of 114.50. Both views show the internal terminal structure and the protective cover.</p>	

9 Connection diagrams

Sh	0Vs	Sign	Col
+V	+Bin	IQ	Emit
 <p style="font-size: 2em; font-weight: bold;">T401 / 2</p>			
NC	NO	COM	+I
+24V	0V	PE	-I

Sensor interface

SH : Screen for the sensor cable
 0VS : Sensor reference voltage
 +V : Sensor power supply
 Sign : Sensor signal

Pulse output :

Col : Open collector of the pulse output
 Emit : Signal reference for the open collector pulse output

IQ : reserved

Relay Output :

NC : Normally Closed contact
 NO : Normally Open contact
 Com : Common contact

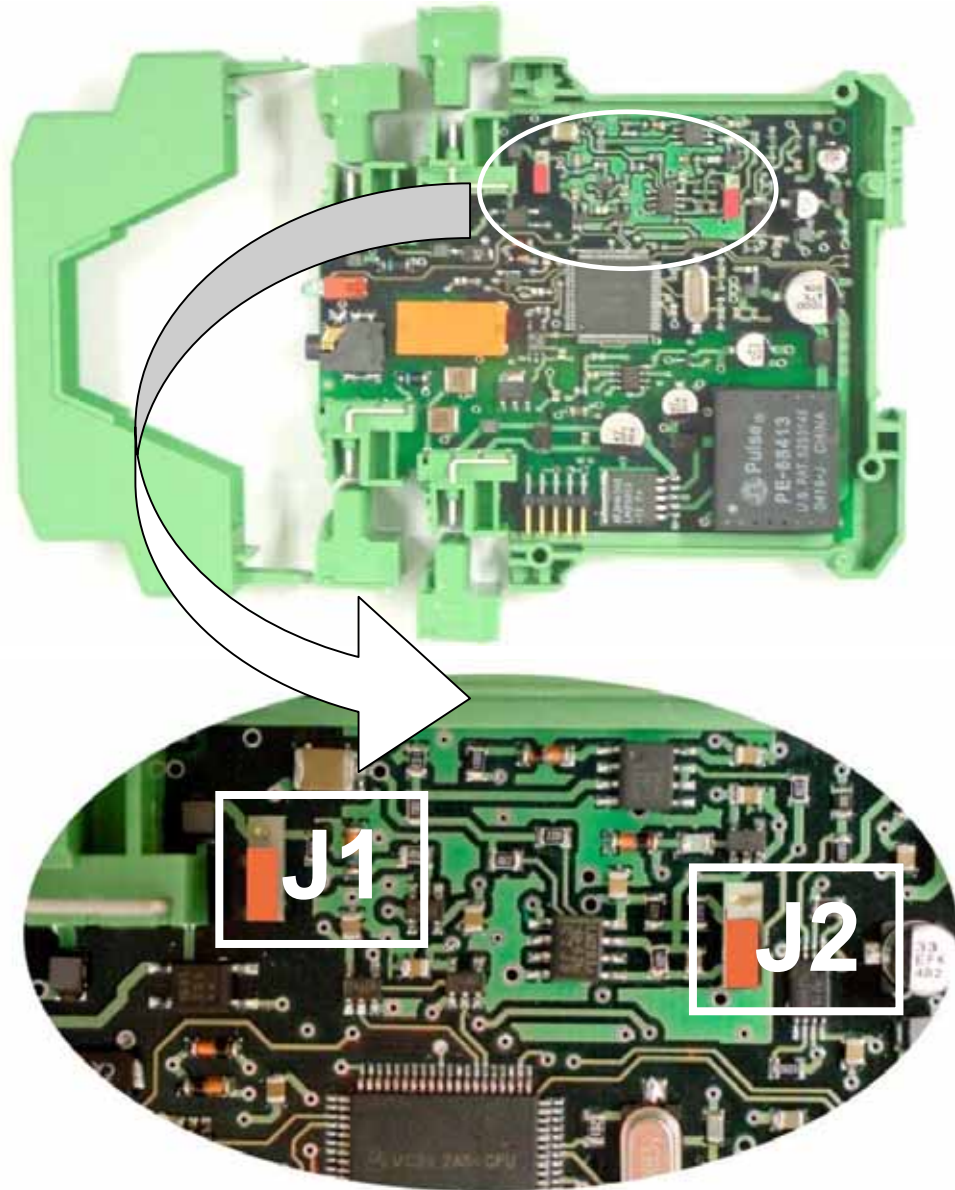
Current output

+I : Analog output positive pole
 -I : Analog output negative pole

Main Power :

+24V : Power line for T401 – T402
 0V : Power reference for T401 – T402
 PE : Earth

10 Hardware configuration



J1 : Sensor type	J2 : Trigger level
2 wires active sensor <div style="display: inline-block; width: 15px; height: 15px; background-color: black; margin-left: 10px;"></div>	20 mV to 5V <div style="display: inline-block; width: 15px; height: 15px; background-color: black; margin-left: 10px;"></div>
Factory setup : 3 wires - sensor or electromagnetic sensore <div style="display: inline-block; width: 15px; height: 15px; background-color: black; margin-left: 10px;"></div>	Factory setup : 500mV to 5V <div style="display: inline-block; width: 15px; height: 15px; background-color: black; margin-left: 10px;"></div>

11 Maintenance / Repair

These instruments do not require any maintenance since they have very low drift rates and they contain neither batteries nor other components subject to wear.

When cleaning the instruments please note the limited protection against accidental electrical shock! Whenever possible, the power supply should be interrupted during cleaning.

For cleaning the surfaces use only spirit, pure alcohol or soap-suds. Other solvents must not be used.

12 Warranty

The standard guarantee includes the replacement or repair of instruments showing a manufacturing defect, agreed upon by JAQUET, within a period of 12 (twelve) months from date of delivery.

Travelling and labour costs are excluded from the guarantee. The guarantee does not cover any damage due to misuse or to improper handling.

Complaints due to visible defects are only accepted if addressed to JAQUET within 14 days after receipt of the goods.

Ihr kompetenter Ansprechpartner / Your competent contact partner :

SCHRIEVER & SCHULZ & Co. GmbH Ing.- und Verkaufsbüro * seit 1958 * Eichstr. 25 B, D - 30880 Laatzen
Tel ++49 (0) 511 86 45 41 / Fax ++49 (0) 511 86 41 56 * www.schriever-schulz.de | schriever@schriever-schulz.de