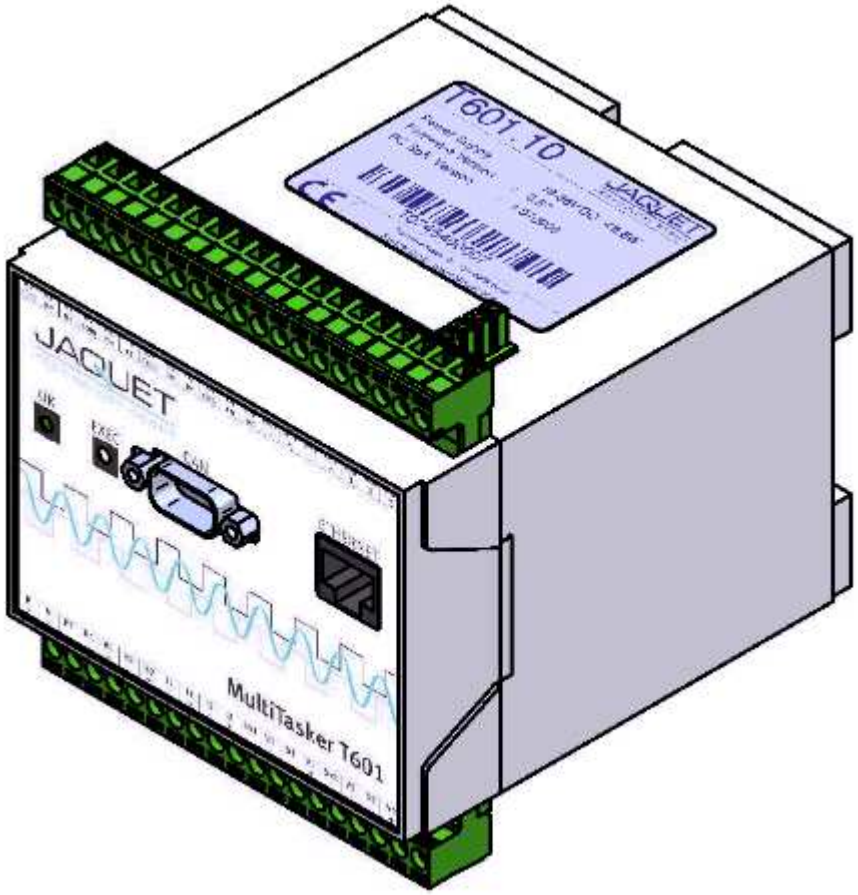
JAQUET
TECHNOLOGY GROUP

Frequency Measurement and Switching Instrument
Multitasker T601

Instruction Manual
Version 1.02E



2 Channel Tachometer with digital and analog Input and Output

- **T601.50:** Part No.: 384Z-05602 (AC Version)
- **T601.10:** Part No.: 384Z-05603 (DC Version)

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1 Safety notice

Series T601 tachometers should only be connected by trained personnel.

T601 tachometers do not generate dangerous potentials but as soon as circuits exhibiting dangerous potentials are connected, then these may be present in the tachometer circuits.

- The Tachometers may only be opened for repair by trained personnel.
- These Instruments correspond to protection class I. The PE terminal must therefore be earthed.
- The instructions in this manual must be strictly adhered to.
- Not following these instructions could result in damage to equipment or plant and injury to personnel, as well as negating warranty claims!
- Units that have suffered electrical over load, mechanical stress or been operated outside of specification must be immediately switched off and returned to the manufacturer for repair.

2 Product features

T601 Series tachometers measure and monitor frequency signals in the range 0.025Hz to 50kHz along with analog signals.

The following functionality is provided:

- 2 Frequency inputs (Speed sensor)
- 1 Analog input for current or temperature (Pt100)
- 2 Binary input
- 2 Analog outputs
- 4 Relays
- 2 Open Collector outputs
- 4 Parameter sets each having 6 System limits with 4 Limit values
- Creep detection
- Direction detection
- Data logger function
- Sensor monitoring
- System monitoring

T601's are configured via Computer (PC) and a user program.

Two tachometer models are offered:

- **T601.50:** Part No. 384Z-05602 (AC Version)
- **T601.10:** Part No. 384Z-05603 (DC Version)

3 Specifications

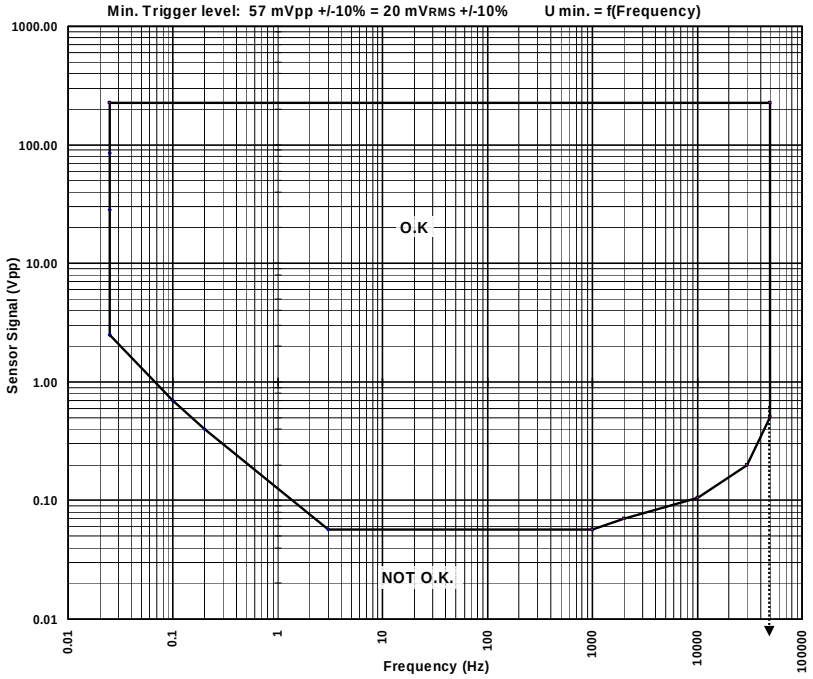
Reference temp: + 20 ℃

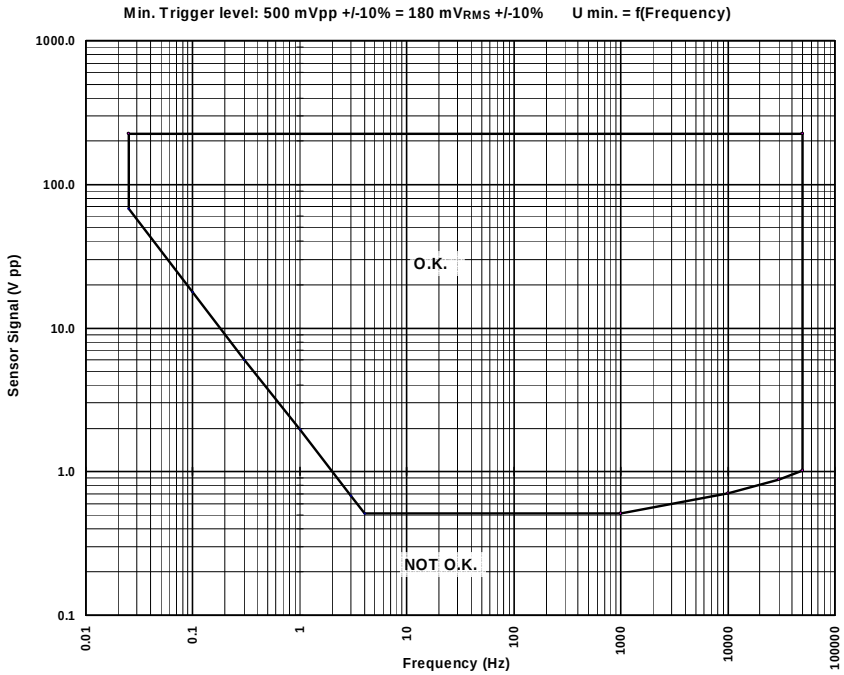
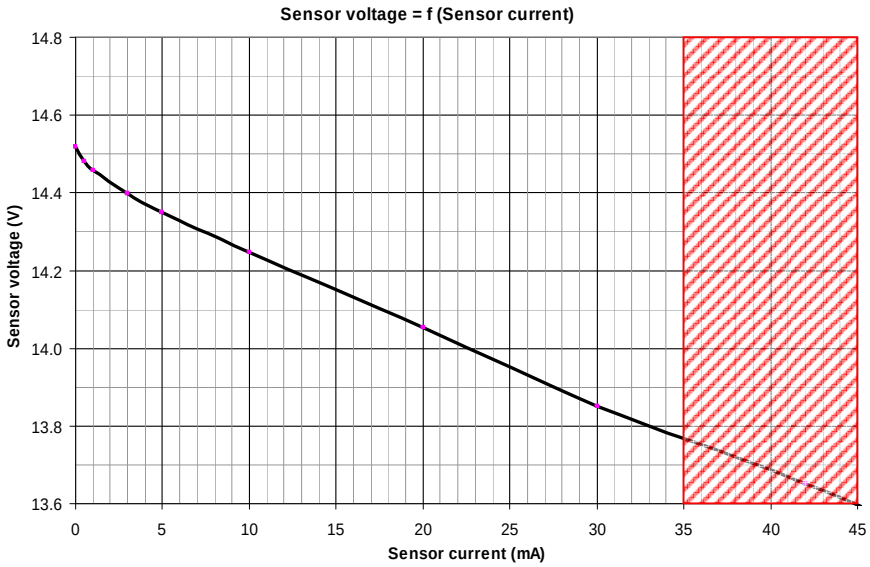
3.1 General

<table>
<tr><td>Measurement interval</td><td colspan="8">2 ms / 5 ms / 10 ms / 20 ms / 50 ms / 100 ms / 200 ms / 500 ms / 1 s / 2 s / 5 s
(Under certain circumstances, frequency measurements can take several measurement intervals)</td></tr>
<tr><td rowspan="2">Supply voltage</td><td colspan="2">AC Version</td><td colspan="6">90…264 VAC (47...63 Hz) / 120VDC … 370VDC</td></tr>
<tr><td colspan="2">DC Version</td><td colspan="6">18…36 VDC</td></tr>
<tr><td rowspan="2">Isolation voltage</td><td colspan="2">AC Version</td><td colspan="6">3000 VAC (of the AC/DC power supply)</td></tr>
<tr><td colspan="2">DC Version</td><td colspan="6">1500 VDC (of the DC/DC converter)</td></tr>
<tr><td>Isolation</td><td colspan="8">Galvanic isolation between:
• Supply
• Sensor input incl. sensor supply, analog input, CAN, Display
• Binary input 1
• Binary input 2
• Analog output 1
• Analog output 2
• Relay outputs
• Open Collector output 1
• Open Collector output 2
• Ethernet interface</td></tr>
<tr><td rowspan="8">Power consumption</td><td colspan="2" rowspan="2"></td><td colspan="2">T601 without Display</td><td colspan="2">T601 with D211 (Cable version)</td><td colspan="2">T601 with D201 (BlueTooth® version)</td></tr>
<tr><td>P min. (W)</td><td>P max. (W)</td><td>P min. (W)</td><td>P max. (W)</td><td>P min. (W)</td><td>P max. (W)</td></tr>
<tr><td rowspan="2">AC Vers.</td><td>110 VAC</td><td>5.0</td><td>11.0</td><td>6.8</td><td>13.0</td><td>5.1</td><td>11.2</td></tr>
<tr><td>230 VAC</td><td>8.0</td><td>15.2</td><td>10.0</td><td>16.7</td><td>8.1</td><td>15.4</td></tr>
<tr><td rowspan="3">DC Vers.</td><td>18 VDC</td><td>3.0</td><td>7.5</td><td>4.4</td><td>8.8</td><td>3.2</td><td>7.7</td></tr>
<tr><td>24 VDC</td><td>3.0</td><td>7.4</td><td>4.4</td><td>8.7</td><td>3.2</td><td>7.6</td></tr>
<tr><td>36 VDC</td><td>3.2</td><td>7.5</td><td>4.6</td><td>8.8</td><td>3.4</td><td>7.7</td></tr>
<tr><td rowspan="8">Power supply bridging with P max.</td><td colspan="2"></td><td colspan="2">T601 without Display</td><td colspan="2">T601 with D211 (Cable version)</td><td colspan="2">T601 with D201 (BlueTooth® version)</td></tr>
<tr><td rowspan="2">AC Vers.</td><td>110 VAC</td><td colspan="2">39 ms</td><td colspan="2">37 ms</td><td colspan="2">31 ms</td></tr>
<tr><td>230 VAC</td><td colspan="2">200 ms</td><td colspan="2">190 ms</td><td colspan="2">170 ms</td></tr>
<tr><td rowspan="4">DC Vers.</td><td>18 VDC</td><td colspan="2">7 ms</td><td colspan="2">6.8 ms</td><td colspan="2">5.5 ms</td></tr>
<tr><td>24 VDC</td><td colspan="2">23 ms</td><td colspan="2">22 ms</td><td colspan="2">19 ms</td></tr>
<tr><td>25 VDC</td><td colspan="2">26 ms</td><td colspan="2">25 ms</td><td colspan="2">22 ms</td></tr>
<tr><td>36 VDC</td><td colspan="2">70 ms</td><td colspan="2">67 ms</td><td colspan="2">55 ms</td></tr>
<tr><td rowspan="2">Operating temperature</td><td colspan="2">AC Version</td><td colspan="6">-25 ℃…+50 ℃</td></tr>
<tr><td colspan="2">DC Version</td><td colspan="6">-40 ℃…+70 ℃</td></tr>
<tr><td rowspan="2">Storage temperature</td><td colspan="2">AC Version</td><td colspan="6" rowspan="2">-40 ℃…+85 ℃</td></tr>
<tr><td colspan="2">DC Version</td></tr>
<tr><td rowspan="2">Weight</td><td colspan="2">AC Version</td><td colspan="6">450 g</td></tr>
<tr><td colspan="2">DC Version</td><td colspan="6">400 g</td></tr>
<tr><td>Sealing to DIN EN 60529</td><td colspan="8">IP 20</td></tr>
</table>

3.2 Inputs

3.2.1 Sensor Inputs

Number	2 Sensor inputs
Frequency range (-3 dB)	0.025 Hz … 50 kHz
Measurement range	Programmable within the frequency range
Measurement accuracy	0.002 %
Resolution (Frequency)	10 ns
Input impedance	> 11.5 kΩ (0.1 Hz→80 kΩ, 1 kHz→18.5 kΩ, 10 kHz→16 kΩ, 50 kHz→11.6 kΩ)
Input signal for fixed 3V trigger (+/-15 %)	• Max. voltage: 80 V_{RMS} (226 V_{pp}) • Best suited to digital signals • Schmitt Trigger Input (Hysteresis > 1 V) • „0“ = Low Level to 1.25 V • „1“ = High level from 3 V (+/- 15 %) • Min. pulse width: 5 µs • Not DC-decoupled
Input signal for adaptive trigger min. 57 mVpp (+/-10 %) 20 mV_{RMS}	• Max. voltage: 80 V_{RMS} (226 V_{pp}) • DC-decoupled • The Trigger level automatically adapts itself to the input signal in the range +28.5 mV to +2 V. The Adaptive Trigger improves the signal to noise immunity e.g. where electromagnetic sensors are used. 

Input signal for adaptive trigger min. 500 mVpp (+/-10 %) 180 mV_{RMS}	• Max. voltage: 80 V_{RMS} (226 V_{pp}) • DC-decoupled • The Trigger level automatically adapts itself to the input signal in the range +250 mV to +2 V. The Adaptive Trigger improves the signal to noise immunity e.g. where electromagnetic sensors are used. 
Sensor supply	• +14 V +/- 0.5 V, max. 35 mA / Short circuit proof • If the current limit has been activated, then the circuit needs to be disconnected to reset the protection. Typical voltage curve as a function of sensor current 
Integral pull up resistor	1000 Ω to +14 V (Only for 2 wire active e.g. NAMUR sensors)
Screen	Terminals are provided for each sensor cable screen (Sh1 and Sh2). These terminals are internally connected to the ground of the sensor input.

Sensor monitoring	3 sensor monitoring settings are available in the configuration software: • No Sensor Monitoring • Monitoring of supplied sensors (active Sensor Types) [Also for 2 wire sensors that are supplied via the internal Pull-up resistor (1 kΩ) → Sensors drawing current outside of I_{min} or I_{max} are considered to be faulty. I_{min} = 0.5…35 mA I_{max} = 0.5…35 mA • Monitoring of non powered sensors (passive Sensor Types) [For 2 wire sensors such as electromagnetic sensors.] → The sensor is considered to be faulty if the line is broken. Here the sensor impedance is dynamically measured. Z < 60 kΩ = OK Z > 125 kΩ = NOT OK

3.2.2 Analog Input

Number	One 0/4 ..20 mA or 1 Temperature input (Pt100)

3.2.2.1 Analog Input as Current Input

Resolution	12 Bit (4096 Steps)
Max Linearity error	1 LSB (Least Significant Bit) ca. 5.37 uA
Measurement error	Max. 0.25 % of Measured value + 1 LSB (-25 ℃ → +50 ℃) Max. 0.50 % of Measured value + 1 LSB (-40 ℃ → +70 ℃)
Accuracy class	0.2 % of final value
Open circuit voltage	Max. 13.7 V_{DC} (active Sensor input)
Driving voltage	Min. 12 V_{DC} (active Sensor input)
External load	Max. 600 Ω (active Sensor input)
Internal current limit	I_{Max} = 24 mA+/-1 mA (active Sensor input)
Measurement Impedance	50 Ω (passive Sensor input)
Damping	Hardware time constant T = 4.1 ms 10 % → 90 % = 8.6 ms (Hardware) Actual time = Hardware time constant + Max. 1 Measurement interval
Temperature Drift	Typ.: 100 ppm/K, max. 150 ppm/K

3.2.2.2 Analogue Input as Temperature Input

Measurement	2 wire or 3 wire
Sensor	Pt100 (Measurement current = 950 uA)
Measuring range	-50 ℃ → +300 ℃
Accuracy	+/-0.5 ℃ of the measurement value
Max. cable resistance	28 Ω (3 Wire Measurement)
Max. cable length, 3 wire measurement	Cable resistance

AWG	Diameter	Cross section	Resistance	Max. Length
	mm	mm^2	Ω/km	Pt100 → T601
38	0.1	0.0082	2190	12.8 m
36	0.13	0.0127	1300	21.5 m
34	0.16	0.02	844	33.2 m
32	0.2	0.032	547	51.2 m
30	0.25	0.051	351	79.8 m
28	0.32	0.08	232	120.7 m
25	0.46	0.16	108	259.3 m
24	0.51	0.21	87.5	320.0 m

2 wire connection	The cable must be kept as short as possible, since the cable resistance will be measured as well; e.g. a cable having 1 Ω (2 x 0.5 Ω wires) would introduce an error of about 2.5 ℃.

Damping	Hardware time constant T = 10 ms 10 % → 90 % = 21 ms (Hardware) Actual time = Hardware time constant + Max. 1 Measurement interval

3.3 Binary Inputs

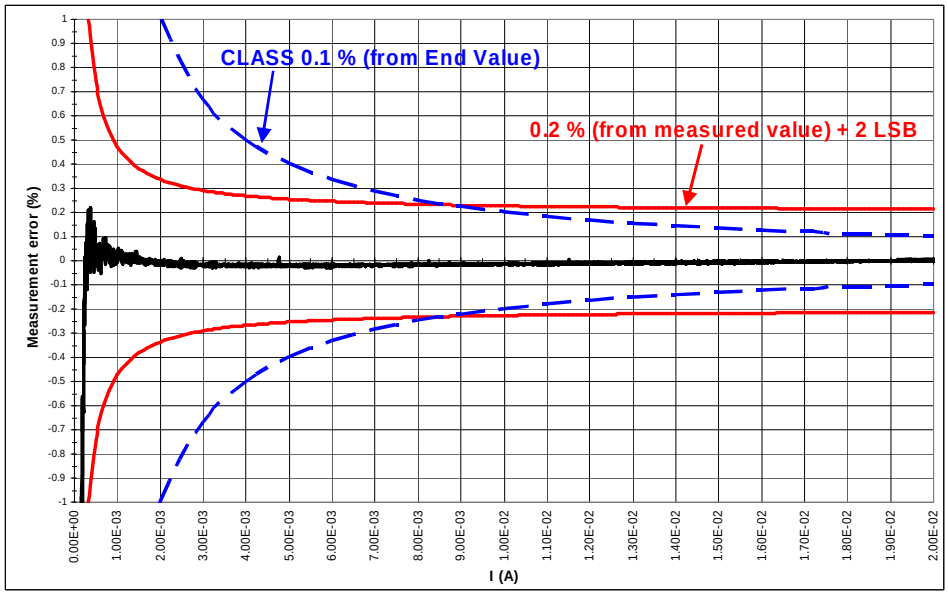
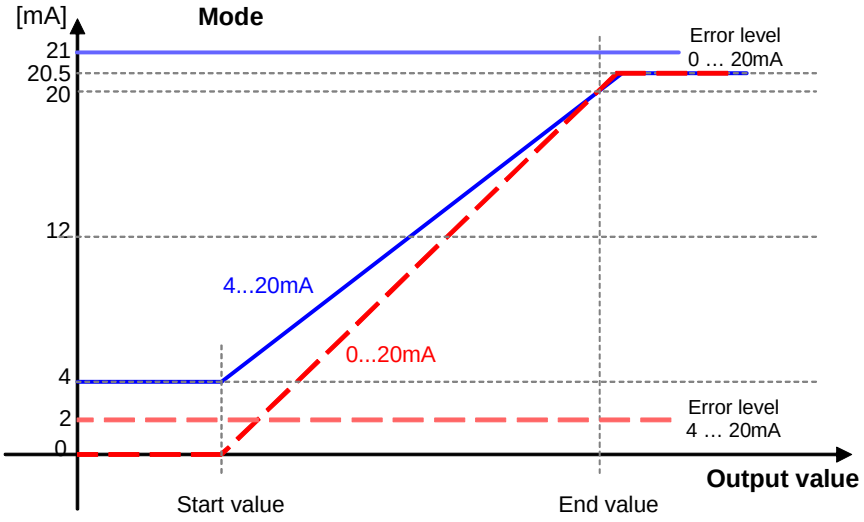
Number	2 Active Binary Inputs and 1 push button (EXEC – logic OR with Binary input B1).
Level	Logic 0 = 0 V….+5 V Logic 1 = +15 V….+36 V
Isolation voltage	1500 V_{RMS}
Input resistance	R_{min} = 8.2 kΩ

3.4 CAN Input

All T601 digital inputs and outputs are represented in the Device Profile DS-404. In addition, 3 manufacturers binary inputs that influence the T601 process are defined in a specific profile area.

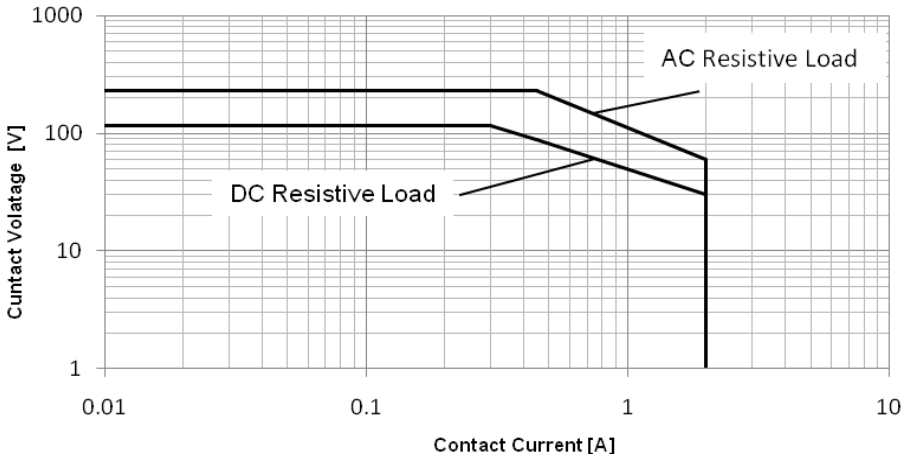
3.5 Outputs

3.5.1 Analog Outputs

Number	2 Analog outputs
Isolation voltage	1000 VDC
Output type	Current (selectable 0…20 mA / 4…20 mA)
Load	Max. 500 Ω
Open circuit voltage	Max. 15 V
Typical error curve	
Mode	
Transfer Functions	Start value < or > End value
Resolution	14 Bit (16384 increments)
Max. Linearity error	2 LSB (Least Significant Bit) approx. 2.7 uA
Measuring error	Max. 0.15 % f.m.v. + 2 LSB (-25 ℃ → +50 ℃) Max. 0.20 % f.m.v. + 2 LSB (-40 ℃ → +70 ℃)

Accuracy class	0.1 % of the end value
Damping	Hardware time constant T = 4.1 ms 10 % → 90 % = 8.6 ms (Hardware) Actual time = Hardware time constant + Software setting (configuration)
Temperature Drift	Typ.: 50 ppm/K, max. 120 ppm/K

3.5.2 Relays Outputs

Number	4 Relay output
Type	Mono-stable single change-over
Functions	• May be assigned to System Limit 1..6, Sensor Alarm, Static error Sensor 1 or 2, dynamic error, Static error Analog input, always on or off. • With or without Hold function (Reset via Binary input) • Fail Safe or Not Fail Safe
Max. switching current	
Reaction time	Effective Measurement interval + max 6 ms
Contact resistance	50 mΩ Max. (Initial-contact)
Contact isolation	1500 VAC (coil to contact) 1000 VAC (between open contacts)

3.5.3 Open Collector Outputs

Number	2 Open Collector output
Type	Opto-coupler (passive)
External resistance	IC nominal = 15 mA ($R_{Pull-up}$ = V / I) *Example: V = 24 V → R = 1.6 kΩ* IC max. = 30 mA
Reaction time	• As Frequency output: <30 us • Effective Measurement interval + max 30 us
Load voltage	V = 5 VDC…36 VDC
Isolation voltage	1500 VAC
Functions	• May be assigned to System Limit 1..6, Sensor Alarm, static error Sensor 1 or 2, dynamic error, static error Analog input, always ON or OFF, Frequency S1 or 2, Frequency x 2, Frequency x 4. • With or without hold function (Reset via Binary input) • Fail Safe or Not Fail Safe
Inverting	Open collector output frequencies are in phase with the input signal.

3.6 Data communication

3.6.1 Ethernet

Number	1 Ethernet interface
Physical Layer	Ethernet 10Base-T, IEEE 802.3i
Max cable length	100 m
Transmission rate	10 MBit/s
Connection	Front panel, 8P8C (RJ45)
Usage	Configuration and measurement status
Protocol	Peer to Peer
Connecting cable	Use a crossover cable

3.6.2 Connection to the Display

Number	1
Connector	Plug (5 pins)
Usage	Connection to the Display

3.6.2.1 Cable

Cable	Complete 6m long cable to connect a display. See Chapter 10.2.1 Cable version

3.6.2.2 Bluetooth®

Max. distance to the Display	10 m – 150 m
Class	Bluetooth® Class 1 + 7 dBm

3.7 Environment

3.7.1 Climatic Conditions

Standard	DIN 40 040
Operating temperature	See 3.1 General
Storage temperature	See 3.1 General
Relative humidity	• 75 % average over 1 year; to 90 % for max. 30 days • Condensation to be avoided

3.7.2 Electromagnetic immunity

Electrostatic discharge	EN 61000-4-2	Contact 6 kV, air 8 kV
Electromagnetic fields	EN 61000-4-3	30 V/m, not modulated and AM 80 % with 1000Hz Sinus wave
Fast transients	EN 61000-4-4	2 kV, repeated 5 kHz duration 15 ms period 300 ms
Slow transients	EN 61000-4-5	Line / line +/- 1kV, earth line +/- 2kV, 1 per minute
Conducted HF	EN 61000-4-6	3 V eff (180 dBuV) 10 kHz – 80 MHz
Mains frequency Magnetic field	EN 61000-4-8	50 Hz, 100 A/m 2 minutes
Voltage dips	EN 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests

3.7.3 Other Standards

CE	Communauté Européenne

4 Principle of Operation

4.1 General

T601's are microprocessor controlled and operate on the period measurement principle whereby the input signal period is measured during the measurement interval. The frequency is determined from the reciprocal of the average input period. The relationship between frequency and speed is determined by the machine factor.

The status of System Limits can be affected by various inputs. Inputs to System Limits may be logically combined AND or OR. System limit inputs may be: speed inputs, analog input, a math function of the 2 speed values or the analog input, both binary inputs, creep, direction, CAN interface.

A hysteresis may be set in the case of both speed inputs, the analog input and the math function.
The 6 System Limits may be variously defined in 4 parameter sets that may be selected via binary inputs.
The 4 relays and 2 open collectors may be assigned to react to the System Limits. The 2 open collectors may alternatively be used to output the input frequency (f), frequency x2, frequency x4.

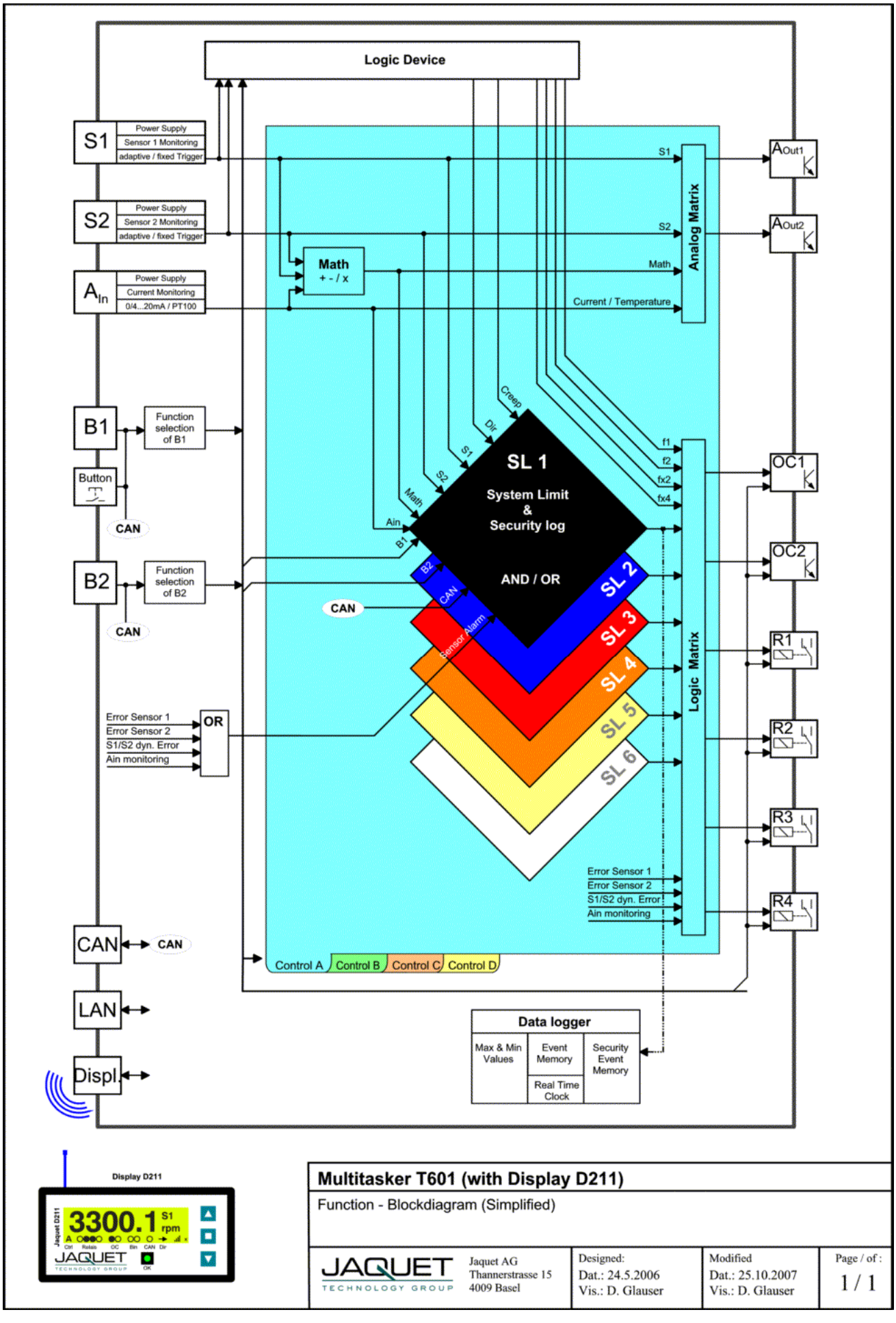
In the case of limits, the relay and open collector status may be latched and then reset via binary input.

The system permanently monitors itself. Sensors may in addition be monitored. Sensor alarm may be used in the configuration to influence System Limits. System error would influence the relays, open collectors and analog outputs and the front panel LED would go out.

Frequency outputs (Open Collector Outputs) are not influenced by the machine factor but where so defined correspond to the input signal. For frequency x2 or x4 the 2 input signals should ideally be phase shifted by 90 degrees.

Parameter input is via resident PC software and the Ethernet interface. This may also be used to interrogate the unit, display measurement and unit status.

The parameters are safely stored in EEPROM.


Logic Device
S1
Power Supply
Sensor 1 Monitoring
adaptive / fixed Trigger
S2
Power Supply
Sensor 2 Monitoring
adaptive / fixed Trigger
AIn
Power Supply
Current Monitoring
0/4...20mA / PT100
Math
+ - / x
B1
Function selection of B1
Button
CAN
B2
Function selection of B2
CAN
CAN
CAN
LAN
Displ.
Error Sensor 1
Error Sensor 2
S1/S2 dyn. Error
Ain monitoring
OR
S1
S2
Math
Current / Temperature
Analog Matrix
AOut1
AOut2
Creep
Dir
S1
S2
Math
Ain
B1
B2
CAN
Sensor Alarm
SL 1
System Limit & Security log
AND / OR
SL 2
SL 3
SL 4
SL 5
SL 6
f1
f2
fx2
fx4
Logic Matrix
OC1
OC2
R1
R2
R3
R4
Error Sensor 1
Error Sensor 2
S1/S2 dyn. Error
Ain monitoring
Control A
Control B
Control C
Control D
Data logger
Max & Min Values
Event Memory
Real Time Clock
Security Event Memory
Display D211
3300.1 S1 rpm
Multitasker T601 (with Display D211)
Function - Blockdiagram (Simplified)
JAQUET TECHNOLOGY GROUP
Jaquet AG
Thannerstrasse 15
4009 Basel
Designed:
Dat.: 24.5.2006
Vis.: D. Glauser
Modified
Dat.: 25.10.2007
Vis.: D. Glauser
Page / of :
1 / 1

4.2 Machine factor

The Machine factor determines the relationship between the measured sensor frequency and the corresponding speed.

$$M = \frac{f}{n}$$

M = Machine factor
f = Signal frequency at machine speed n
n = Machine speed

There are two means of determining this value:

4.2.1 Measured

Where the Frequency (f) at the Sensor input and the corresponding speed (n) is known:

$$M = \frac{f}{n}$$

M = Machine factor
f = Signal frequency at known speed
n = Machine speed at measured signal frequency

4.2.2 Calculated

The relationship between sensor signal frequency (f) and speed (n) at a pole wheel is:

$$f = \frac{n \times p}{60}$$

f = Signal frequency in Hz
n = Pole wheel speed in U/min (rpm)
p = Number of teeth

Machine factor is then:

$$M = \frac{p}{60}$$

M = Machine factor
p = Number of teeth

Should a gearbox be present between the pole wheel and drive shaft the formula becomes:

$$M = \frac{p \times i}{60}$$

M = Machine factor
p = Number of teeth
i = Gearbox ratio

The gearbox ratio is determined as follows:

$$i = \frac{n_1}{n_2} = \frac{p_2}{p_1}$$

i = Gearbox ratio
n_1 = Primary pole wheel speed (Sensor position)
n_2 = Secondary pole wheel speed (Speed to be indicated)
p_1 = Nr. of teeth – primary pole wheel
p_2 = Nr. of teeth – secondary pole wheel

4.2.3 Other physical parameters

In principle any parameter may be processed as long as it can be translated into a frequency proportional value. The formulas above may still be applied whereby the required parameter is used in place of speed.

4.3 Datalogger

This function is for the Firmware version 0.88 not available.

4.3.1 Min- Max value registers

The minimum and maximum values of input signals S1 and S2 along with the analog value are measured and stored. The Min / Max registers may be reset via appropriately configured binary inputs (see 7.7.3) or via the configuration software (see 7.6.5 Event Recorder readout and / or reset).

NB. If the Min / Max registers are reset via the configuration software, then the event and trip data recorders are reset as well!

4.3.2 Event Recorder

The event recorder logs events such as when a relay operates or a system limit occurs. The following events are logged:

- Relay 1 – 4
- Open Collector 1 and 2 (If assigned to a System Limit)
- Binary input 1 and 2
- CAN Cell
- Sensor alarm
- System Limit 1 – 6 from the active parameter set
- Creep
- Direction
- Sensor fault (Static Fault S1, Static Fault S2, Dynamic Fault, Static Fault Analog Input)

144 events can be recorded for each item in the list. Each event is time and date stamped. Every event has its own memory range. The event memory can be defined as Ring or Limited Memory. (see 7.7.18 Data-logger Memory)

Time and date are only used for the event recorder and have no influence over other tachometer functions. In the event of power loss the clock will continue to operate for approx. 7 days. Thereafter it must be reset. (see 7.8.2 Time and Date settings)

NB: If the memory is reset via the configuration software, then the event recorder, trip data logger and min / max registers are reset at the same time!

4.3.3 Trip Datalogger

A Trip Data Logger is assigned to System Limit 1 in each parameter set. When activated by a System Limit 1 becoming active, 100 additional parameters before and after the trip event are logged. The additional parameters being:

- Speed - Sensor S1
- Speed - Sensor S2
- Analog input value
- Status – Binary input 1
- Status – Binary input 2
- CAN Cell status
- Sensor alarm
- Creep
- Direction

This function stores data for a fixed event window and needs to be reset via binary input to allow recording of further trip event data.

NB: If the memory is deleted via configuration software then the safety and event recorders along with the min / max registers are reset at the same time!

5 Installation

Series T601 tachometers may only be installed by competent personnel. Only undamaged and correctly configured units may be used. Please note the safety instructions in chapter 1 Safety notice.

They should be connected to the power supply by means of an isolating switch and correspond to protection class I. The PE terminal must therefore be earthed.

Before switching on check that the supply is within the permissible range.

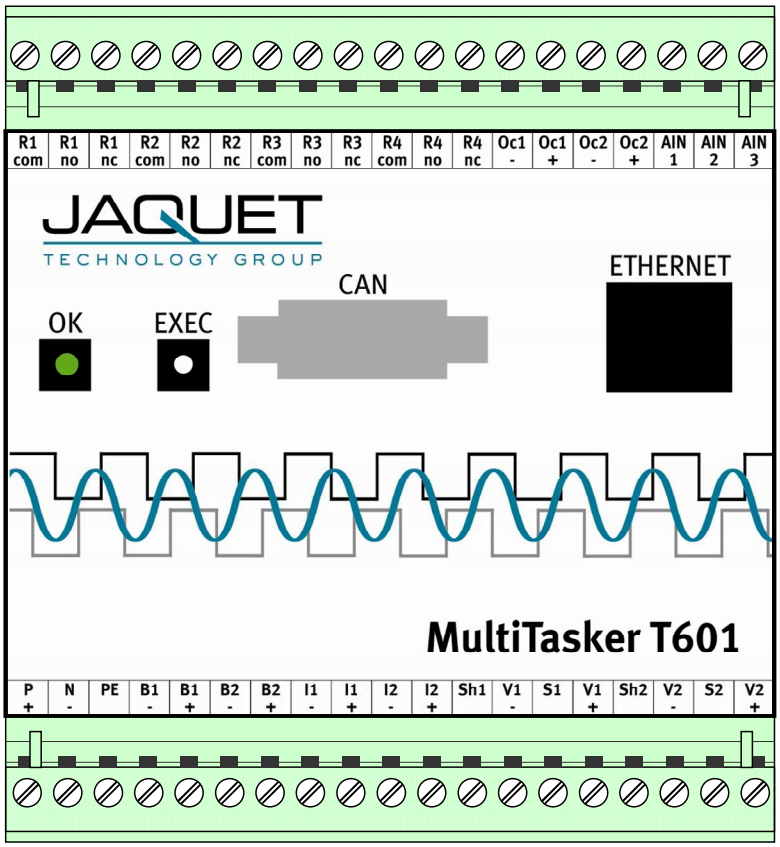
The sensor cable screens must be connected to the terminals „Sh1“ and „Sh2“ respectively so as to minimize the effects of signal noise. These terminals are internally connected to 0V (not PE).

Attention: If the password has been changed, there is no way of returning to a factory setup. If the password is forgotten, you have to send in the tachometer and the Jaquet-Service-Team will set it back.

6 Connections

6.1 Front view

6.1.1 Front view T601



Terminal B

Terminal A

The Ethernet and CAN interfaces along with the control LED and execute push button (EXEC) are all located at the front. A crossover Ethernet cable is required for configuration (see Chapter 7)

6.1.2 Terminal A

Supply

N (-) : Neutral (Return)
P (+) : Live
PE : Earth

Sensor connections S1 / S2

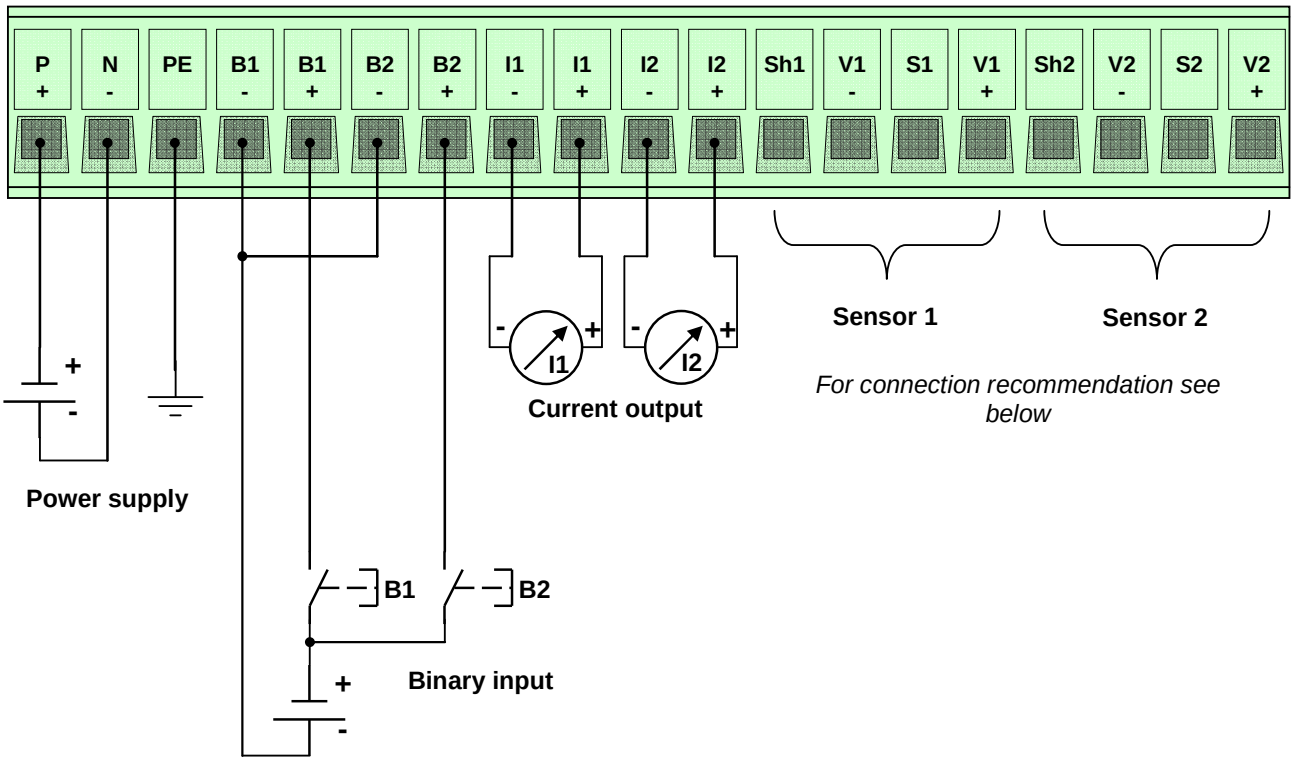
S1 : Sensor input S1
Sh1 : Screen S1
V1+ : Sensor Supply S1
V1- : 0V S1
S2 : Sensor input S2
Sh2 : Screen S2
V2+ : Sensor Supply S2
V2- : 0V S2

Binary inputs

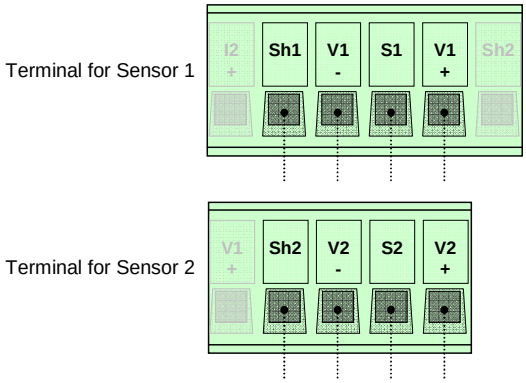
B1+ : positive B1
B1- : negative B1
B2+ : positive B2
B2- : negative B2

Analog outputs

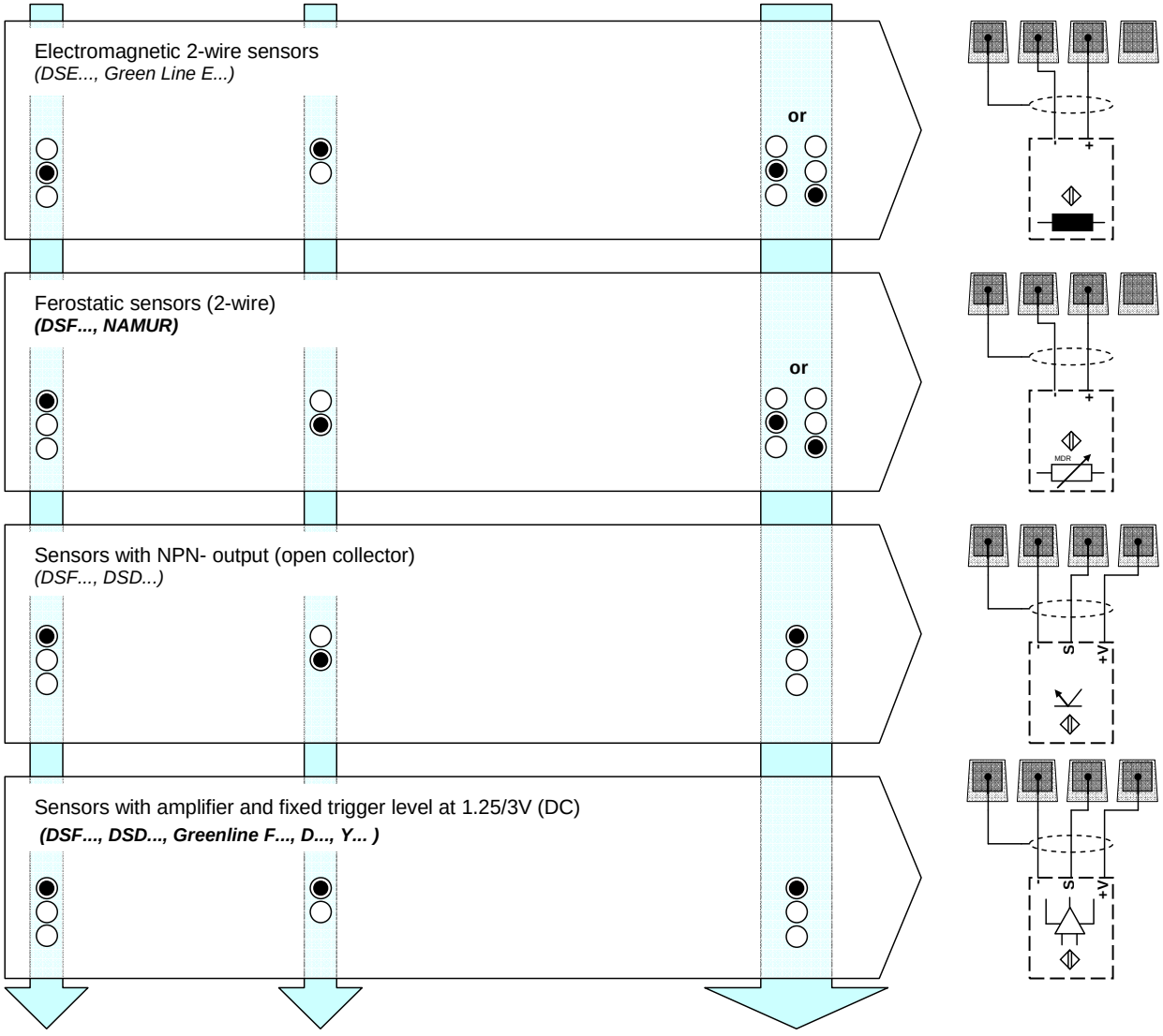
I1+ : positive I1
I1- : negative I1
I2+ : positive I2
I2- : negative I2



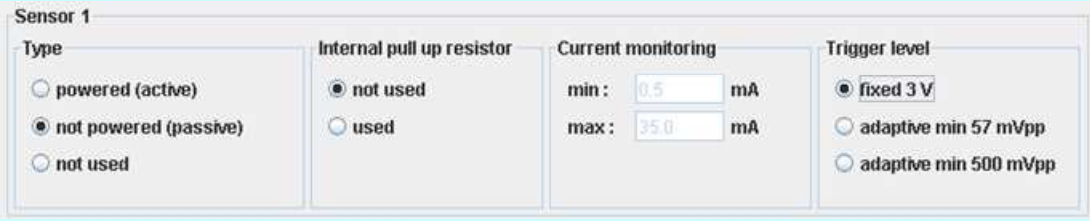
Connection recommendation



Sensor types



Configuration recommendation of the software parameters



6.1.3 Terminal B

Open Collector outputs Oc1 / Oc2

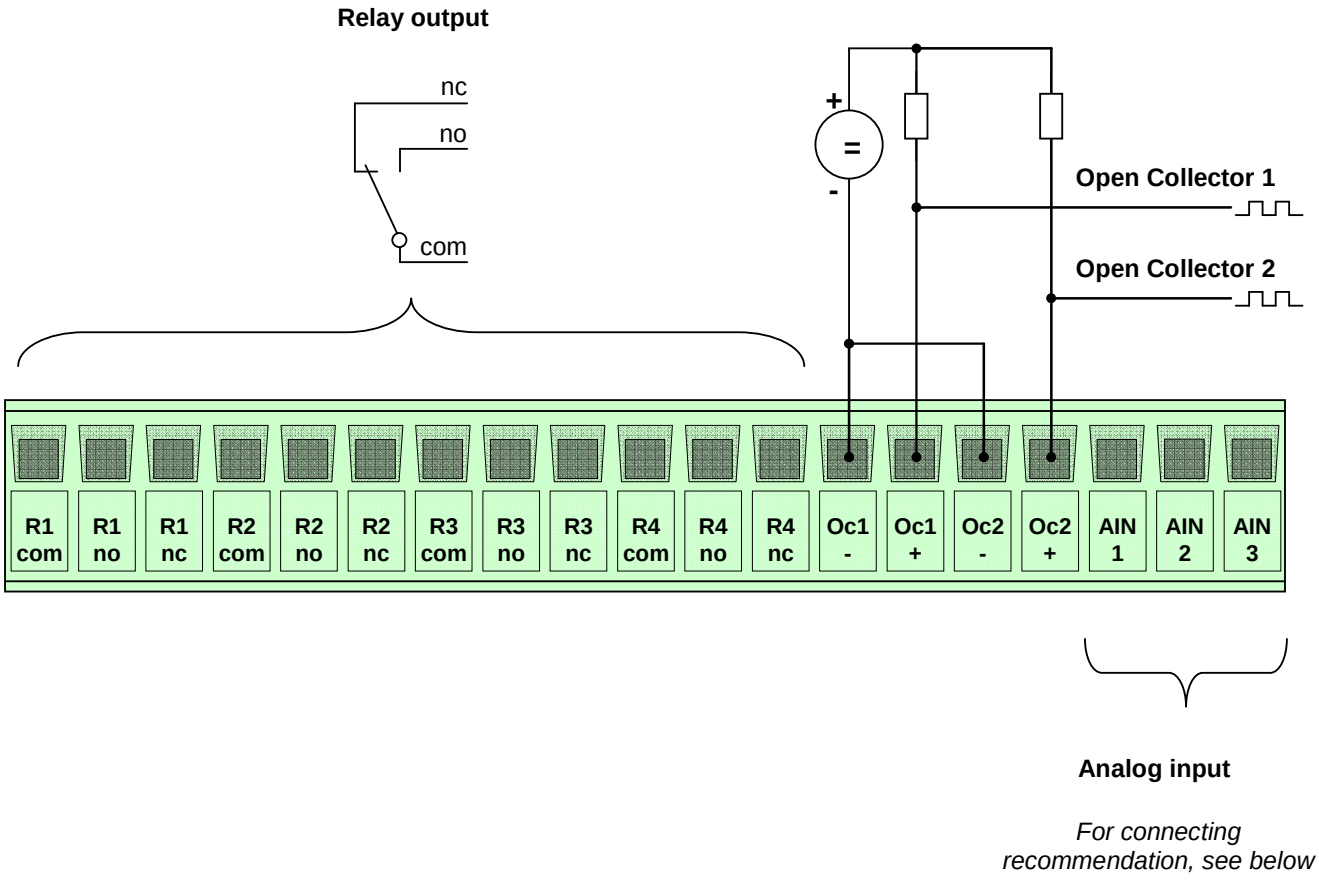
Oc1+ : positive Open Collector 1 (Emitter)
Oc1- : negative Open Collector 1 (Collector)
Oc2+ : positive Open Collector 2 (Emitter)
Oc2- : negative Open Collector 2 (Collector)

Relay outputs R1-R4

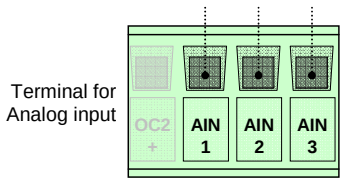
NC : Normally closed
NO : Normally open
Com : Common

Analog input

		temperature measurement	current measurement
AIN1	: Terminal 1	+	+ (active)
AIN2	: Terminal 2	Sense (-)	- /+ (active / passive)
AIN3	: Terminal 3	-	- (passive)

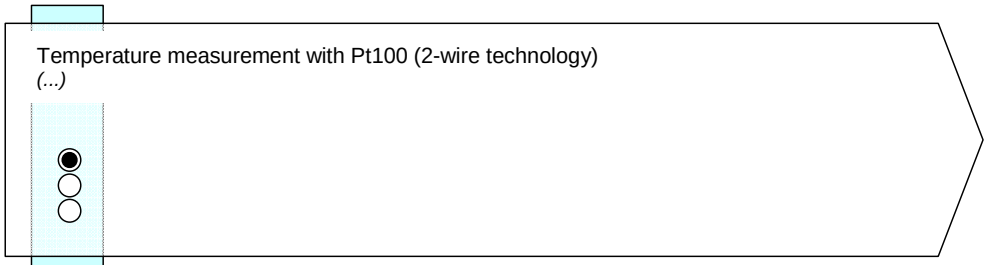


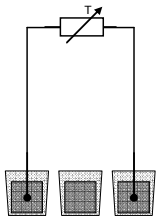
Connection recommendation



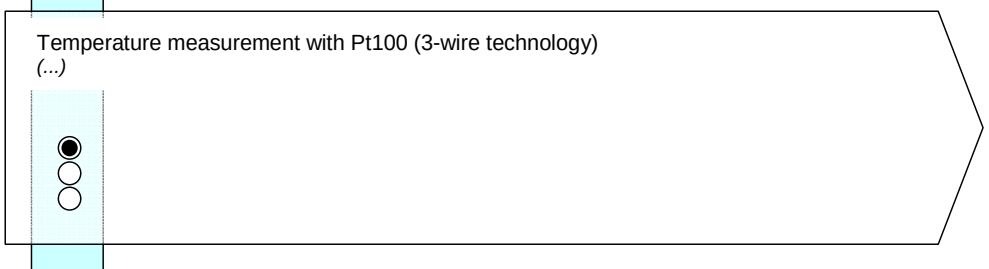
Sensor types

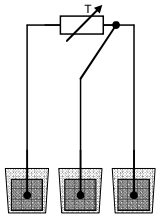
Temperature measurement with Pt100 (2-wire technology)
(...)





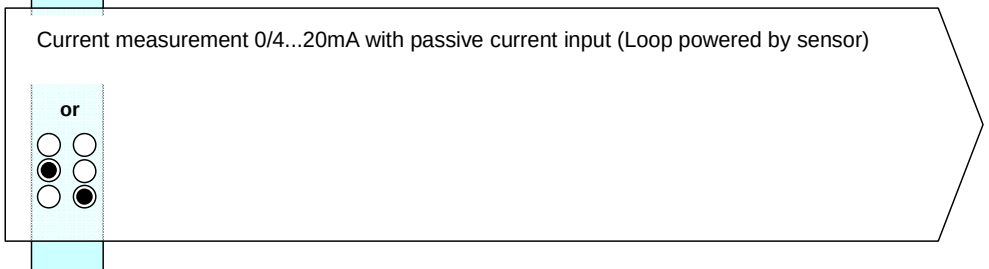
Temperature measurement with Pt100 (3-wire technology)
(...)

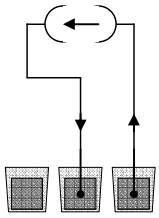




Current measurement 0/4...20mA with passive current input (Loop powered by sensor)

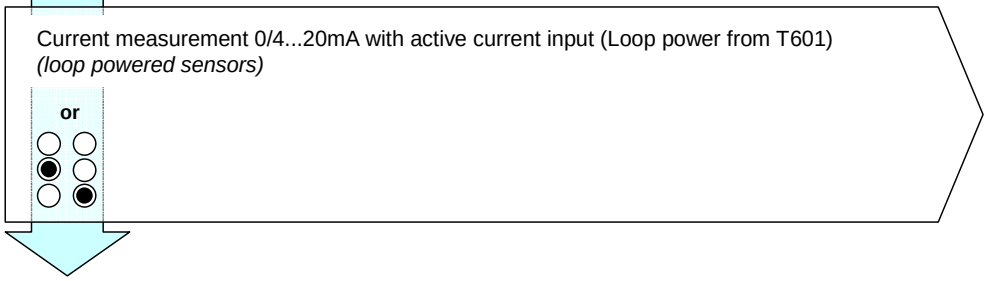
or

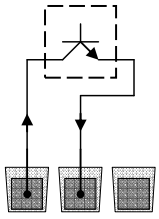




Current measurement 0/4...20mA with active current input (Loop power from T601)
(loop powered sensors)

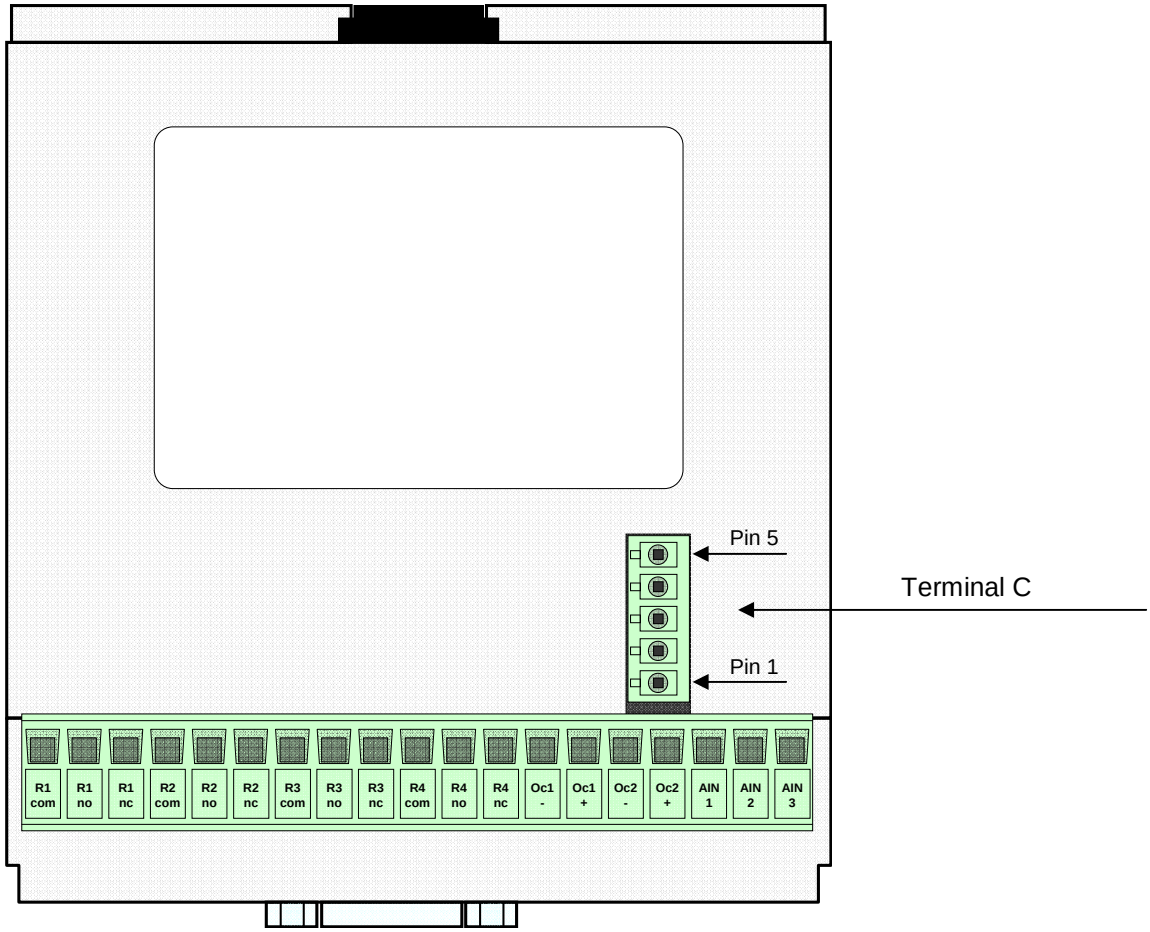
or





Configuration recommendation of the software parameters

6.2 Top View



6.2.1 Terminal C

This connector is used to connect displays. Please refer to the operating instructions of the used display(s).

7 Configuration via PC Software

7.1 Software Concept

The Ethernet interface is required to configure the T601 or view its measurement status.

Settings are written to the T601 from a PC via a cross-over cable (see chapter 10 Accessories). The Configuration is done with a user friendly and self explanatory menu driven software.

The software is resident in the T601 and needs to be downloaded for configuration.

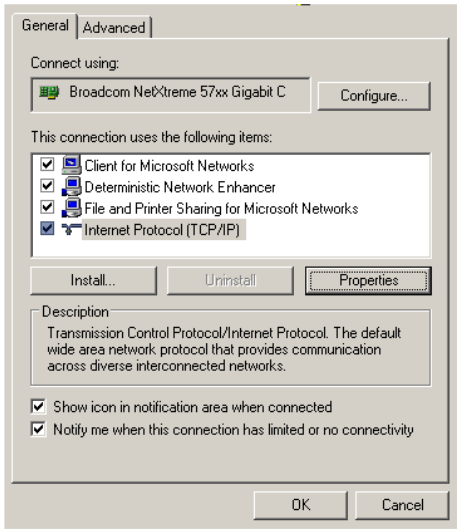
Normal file handling applies to the configured parameters and they may be printed out.

To run the software Java Runtime Environment (JRE) 1.5 or higher is required. You can get the newest version online at www.java.com or you will find it on the CD-Rom.

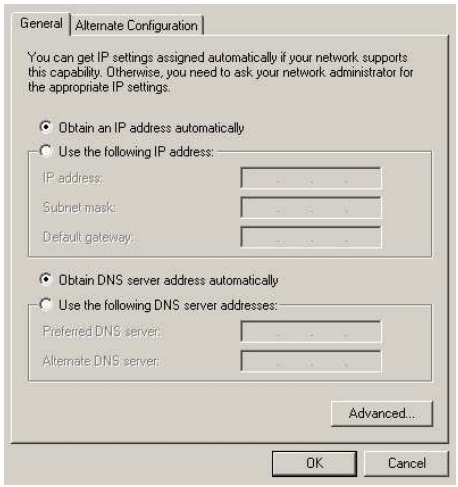
7.2 PC Settings

The PC Ethernet card must first be set correctly. T601's cannot be used on a network.

Go to Desktop, Settings, Network connections and right click on <Properties>. Right click the Network card you want to use for T601 comms and select <Properties>.



Select Internet Protocol (TCP/IP) and select the option <Obtain an IP address automatically>



7.3 Download configuration software

Connect the Tachometer to your PC using a cross over patch cable. Once connected open your internet browser and enter the IP address 192.168.1.127/software

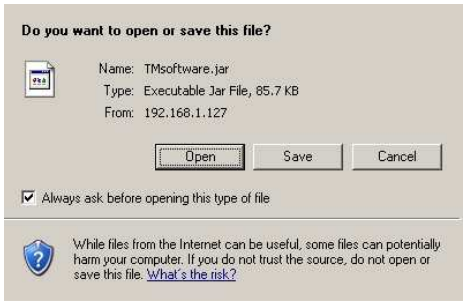
A HTML page will open with the link <Download control program>

Click on the link. Dependent on your internet Explorer configuration you will be asked whether you want to <Open> (Run) or <Save> (Save as) the programme.

NB: depending on your security settings, these functions will be denied. In this case, contact your administrator.

7.3.1 Direct execution

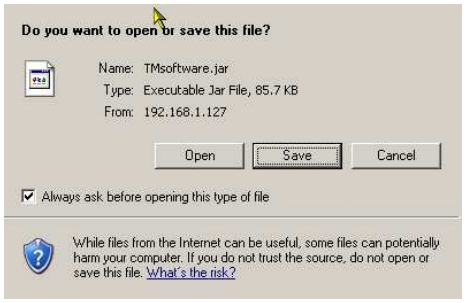
Select <Open> and the configuration will be read from the tachometer (can take a few seconds). Once loaded the configuration software will open automatically.



7.3.2 Save as

Select <Save> to save the file in a path of your choice (can take a few seconds).

Open the file from your PC. The configuration software establishes a connection to the T601 and reads the actual parameters.



7.4 Configuration software

7.4.1 Configuration user and Process user

T601 parameters are divided into 2 groups, Configuration and Process parameters.
When the programme is started the window shows 3 levels one can log into, Config user, Process user or Guest. Process and Configuration users require passwords.

A Guest has only the right to view measured data or print out actual parameters.

Process users may execute all of the functions that a Guest can do. In addition he is able to view or set process parameters. Should a new file be loaded, only process parameters will be accepted (no configuration parameters).

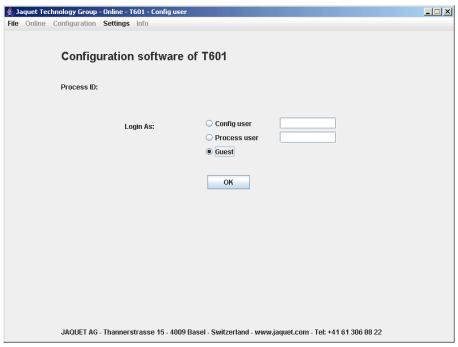
The Configuration user has full access and control over all parameters, Process as well as Configuration.

The factory settings are shown below **bold**.

7.4.2 Log in

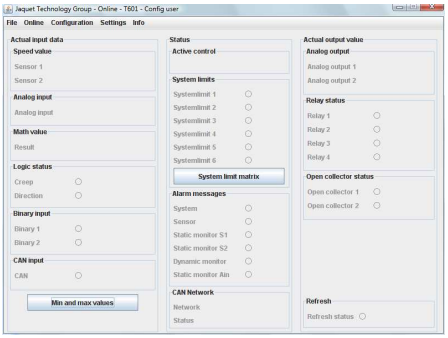
Here you can Log in on three different levels. The standard passwords for Config- and Process- User are:

Config user password	**1981**
Process user password	**1977**



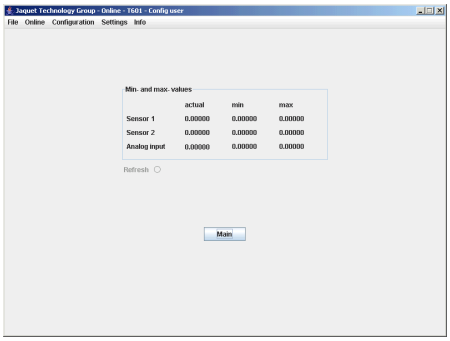
7.4.3 Main Window, Min-Max Values and System Limit Matrix

After successfully logging in, the main over view appears. Here one sees the various I/O's and status.



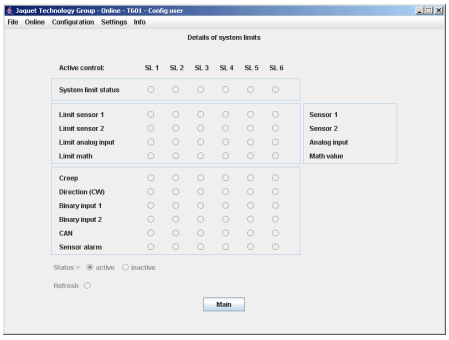
Listed on the left hand side are the various System Limit inputs. System Limit status and alarm messages are to be found in the middle. Shown on the right are all outputs status and output current levels.

The measured Min-Max values are accessed via the button on the left.



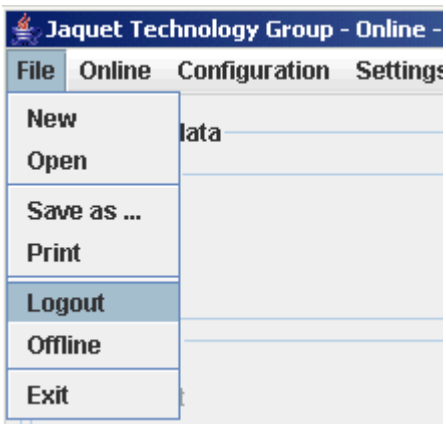
Actual measured values are shown alongside the Min-Max values for sensor signals 1 & 2 and the analog input.

In the middle next to status is a further button through which an overview of the System Limit matrix is accessed, showing the logical status of System Limits, binary inputs etc.



7.4.4 Logging in and out

To change user level log out via <File> and click on <Logout>, then log in again using the appropriate password.

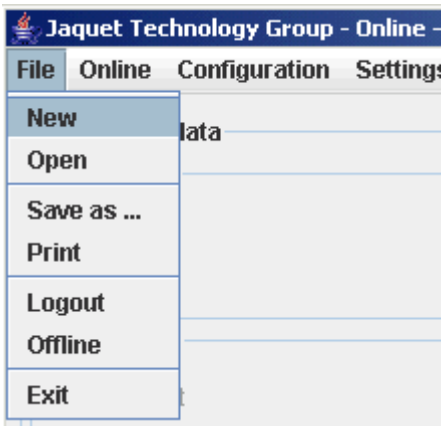


7.5 Configuration file…

7.5.1 … creating new

To create a new configuration file go to <File>, <New> and click on OK. All parameters are then reset.

NB: if you have not saved the live parameters then they would be lost.



7.5.2 … resetting to factory default

To reset parameters to factory settings go to <Settings> <Back to factory setup> then click on OK.

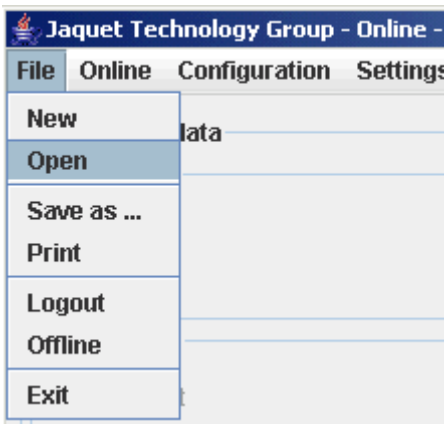
NB: if you have not saved the live parameters then they would be lost.

7.5.3 … loading

To load an existing file go to <File>, <Open> and select the required configuration file.

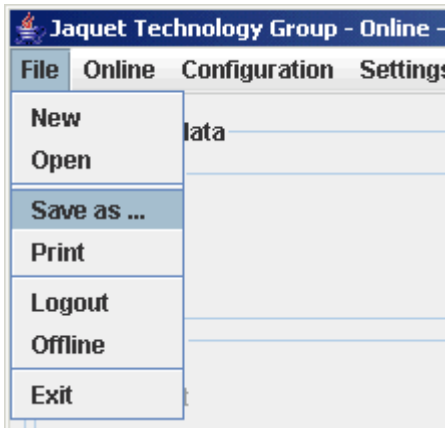
NB: if you have not saved the live parameters then they would be lost.

NB: you can only load parameters that your user level allows you to change.



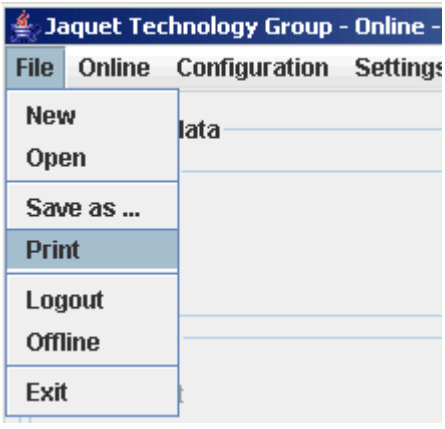
7.5.4 … saving

To save actual parameters go to <File>, <Save as> and choose the path and file name you want to use. Please note that the file name ends in the format *.T601.



7.5.5 … printout

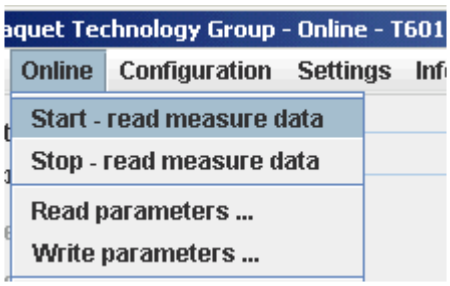
To print actual parameters go to <File>, <Print> and choose your printer. 9 pages will be printed.



7.6 Communication with the Tachometer

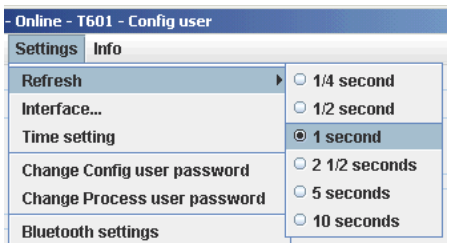
7.6.1 Read measured data

To read actual measured data and unit status go to <Online>, <Start – read measure data>.

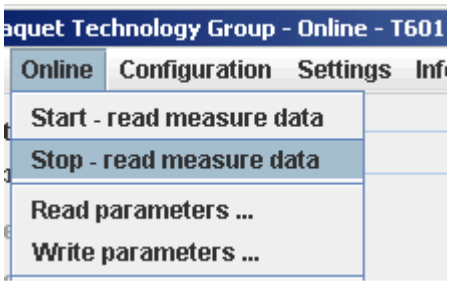


Measured data is updated in the Main window with interval defined under <Settings>, <Refresh Interval>.

¼ Second
½ Second
1 Second
2 ½ Seconds
5 Seconds
10 Seconds



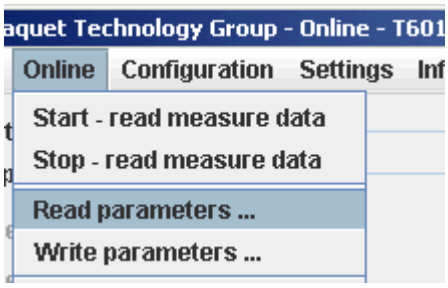
To end the measured data display go to <Online>, <Stop – read measure data>.



7.6.2 Reading configuration from the T601

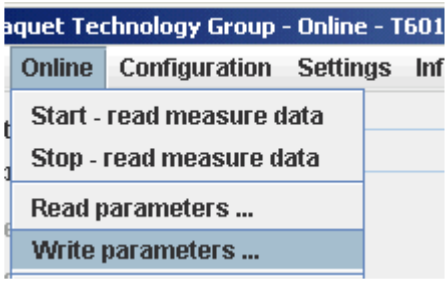
When the configuration software is started the configuration file is automatically transferred to the PC. To up load the file again go to <Online>, <Read parameters> and confirm with Enter.

NB: The live parameter data will be overwritten.



7.6.3 Writing a configuration to the T601

Once the configuration is prepared it can be written to the T601. Go to <Online>, <Write parameters>. The parameters will then be sent to the tachometer. The process takes approximately 10 seconds. The T601 status during this period is described in chapter 8.7 Behaviour during Configuration.

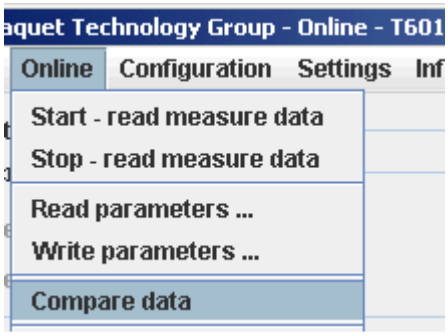


If no connection can be established, the process is repeated 3 times and then abandoned.

NB: Actual tachometer data will be over written and the unit is in error mode during this period.

7.6.4 Compare data

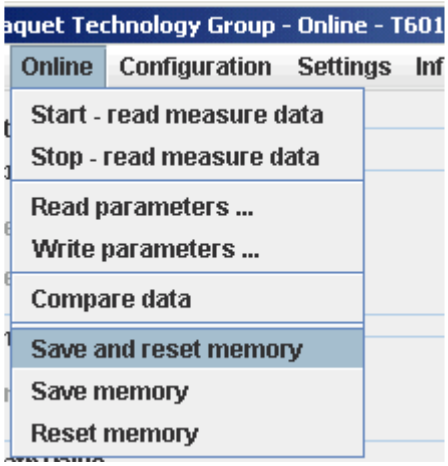
If you like to compare a PC configuration file with that in the T601, first open the file and then go to <Online>, <Compare Data>. The actual file is then uploaded from the T601 and compared with the software parameters. A dialogue window will then appear showing whether the files are identical or not.



7.6.5 Read and/or Delete Event Recorder

This function is for the Firmware version 0.88 not available.

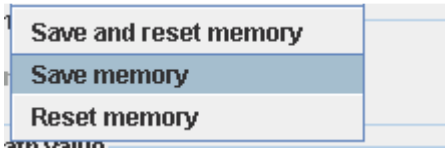
To read out the contents of the event recorder and then delete it go to <Online>, <Read and delete memory>.



After confirming with OK that you wish to read the data, it is loaded from the tachometer. That can take a few seconds. When reading the data you can define the destination to save it. For safety reasons you will be asked again whether you wish to delete the data.

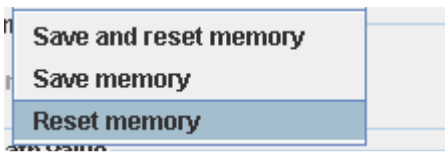
NB: After deleting the data it cannot be restored.

If you only wish to read the data from the event recorder got to <Online>, <Read memory>



After confirming with OK that you wish to read the data, it is loaded from the tachometer.

If you only wish to delete the event recorder data go to <Online>, <Delete memory>, then confirm with OK.

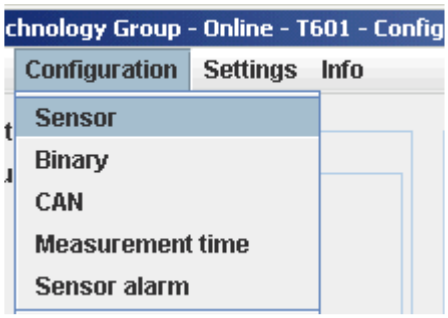


7.7 Configuring

The factory defaults are written in **bold**.

7.7.1 Configure Speed Sensors

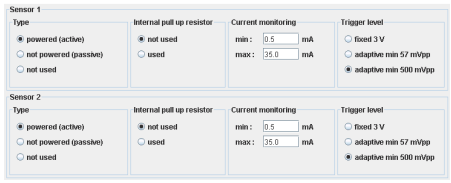
Go to <Configuration>, <Sensor>.



To connect the sensor see chapter 6.1.2 Terminal A.

5 Parameters are used to configure the sensor:

Type:	**powered** / not powered
Resistor:	used / **not used**
Min. current:	**0.5**mA … 35mA
Max. current:	0.5mA … **35**mA
Trigger level:	fixed 3V / min 57mV$_{pp}$ / **min 500mV$_{pp}$**

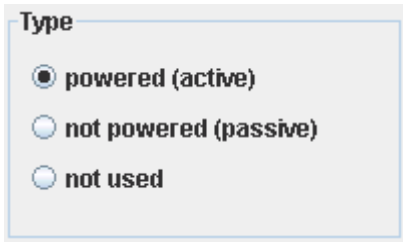


Sensor Type

powered: The sensor is supplied from the Tachometer's 14V (+/-0.5V) supply. To use static sensor monitoring the Min/Max current consumption must be defined.

not powered: For sensors that aren't powered by the Tachometer. Sensor monitoring is done via impedance measurement. Therefore a broken cable can be detected.

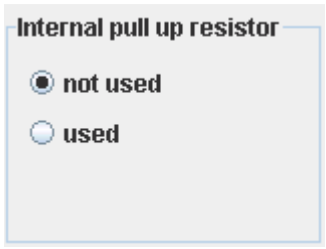
not used: Sensor input is not used. Certain functions requiring 2 sensors are not available and will be automatically disabled.



Internal pull up resistor

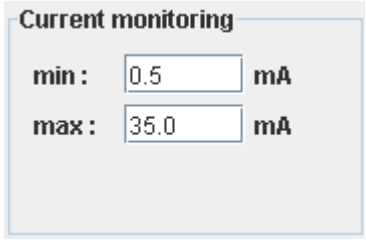
not used: The internal pull up is not in circuit.

used: The internal pull up is in circuit.

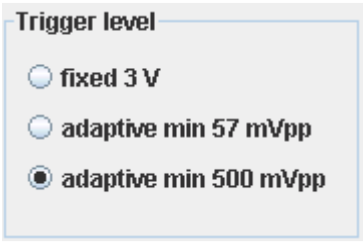


Current monitoring

When the sensor is supplied from the tachometer upper and lower current limits must be entered. Current consumption outside of the defined limits results in a static sensor error being signalled.



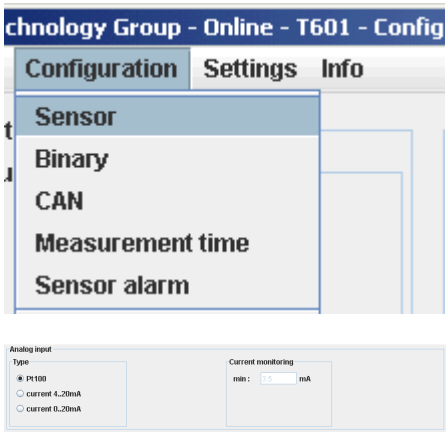
Trigger level



One of 3 modes may be selected. Fixed trigger (fixed 3V) for digital sensors and two adaptive triggers (57 mV_{pp} / 500 mV_{pp}) for analog speed sensors (electromagnetic).

7.7.2 Configure Analog Sensor

To configure the analog sensor input, go to <Configuration>, <Sensor>.



How to connect the sensor to terminal B is shown in 6.1.3 Terminal B.

There are 2 parameters available for configuration:

Type: **Pt100** / Current 4 .. 20mA / Current 0 .. 20mA
Min. Sensor current: 0.5mA … **3.5mA** … 35mA

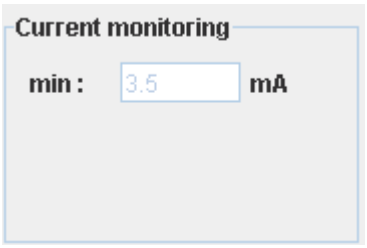
Sensor Type

Pt100: Temperature sensor (Pt100)

Current 4 .. 20mA: Current input 4mA … 20mA

Current 0 .. 20mA: Current input 0mA … 20mA

Current monitoring

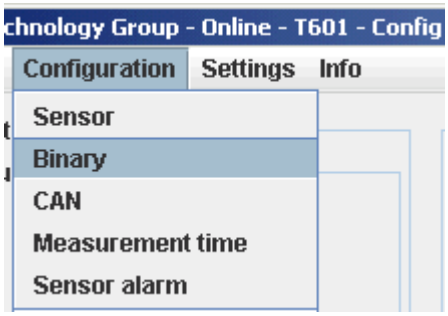


Static sensor fault is signalled if the current falls outside of the limits. The lower limit may only be selected where the sensor range is 4...20mA.

The upper limit is fixed at > 20.5mA and cannot be adjusted.

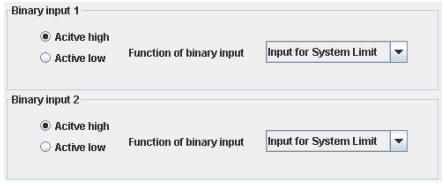
7.7.3 Configure binary input

To configure the binary inputs go to <Configuration>, Binary input>.



There are 2 parameters available to configure:

Logic level:	**Active High** / Active Low
Binary input for:	**Input to System Limits** / Parameter set selection (A/B/C/D) / Latch reset / Creep reset / Min - Max value reset



Logic levels

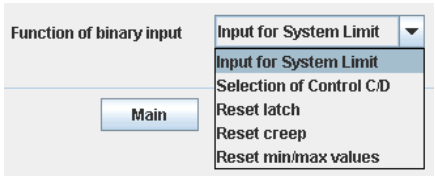
Active High:	Logic 1 = voltage in range on binary input
Active Low:	Logic 1 = no voltage on binary input

Please see chapter 3.3 Binary Inputs for binary input voltage levels

Binary input

Binary inputs may be used for various functions.

Input for System Limits:	The binary input forms part of the logical combination for System Limit.
Parameter set selection:	Select parameter set A, B, C or D. See chapter 8.4.2.
Reset latch / Open Collector:	Reset latched relay and open collector
Creep reset:	Reset the Creep function
Min / Max reset:	Reset min / max values in the event recorder

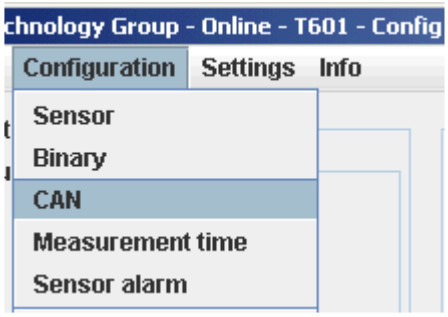


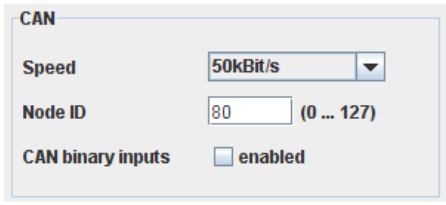
7.7.4 CAN

To set the CAN interface go to <Configuration>, <CAN>.

To set up the interface the port must be enabled.

Speed:	20kBit / 50kBit / 125kBit / **250kBit** / 500kBit / 1MBit
Node ID:	0 … **80** … 127
Activate:	Yes / **No**



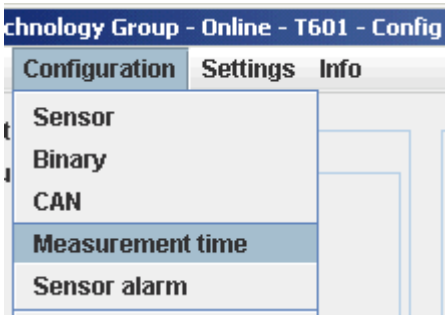


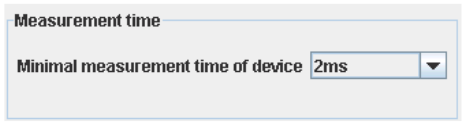
7.7.5 Set Measurement Interval

Go to <Configuration>, <Measurement time>.

This time interval determines the period during which the speed, parameters, status and outputs are recalculated and set accordingly.

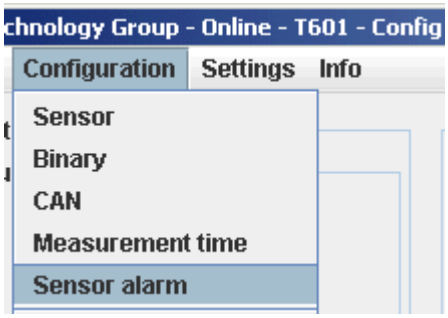
Measurement time: **2ms** / 5ms / 10ms / 20ms / 50ms / 100ms / 200ms / 500ms / 1s / 2s / 5s





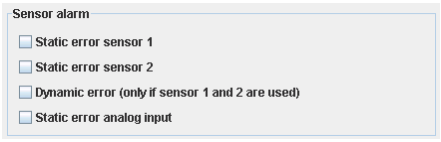
7.7.6 Sensor Alarm

Go to <Configuration>, <Sensor alarm>.



There are 4 possible error sources for sensor alarm that may be combined in a logic OR. Each individual error source may be independently selected.

Static error sensor 1:	On / **Off**
Static error sensor 2:	On / **Off**
Dynamic error:	On / **Off**
Static error analog input:	On / **Off**



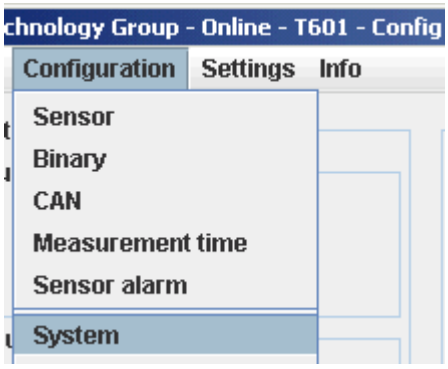
Box checked = On, unchecked = Off (see also chapter 7.7.1 Configure Speed Sensors).

Dynamic Error can only be used when 2 sensors are present. (see chapter 7.7.10 Dynamic Error).

Analog input static error occurs if the input falls outside of permitted limits.

7.7.7 Machine factor

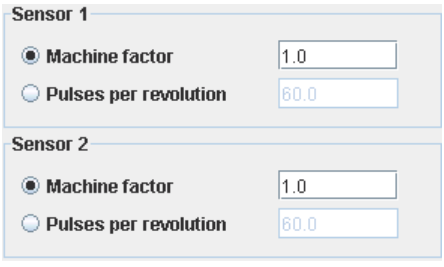
Go to <Configuration>, <System>.



The machine factor establishes the relationship between sensor frequency and associated machine speed. (see chapter 4.2 Machine factor)

The machine factor may also be set by means of the number of pulses per revolution. The 2 parameters have a fixed relationship of factor 60 (Pulses per rev. = Machine factor x 60)

Machine factor:	0.0001 … **1** … 999,999
Pulses per revolution:	0.006 … **60** … 59,999,940



Once the machine factor has been established all further entries such as speed limits are in machine units e.g. rpm.

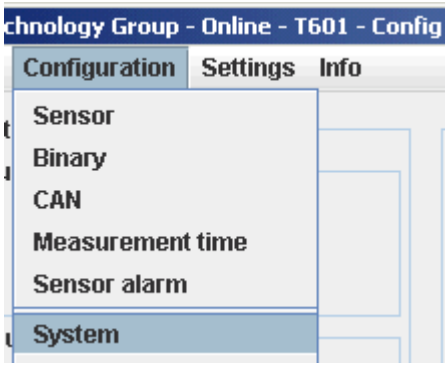
7.7.8 Direction Sensing

To configure direction sensing go to <Configuration>, <System>.

To use direction sensing, 2 sensors must be connected that optimally exhibit 90° phase shift (minimum 10°).

The signal sequence that corresponds to clockwise rotation of the shaft must be defined

Clockwise: **S1 before S2** / S2 before S1

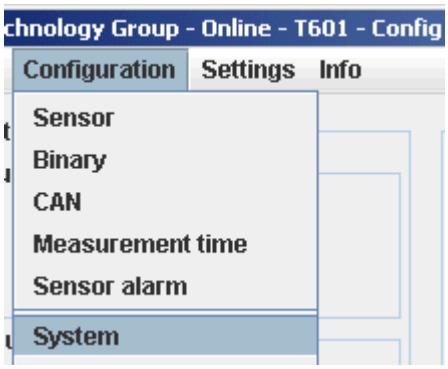


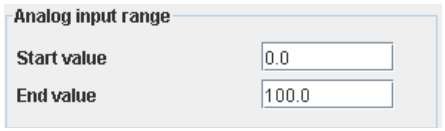
7.7.9 Analog Input Range

To configure the analog input go to <Configuration>, <System>.

The current value may be defined for inclusion in System Limits. The start value refers to 0/4mA according to the definition and the end value to 20mA input.

Start value: -999'999 … **0.0** … 999’999
End value: -999'999 … **100.0** … 999’999





7.7.10 Dynamic Error

Go to <Configuration>, <System>.

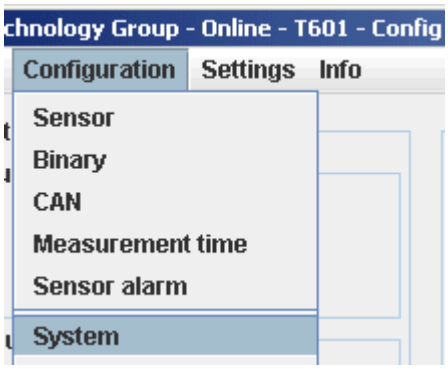
$$Difference = \left| f_{S1} - f_{S2} \right|$$

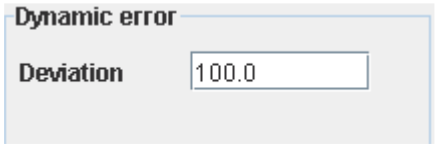
f_{S1}: Sensor 1 frequency
f_{S2}: Sensor 2 frequency

This function is only available used when both sensor inputs are used. This function has influence only on Sensor alaram.

Deviation: 0.0 … **100.0** … 999’999

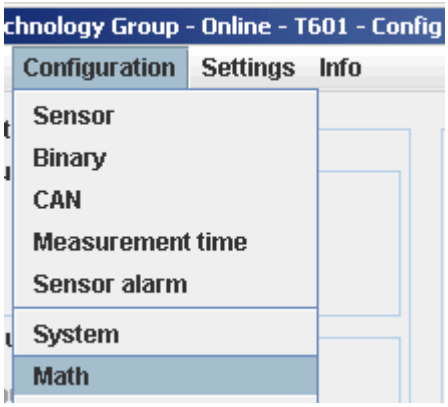
If the speed difference is bigger than this value, then Dynamic error is signalled.

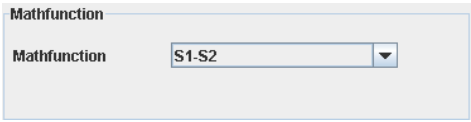




7.7.11 Math Function

Go to <Configuration>, <Math>.





Math function is an additional input available for System Limit and current outputs
The following Math functions may be constructed.

S1 – S2	Subtraction of speed values
S2 – S1	
S1 / S2	Division of speed values
S2 / S1	
100% x (S1-S2)/S2	Percentage difference
100% x (S2-S1)/S1	
Variance (S1)	Variance
Variance (S2)	
Variance (Ain)	
Acceleration (S1)	Speed value acceleration
Acceleration (S2)	
Acceleration (Ain)	
S1	May also be used for the Window Function.
S2	
Ain	

Percentage difference

$$\frac{100 \times (n2 - n1)}{n1}$$ n: Speed

Variance

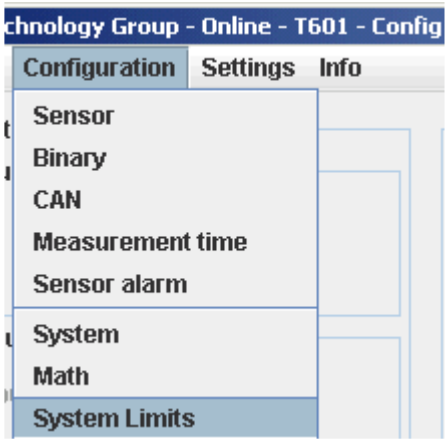
$$S_x^2 = \frac{1}{j-1} \sum_{i=1}^{j} (x_i - \bar{x})^2$$ j = 100

Acceleration

$$a = \frac{\Delta v}{\Delta t} = \frac{n_1 -_{1alt}}{t_{edgeS1} - t_{edgeS1alt}}$$ n: Speed

If the variance for S1, S2 or Analog input needs to be calculated, the measurement time must be set to 5ms or higher.

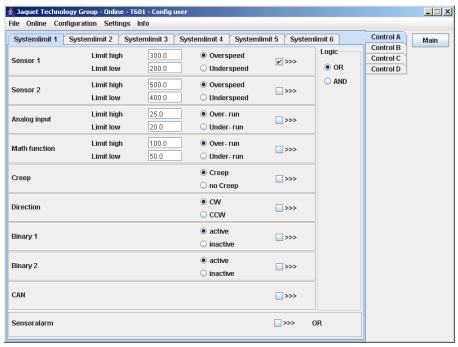
7.7.12 System Limits



Go to <Configuration>, <System Limits>.

Every System Limit has the same 9 logical inputs: sensor 1, sensor 2, analog input, math function, creep, direction, binary input 1, binary input 2 and CAN. A hysteresis may also be set for the first 4. Every input may be inverted and selectively assigned to the logical combination. The inputs may be logically combined OR or AND.

Sensor alarm may be additionally combined OR with the System Limit result.



Sensor 1:
- Limit low: 0.01 … **200.0** … 999'999
- Limit high: 0.01 … **300.0** … 999'999

Sensor 2
- Limit low: 0.01 … **400.0** … 999'999
- Limit high: 0.01 … **500.0** … 999'999

Analog input for Pt100 Sensor:
- Limit low: -50 … **20.0** … 300
- Limit high: -50 … **25.0** … 300

Analog input for current Sensor:
- Limit low: -999'999 … **50.0** … 999'999
- Limit high: -999'999 … **100.0** … 999'999

Math function
- Limit low: -999'999 … **50.0** … 999'999
- Limit high: -999'999 … **100.0** … 999'999

Inversion:
- Sensor 1: **Over speed** / Under speed
- Sensor 2: **Over speed** / Under speed
- Analog input: **Over-run** / Under-run
- Math: **Over-run** / Under-run
- Creep **Creep** / no Creep
- Rotational Direction **CW** / CCW
- Binary input 1: **active** / inactive
- Binary input 2: **active** / inactive

Inclusion in logical combination:

Sensor 1:	On / **Off**	On with system Limit 1
Sensor 2:	On / **Off**	On with system Limit 2
Analog input	On / **Off**	
Math:	On / **Off**	On with system Limit 3
Creep	On / **Off**	
Rotational Direction	On / **Off**	
Binary input 1:	On / **Off**	On with system Limit 4
Binary input 2:	On / **Off**	On with system Limit 4
CAN	On / **Off**	

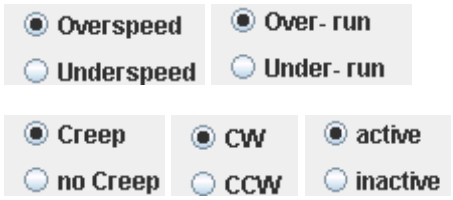
Logical combination:
- Combined **OR** / AND

Hysteresis

Hysteresis may be defined for the first 3 inputs via upper and lower limits. If the lower limit is set higher than the upper limit, the hysteresis is inverted.

Inversion

Every input may be inverted. Just select your event that triggers your system limit.



Logical combination

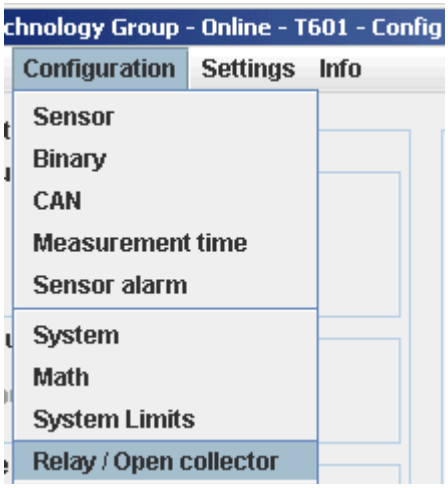
The box must be ticked to include the input in the logical combination.

Sensor Alarm

To OR Sensor alarm with the System Limit result the box must be ticked.

7.7.13 Relay Outputs

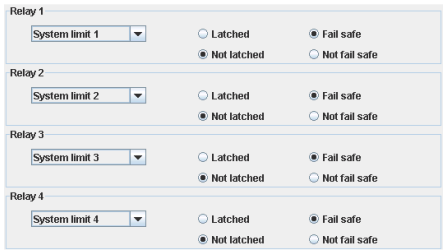
To configure relay outputs go to <Configuration>, <Relay / Open Collector>.



Relay configuration consists of:
Assignment, the latch function and the fail safe/not fail safe mode.

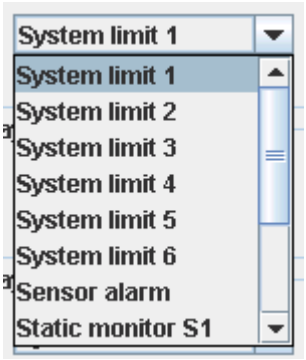
System limit 1	Sensor alarm
System limit 2	Static S1
System limit 3	Static S2
System limit 4	Dynamic error
System limit 5	Always ON
System limit 6	Always OFF
Static Ain	

Latch Function: Latched / **not latched**
Safety function: **Fail safe** / Not fail safe



Assignment selection

The selection box is used to choose relay assignment.



Latch Function

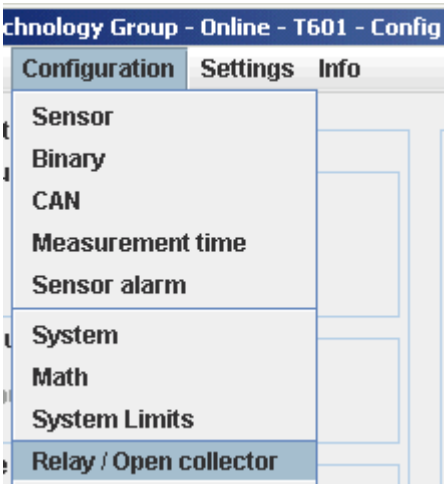
Defines whether a relay state should be held (Latched) until reset.

Safety Function

Defines whether the relay is to operate in Fail safe (deactivate at e.g. limit) or not fail safe mode (activate at e.g. limit).

7.7.14 Open Collector Outputs

To configure the Open Collector outputs go to <Configuration>, <Relays / Open Collector>



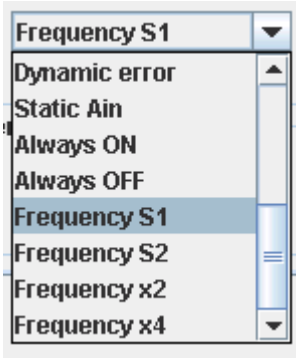
3 parameters are available for configuration: Open Collector assignment, latch function and fail safe / not fail safe function

System Limit 1	Dynamic error
System Limit 2	Static Ain
System Limit 3	Always ON
System Limit 4	Always OFF
System Limit 5	**Frequency S1**
System Limit 6	**Frequency S2**
Sensoralarm	Frequency x2
Static S1	Frequency x4
Static S2	

Latch Function: Latched / **not latched**
Failsafe / not failsafe: **Failsafe** / not failsafe

Assignment selection

The selection box is used to choose Open Collector assignment.



Latch Function

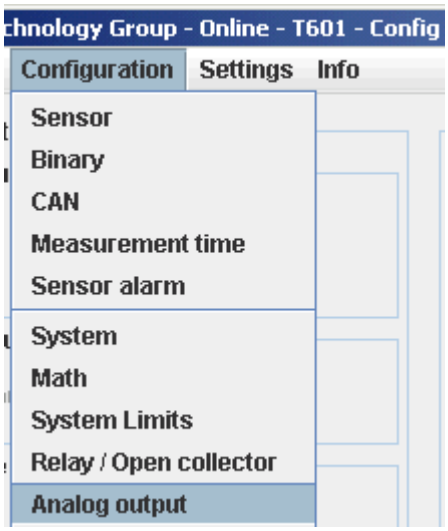
Defines whether an Open Collector state should be held (Latched) until reset.

Safety Function

Defines whether the Open Collector is to operate in Fail safe (deactivate at e.g. limit) or not fail safe mode (activate at e.g. limit).

7.7.15 Analog Output

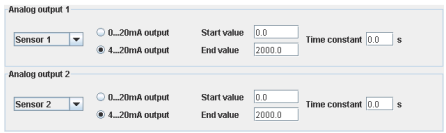
To configure analog outputs go to <Configuration>, <Analog out>.



4 parameters are available: Assignment, current range, start and end values and the time constant

Assignment possibilities:

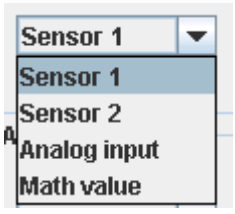
Sensor 1	Analog output 1
Sensor 2	Analog output 2
Analog input	
Math value	



Current range:	0 ..20mA / **4 .. 20mA**
Start value:	-999'999 … **0.0** … +999'999
End value:	-999'999 … **2'000.0** … +999'999
Time constant	**0** … 9.9 in 0.1 second increments

Assignment selection

The selection box is used to choose analog output assignment.



Current range

0 … 20mA or 4 … 20mA.
Error status for 0 … 20mA > 21mA.
Error status for 4 … 20mA > 2mA.

Start and End values

Enter the start and end values e.g.
0 (rpm) = 4mA
2000 (rpm) = 20mA

If the end value is lower than the start value the output current follows a falling characteristic.

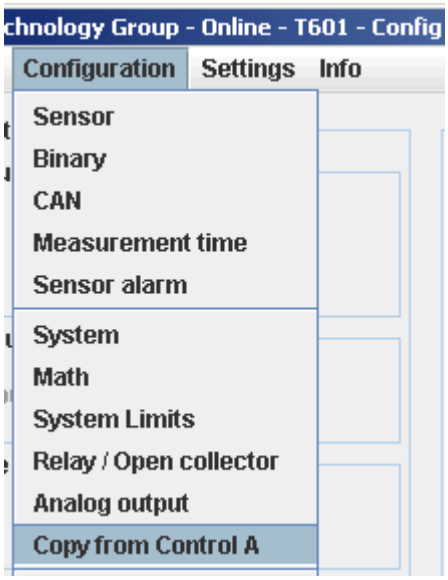
Time constant

Sets a time constant T. The target value is reached after 5xT.
The output current follows an e- Function.

If the time constant is longer than 0 seconds, the measurement time must be set to 5ms or higher.

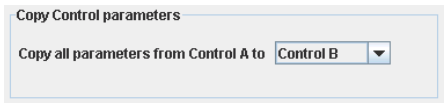
7.7.16 Copy Parameter Set

Go to <Configuration>, <Copy from Control A>.



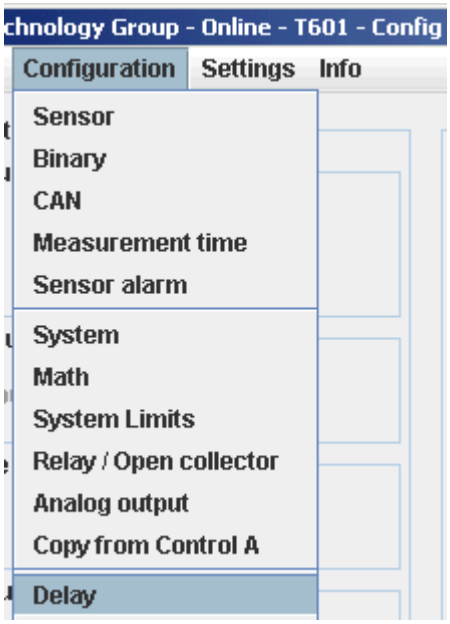
A Parameter set may only be copied from Parameter set A! All parameter of the submenu <System>, <Math>, <System Limits>, <Relay / Open collector> and <Analog output> are members of the parameters sets. Therefore, the following Parameters will be copied:

- Machine factor 1 and 2
- Deviation
- Direction Sensing
- Analog input range
- Math function selection
- Upper and lower limits in System Limits
- System Limit inversion
- Inclusion of input in the logical combination
- Inclusion of sensor alarm in the logical combination
- Relay / Open Collector assignment
- Relay / Open Collector latch mode
- Relay / Open Collector fail safe mode
- Analog output assignment
- 0..20mA or 4..20mA setting
- Start and end values
- Analog output time constant



7.7.17 Change-over delay

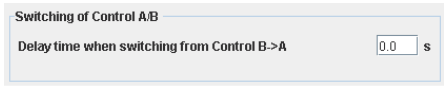
Go to <Configuration>, <Delay>.



One change-over delay may be set for the delay in switching from Parameter set B to Parameter set A only.

Delay time: **0** … 2000 Seconds

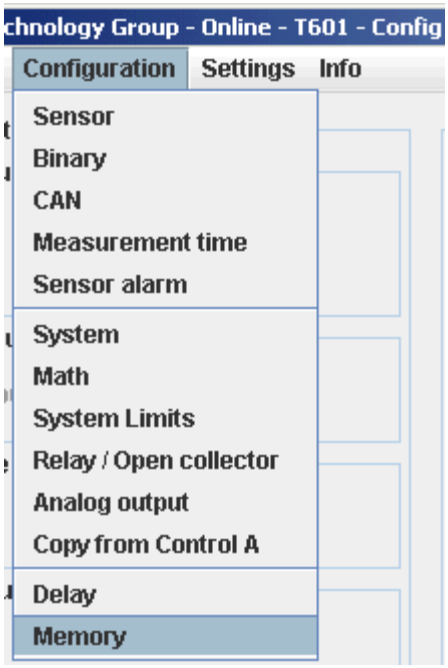
Only integer values can be used for the change-over delay.



7.7.18 Data-logger Memory

This function is for the Firmware version 0.88 not available.

To configure the data-logger go to <Configuration>, <Memory>.

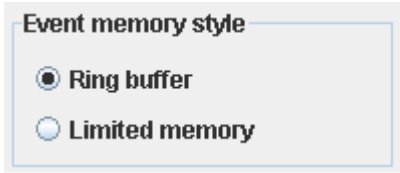


The memory may be organised as: Ring buffer or limited memory.

Memory mode: **Ring buffer** / Limited memory

Ring buffer: earlier data is over-written after a given number of values.

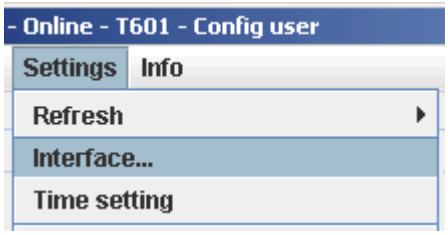
Limited memory: a given number of values are stored. Once that value is reached no further data is saved.



7.8 Settings

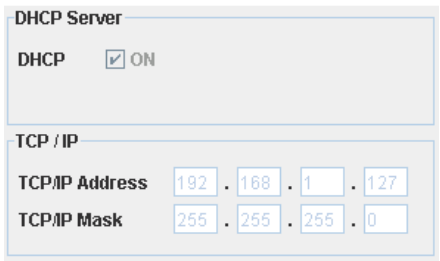
7.8.1 Ethernet Interface

Go to <Settings>, <Interface …>.



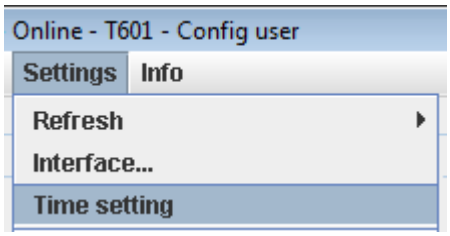
No settings can be made. The PC-T601 connection is peer to peer (PC to PC). T601's cannot be connected to a network!

For technical data see chapter 3.6.1 Ethernet.



DHCP Server	**ON** / OFF
TCP/IP Address	**192.168.1.127**
TCP/IP Mask	**255.255.255.0**

7.8.2 Time and Date settings



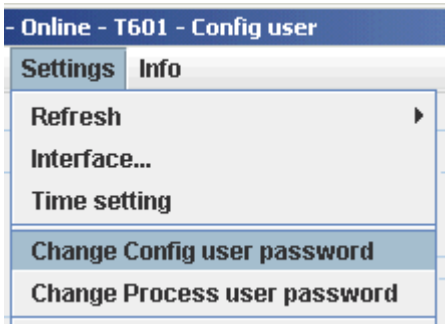
Go to <Settings>, <Time setting>.

To set the time enter the new time into the text field and click on <Set time>. Please keep to the format (hh:mm).

To set the date enter the new date into the text field and click on <Set date>. Please keep to the format (dd.mm.yyyy).

NB: The time and date settings have not yet been transferred to the tachometer. That only occurs when the parameters are sent to the unit.
In the case of power loss, time and date are stored for approx. 7 days. Thereafter they must be re-enterred.

7.8.3 Changing the Password



Go to <Settings>, <Change Config user password> or <Change Process user password>.

Changing the password involves entering the old password and the new password twice. To save the password click on <OK>.
The password is now stored in the configuration software.
To change it in the T601 the data must be downloaded.

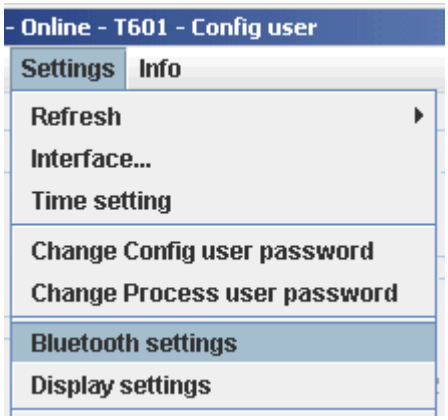
A configuration user may change the process user password by entering the Configuration user password first.
Factory set passwords:

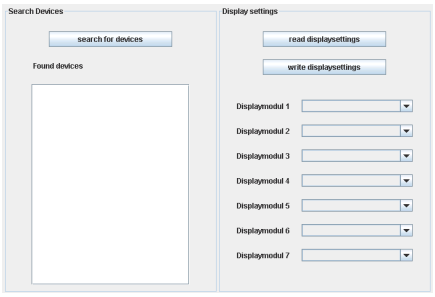
Config user:	**1981**
Process user	**1977**

Attention: If the password has been changed, there is no way of returning to a factory setup. If someone has forgotten the password, you have to send in the tachometer and we will set it back.

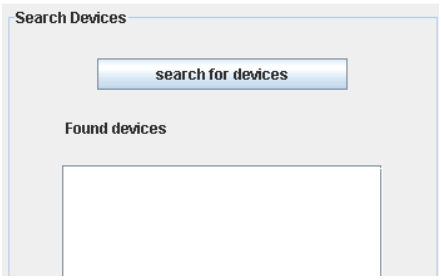
7.8.4 Displays via Bluetooth®

To configure Display via Bluetooth® go to <Settings>, <Bluetooth Settings>.



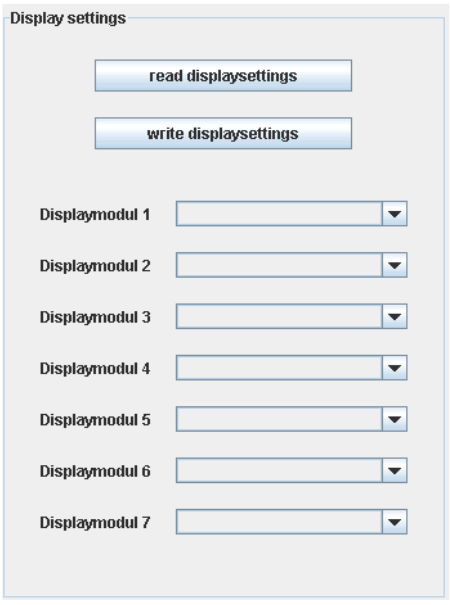


If you have connected a Bluetooth® Display or wish to connect an additional one, click on the button <Search for devices>. This search may take a few seconds. All Bluetooth® equipment found will be shown in a list.



Then choose the required displays from the selection menu on the right to assign them to the tachometer.

After assignment, the settings must be sent to the tachometer by clicking on the button <Save Settings>. This process can take a few seconds.

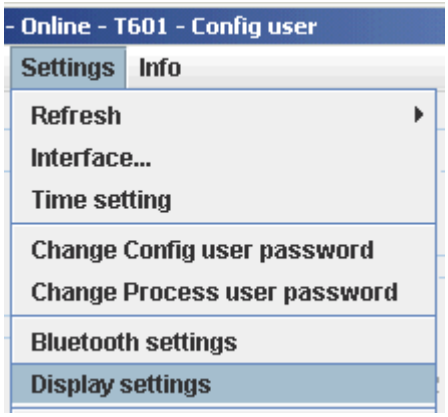


NB: These settings are independent of the other parameters and do not form part of PC-T601 parameter transfers!

To read the settings click on the button <Read Settings>. The actual settings are then displayed. This process can take a few seconds.

7.8.5 Display Settings

To configure the display go to <Settings>, <Display Settings>.



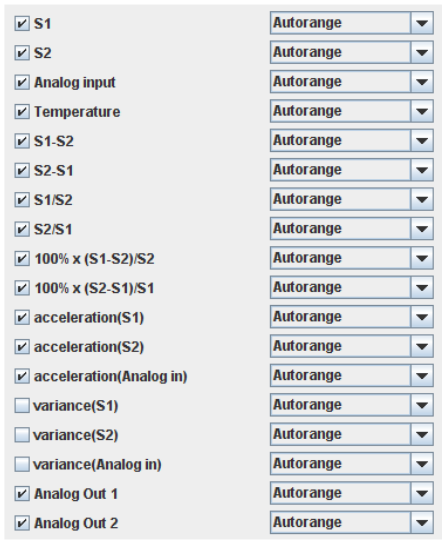
18 values are available for display.

Whether each value may be displayed can be independently selected.

Further information is to be found in the display operating instructions.

The display mode can be set for each value.
Automatic: The decimal point is placed automatically
Alternatively, the decimal point position may be fixed. In the case of values >100000, 100.0k may be used.

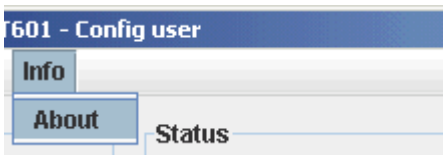
Display the value:	**Yes** / No (except variance)
Mode:	**automatic** / 0000.0 / 000.00 / 00.000 / 0.0000 / 100.0k



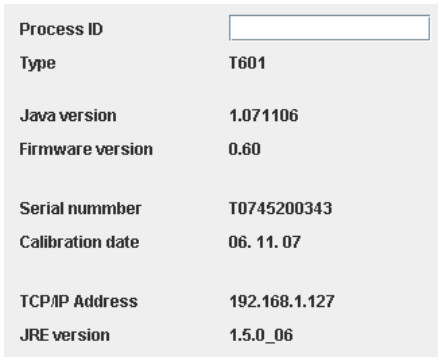
If the variance should be shown on the display, the measurement time must be set to 5ms or higher.

7.9 Info

To gain information about the Tachometer or to enter a process name <Info>, <Info about>.



An individual process name may be entered into the text field to the right of <Process ID>, max. 16 characters. (Only alphanumeric characters).



Type:	Tachometer type number
Java version:	Configurations software of the Tachometer
Firmware version:	T601 Firmware Version
Serial number:	T601's serial number
Calibration date:	Calibration date
TCP/IP Address:	T601's IP Address
JRE version:	PC's JAVA Runtime version

8 Operating behaviour

8.1 Power on

The parameter set e.g. as defined by binary inputs is immediately valid.

8.1.1 Analog Output

Immediately after power on the output corresponds to the lower range value set. Following the first measurement interval the output corresponds to the measured value.

8.1.2 Relay Output

Up until the first measurement interval is completed, all relays are de-energised. Thereafter they assume the defined condition.

If no input frequency is present then after measurement interval x 2, 0Hz is assumed.

8.1.3 Open Collector Output

Up until the first measurement interval is completed, all Open Collectors are inactive. Thereafter they assume the defined condition.

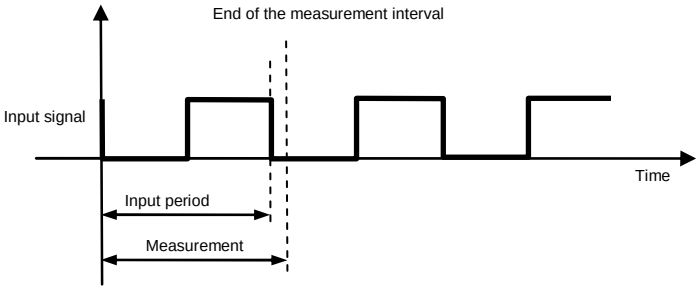
If the Open Collector is assigned to a frequency, then it immediately assumes the corresponding status.

If no input frequency is present then after measurement interval x 2, 0Hz is assumed.

8.2 Frequency Measurement

Every frequency measurement starts with the negative edge of the input signal. The last measured edge prior the end of the measurement interval completes the running measurement and immediately starts the next.

An optimum measurement is achieved when the input period is shorter than the measurement interval.

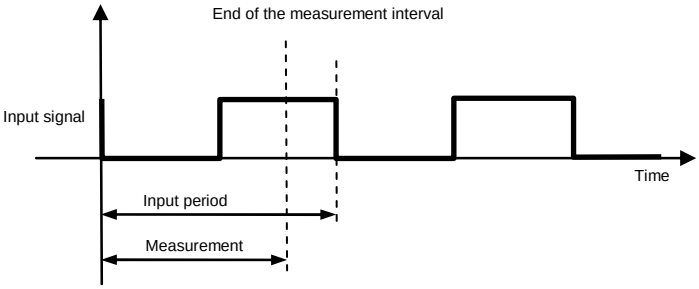


If the input period is greater than the measurement interval, the frequency is calculated as follows:

$$f = \frac{1}{t_{\text{Measurement}} \times n}$$

n: Number of measurement intervals without input signal

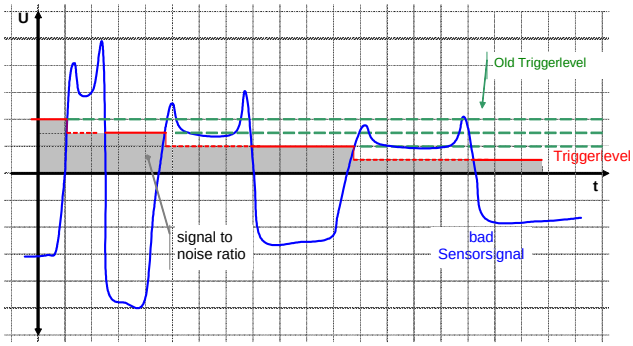
This continues until a second negative edge arrives.



The calculation and adjustment of outputs occurs immediately after the start of the next measurement interval. If the input frequency is lower than the lower limit (0.025Hz), then the output will be zero. The measurement of input frequencies above the upper limit (50kHz) is not guaranteed.

8.2.1 The Adaptive Trigger Level

The trigger level is continuously adjusted for successive pulses. This guarantees that the trigger level can follow a 50% reduction in speed from pulse to pulse. DC offset, resonance and negative pulses have no effect on the triggering.



8.2.2 Signal failure

Signal failure is defined as the sudden transition from an input frequency to no further recognisable pulses. The frequency is then calculated as follows:

$$f = \frac{1}{t_{\text{Measurement}} \times n}$$ n: the number of measurement intervals without an input signal

The measured speed thereby follows an exponential function to the minimum frequency (0.025Hz) and then falls to zero.

8.3 Analog Input

The analog input may be connected to a Pt100 temperature sensor or an analog signal (see 6.1.3 Terminal B)

If a Pt100 is connected the resistance of the sensor is measured and converted into a temperature value based on the Pt100 characteristic. (Accuracy 0.5℃) .

If an analog signal is connected it may be defined as 0 … 20mA or as 4mA … 20mA.

NB: If the wrong configuration is selected the sensor may be damaged! (Pt100: I=950uA, Current output I_{max} = 24mA)

8.4 Functions

8.4.1 "Exec" Push button

The front panel "Exec" button is ORed with binary input B1. Pushing the button executes the B1 function.

8.4.2 Parameter sets A, B, C and D

Binary input configuration	Status BIN 1	Status BIN 2	Selected Parameter set
Binary input 1 to <Selection of Control A/B> Binary input 2 **not** to parameter set selection	0	X	A
	1	X	B
Binary input 1 **not** to parameter set selection Binary input 2 to <Selection of Control C/D>	X	0	C
	X	1	D
Binary input 1 to <Parameter set selection A/B> **and** Binary input 2 to <Parameter set selection C/D>	0	0	A
	0	1	B
	1	0	C
	1	1	D

For delay in switching between Parameter sets B and A see Paragraph 7.7.17 Change-over delay.

8.4.3 Limits

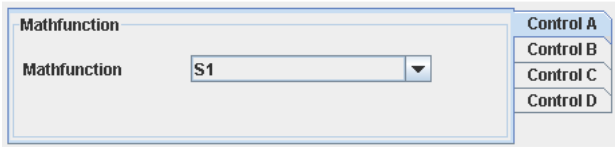
User defined upper and lower limits allow wide or narrow hysteresis to be set. Unless otherwise required we recommend a hysteresis of 10%.

8.4.4 Window Function

The Window function as implemented in earlier tachometers is realized in the T601 by means of the Math function.

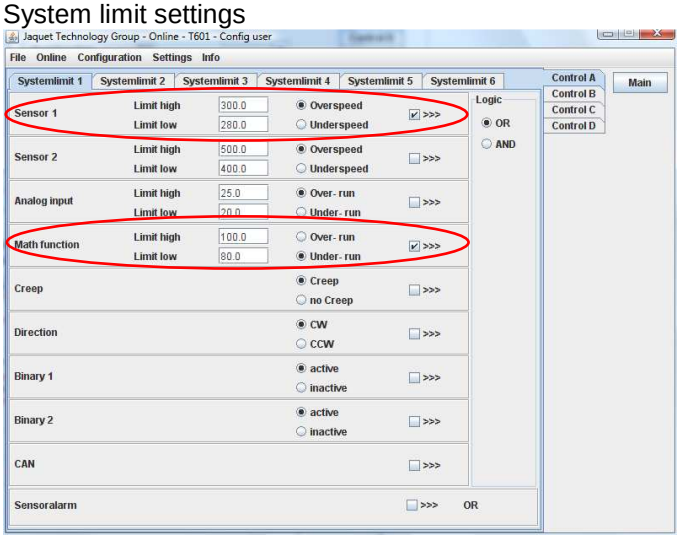
To set a Window function on a speed input please follow the steps below. (Example for Sensor 1):

1. Set the Math function to S1.



2. Set Math function and Sensor 1 hysteresis.
3. The Sensor – hysteresis gets the higher limit.
4. Math function must be set to under run.
5. All logic inputs must be switched off except Sensor 1 and Math function.
6. The two inputs must be combined OR.

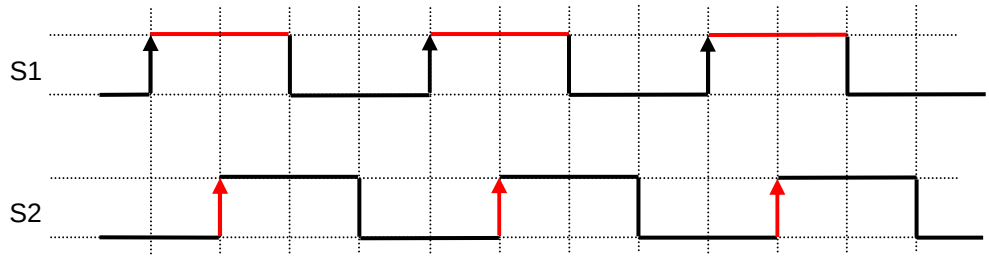
System limit settings



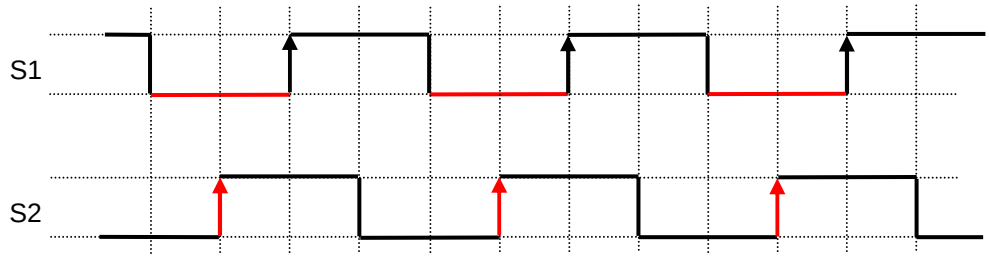
8.4.5 Rotational Direction

2 sensors must be connected to determine direction. The sensor signals should ideally exhibit a phase shift of 90°(10°minimum). For reliable operation digital s ensors generating square wave signals are preferred, alternatively clean sine-wave signals. The sensors must be configured accordingly. See 3.2.1 Sensor Inputs.

Clockwise direction (S1 before S2) is defined as: S2 generates a positive going edge whilst S1 is high.

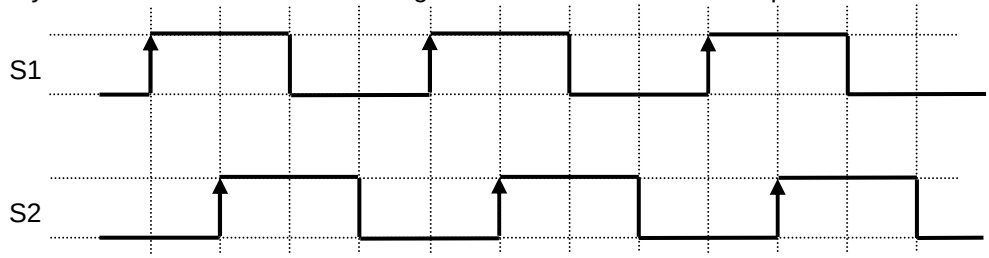


Counter clockwise direction (S2 before S1) is defined as: S2 generates a positive going edge whilst S1 is low.

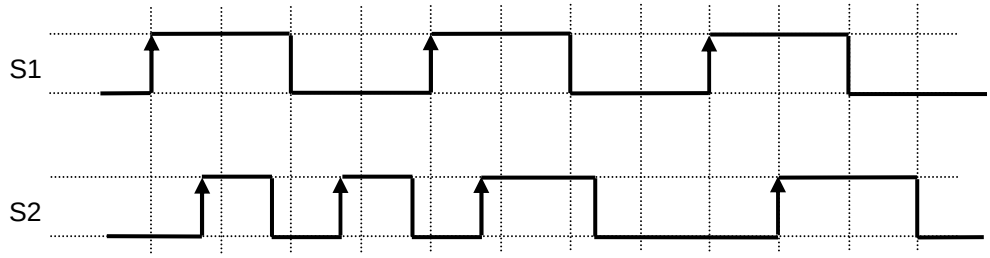


8.4.6 Creep Detection

This function allows discrimination between pole wheel rotation and jitter (vibration). Following a reset command via Binary input the sequence of the first 4 pulses is checked i.e. S1 > S2 > S1 > S2. The sequence may start with S1 or S2. Should irregularities arise after the first 4 pulses then that would not be recognised.



No creep is, if the order of these four pulses isn't correct.



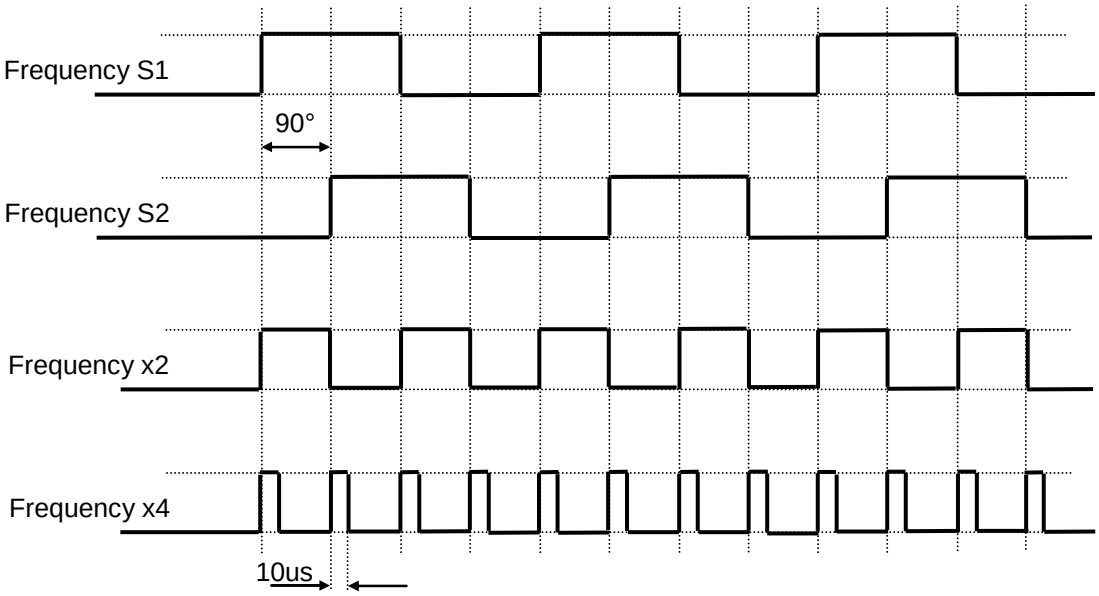
To check for shaft rotation again the creep detector needs to be reset via binary input (defined under 7.7.3 Configure binary input).

8.4.7 Frequency x2 and x4

A prerequisite for the x2 and x4 functions is that the 2 signals are synchronous, exhibit a phase shift close to 90° (minimum 10°) and a 50% Mark / Space ratio.

The x2 function is an EXOR combination of the two input signals S1 and S2, with frequency limited to 35kHz.

The x4 function comes from doubling of x2 and generates a 10us pulse for each positive and negative 'x2' edge. The Mark / Space ratio therefore changes with frequency, which is limited to 35kHz max.



8.4.8 Relay and Open Collector Latch Function

Relays and Open Collectors can be assigned a latch function. If a signal arrives from the assigned function the relay / OC is latched and remains latched until reset via binary input or the <Exec> button.

Where fail safe mode is selected the deactivated Relay / Open Collector state is held.

8.4.9 Analog Output

If an analog time constant higher than zero is set, with measurement interval of 2ms, then the max. frequency that can be measured is 35kHz.

To measure frequencies higher than 35kHz with time constant higher than zero, a min. measurement interval of 5ms must be selected.

If Sensor Alarm is active that influences the analog output, which assumes the error condition:

Configuration	Output current
0 .. 20mA	21mA
4 .. 20mA	4mA

8.5 Sensor Error

8.5.1 Sensor error

The sensors may be monitored in 3 ways.

- Sensor powered by the T601 – Sensor supply current monitoring.
  If the current falls outside of the defined range then static error is signalled.
- Sensor not powered by the T601 – wire break detection.
  Static error is signalled when wire breakage occurs. (Impedance measurement of 2 wire sensor)
- 2 speed sensors connected – Dynamic sensor monitoring, i.e. the 2 signals may be compared. If the values differ by more than the defined tolerance, dynamic error is signalled.

The T601 behaviour in the event of a sensor fault is a function of the software configuration. If sensor monitoring is selected, a fault causes the LED to go off and the analog output (both) go to error status. The relay and open collector behaviour is a function of the configuration.

8.5.2 System alarm

The microprocessor continuously monitors the following functions for errors: Supply, math functions of the micro controller, RAM, EEPROM.
In the event of a fault the relays are de-activated, the current output goes to 2mA (4-20mA) or 21mA respectively and the Open Collectors become high resistance if assigned to a function other than frequency output. The T601 then initializes and attempts to run again.

8.6 Power failure

If the power fails for longer than the bridging time the outputs are de-activated, i.e. Analog outputs go to 0mA, relays de-activate and the Open Collectors go to high resistance.

As soon as the supply returns to the minimum required the T601 recommences its initialization routine.

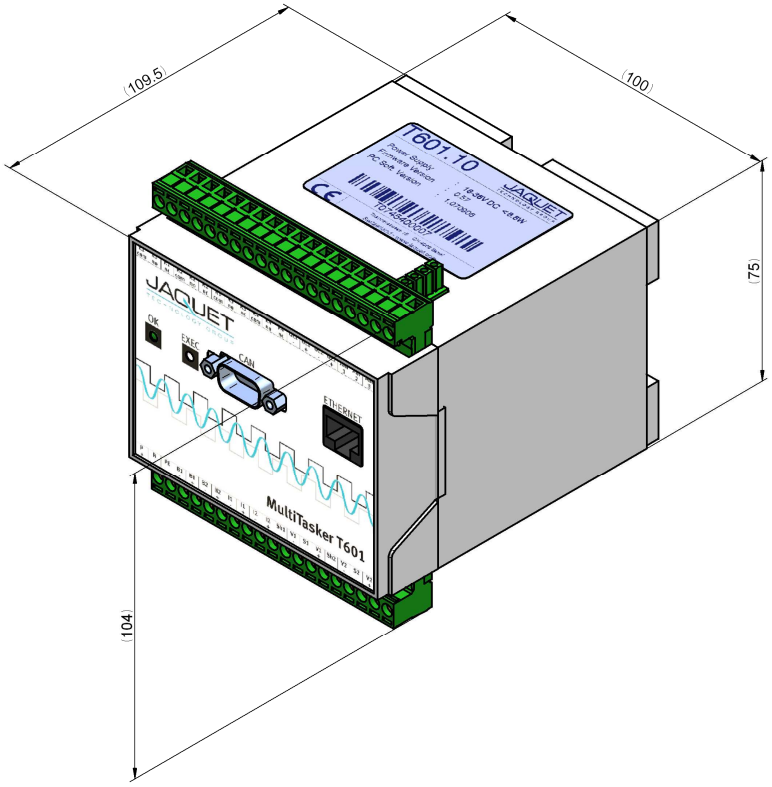
8.7 Behaviour during Configuration

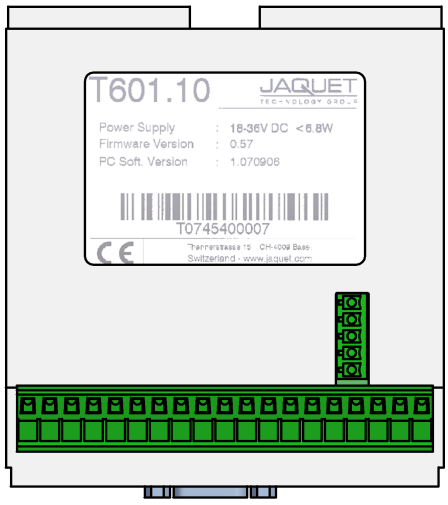
During the transmission of configuration or process parameters to the tachometer, it goes into a safe mode, i.e. the outputs assume a defined state. For individual outputs that means:

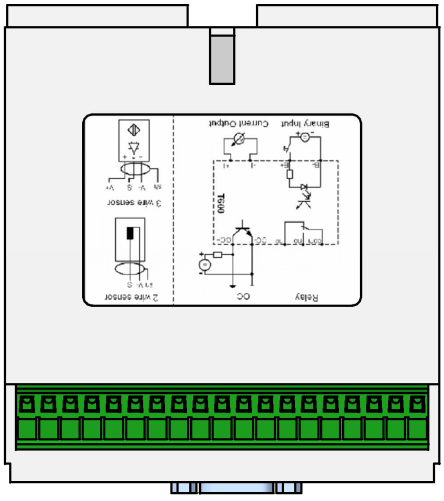
- Relays: are no longer powered
- Open Collectors: become high resistance
- Analog outputs: assume the fault mode according to the configuration

9 Mechanical Construction / Housing

9.1 Tachometer

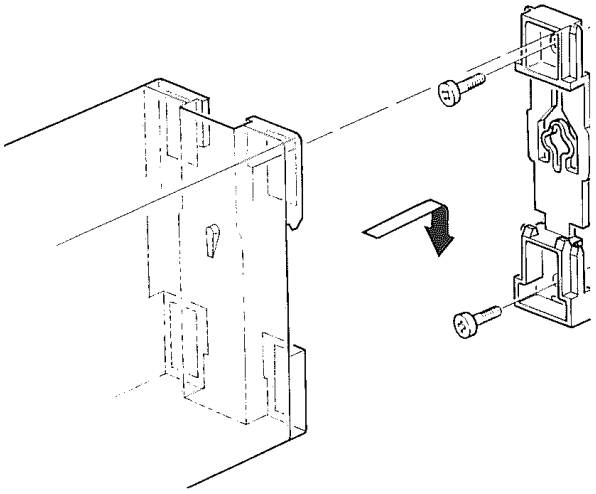




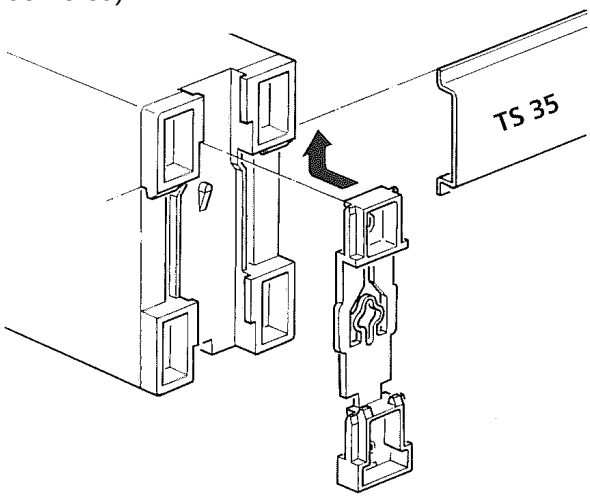


9.2 Mounting

Wall mounting



Top hat rail mounting
(as delivered)



10 Accessories

10.1.1 Interface cable

Optional cable for computer – tachometer communications:

- PC-T601, cross over, 2m: Part No. 830A-37649
- PC-T601, cross over, 5m: Part No. 830A-37650

10.2 Display

Two types of display are available for various process values:

- Cable version, whereby the display has a fixed connection to the tachometer.
- Bluetooth® Version, whereby up to 7 displays may be connected via Bluetooth® and used to display different process values.

10.2.1 Cable version

Cables are available assembled or for self assembly.

- D211.10 Display with assembled cable: Part No. 384Z-05729
- Cable with 2 connectors: Part No. 304F-73740

10.2.2 Bluetooth® Version

Connecting 1...7 displays via Bluetooth® requires a Base Module connected to the tachometer and Bluetooth® displays.

- Display Base Module: Part No. 384Z-05731
- D211.11 Display with Bluetooth®: Part No. 384Z-05730

11 Maintenance / Repair

T601 s require no maintenance as they exhibit minimal drift and have no consumable components.

When cleaning, please note the IP protection level.

Wherever possible T601's should be isolated from all power sources (including relay supplies) prior to cleaning. Surface cleaning may be only with a damp cloth.

12 Software-Version

History and changes of the configuration software and firmware

12.1 Configurations software

Software version	Changes
1.080428	First edit

12.2 Firmware

Firmware version	Changes
0.88	First edit

13 Warranty

The standard warranty in the event of a manufacturing defect confirmed by JAQUET consists of repair or replacement within 12 months of delivery. Ancillary costs are excluded, as is damage caused by use outside the specification. Complaints concerning visible defects will only be accepted if advised to JAQUET within 14 days of receipt.

Appendix

A: Declaration of Conformity

According to the CE guidelines

- 89/336/EEC Electromagnetic Compatibility directive, as amended
- 73/23/EEC Low Voltage Equipment directive, amended by 93/68/EEC

The Products Covered by this Declaration
Tachometer Dualtach T501 and Tachometer Multitasker T601

The Manufacturer of the Products covered by this Declaration is

JAQUET
TECHNOLOGY GROUP

Company: JAQUET AG, Thannerstrasse 15, CH - 4009 Basel Schweiz

The Basis on which Conformity is being Declared
The manufacturer hereby declares under his sole responsibility that the products identified above comply with the protection requirements of the EMC directive and with the principal elements of the safety objectives of the Low Voltage Equipment directive, and that the following standards have been applied:
The following harmonised standards are applicable:

- EN 61000-6-4: Generic standarts – Emission standart for industrial environments
- EN 61000-6-2: Generic standarts – Immunity for industrial environments
- EN 61000-4-2: Electrostatic discharge ommunity test
- EN 61000-4-3: Radiated, radio-frequency, electromagnetic field immunity test
- EN 61000-4-4: Electrical fast transient/burst immunity test
- EN 61000-4-5: Surge immunity test
- EN 61000-4-6: Immunity to conducted disturbances, induced by radio-frequency fields
- EN 61000-4-8: Power frequency magnetic field immunity test
- EN 61000-4-11: Voltage dips, short interruptions and voltage variations immunity test

The following national standards are applicable:

- IEC 60068-2-1/2/30/6
- IEC 61131-2

The technical documentation required to demonstrate that the products meet the requirements of the Low Voltage Equipment directive has been compiled and is available for inspection by the relevant enforcement authorities. The CE mark was first applied in:

Signed: W. Edwell Authority: D. Bl[illegible]

Head Quality Management CTO

Date: Basel, the 07.11.07

B: Possible Problems

Neither green nor yellow LAN connector LED light up

Cause: No physical (electrical) connection present.
Solution: Check that a LAN Crossover cable is being used.

Cause: Tachometer is unpowered.
Solution: Check the supply connections and level.

Cause: Computer network card is switched off or de-activated (energy save mode)
Solution:
- Open the Network Connections window.
  <Start> → <Settings> → <Control Panel> → <Network Connections>
- Click on the appropriate connection
- Open the Menu <File>
- Select <Deactivate>
- Re-open Menu <File>
- Select <Activate>

Yellow LAN connector LED lights but no connection to browser

Cause: Several instruments are connected to the same LAN as the tachometer.
Solution: The tachometer only functions with a <Pier to Pier> connection. Remove the other equipment and insure that no hub, switch or router is connected between tachometer and computer.

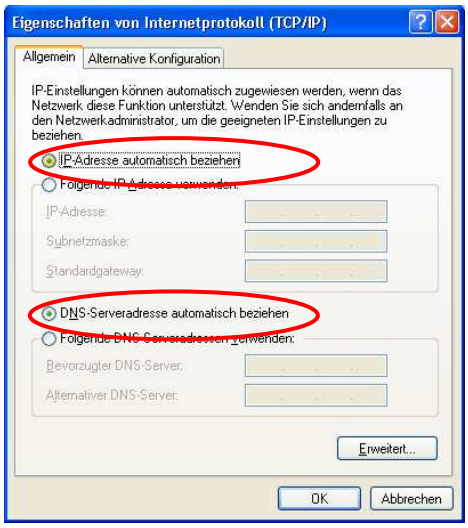
Cause: Computer LAN card not set correctly.
Solution: Configure the card in accordance with chapter 7 Configuration via PC Software. If that does not solve the problem check that the network card is configured as follows:
Go to Desktop, Settings, Network connections and right click on <Properties>. Right click on the network card you want to use and select <Properties>.

Select Internet protocol (TCP/IP) and select the options:

→ <IP-Address automatically recognize>

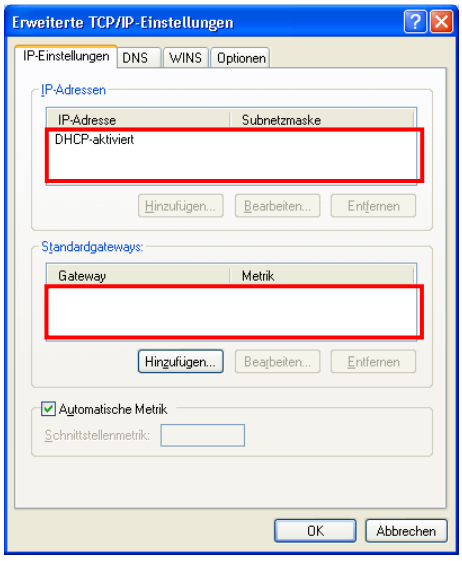
→ <DNS-Server address automatically recognize>

Then select <Advanced>.



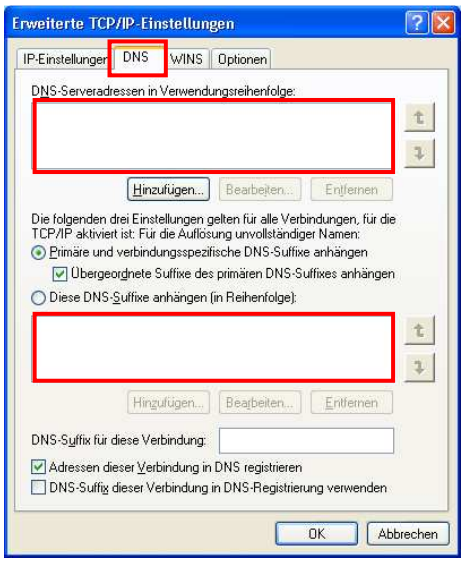
Insure that:

→ apart from the entries shown, no other entries are present.



Select the tag <DNS> and insure that:

→ no entries are present.

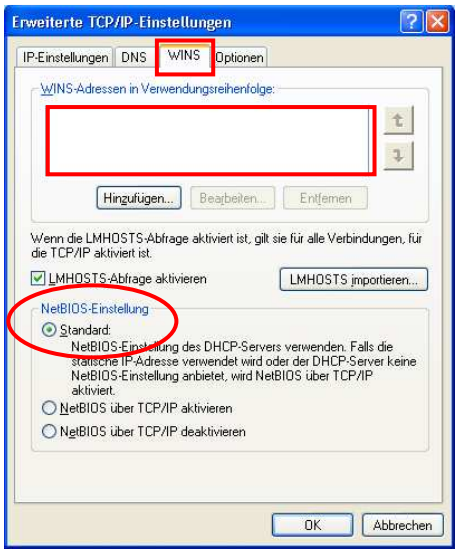


Select the tag <WINS> and insure that:

→ no entries are present.

→ NetBIOS- Setting is Standard.

Confirm with <OK>

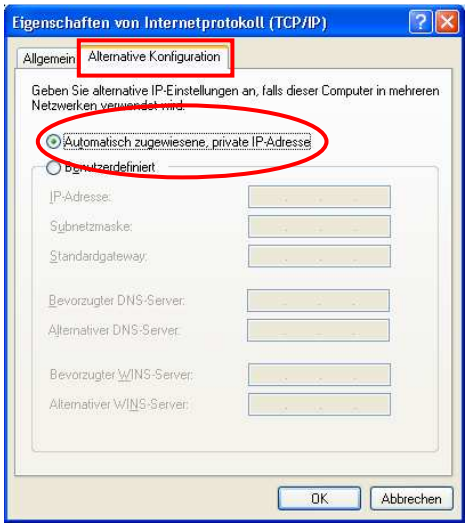


Change to tag <Alternative Configuration>.

Insure that:

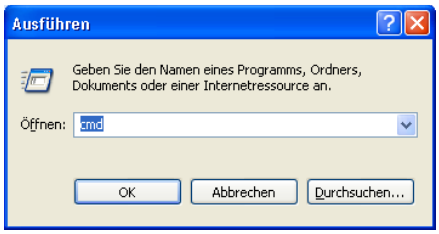
→ <Automatically allocated, private IP-Address> is selected.

Confirm all settings with <OK>



Confirm settings with <OK>

If you had to make changes you must now reset the LAN card:



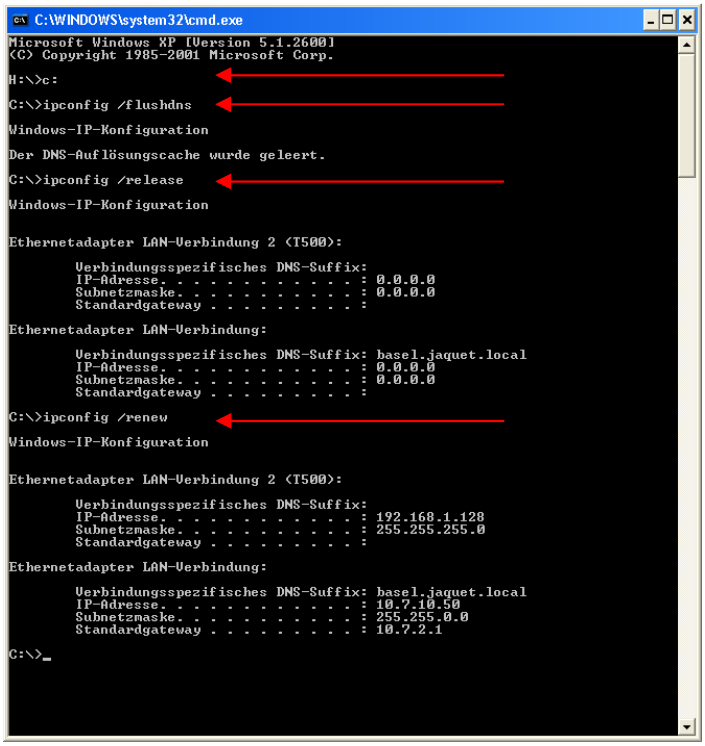
Enter the following commands:

→ c:

→ ipconfig /flushdns

→ ipconfig /release

→ ipconfig /renew



The tachometer responds with incomprehensible hieroglyphics

Cause: Your browser and computer interpret the address incorrectly.

Solution: Extend the address with a forward slash: http://192.168.1.127/software/

Problems when using Microsoft Internet Explorer

Cause: Your browser and computer interpret the address incorrectly.

Solution:

- Close Internet Explorer
- Restart Internet Explorer
- Wait until IE has fully loaded and the computer is inactive.
- Call the tachometer using the address: http://192.168.1.127/software/

Solution: Should the solution above not work, go to the menu <Extras> and select <Internet options>

Click on <Security>

Select <Adjust level>

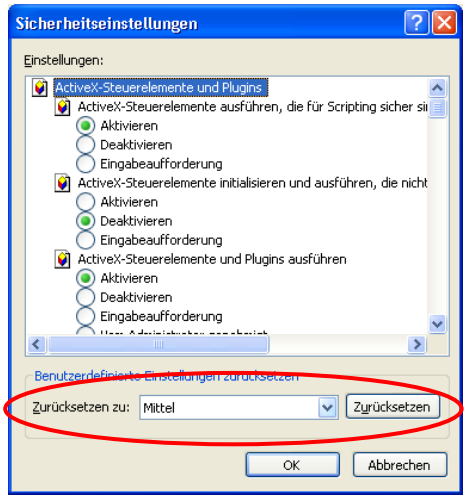
Change setting to „Medium“

→ Click on <Reset>

→ Click on <OK>

→ Click <OK> again

Start IE again and proceed as described in the operating instructions.



The first page is shown correctly but after selecting Download nothing happens

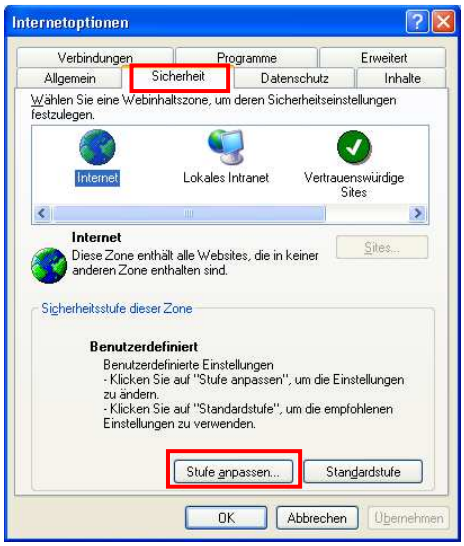
Cause: The IE security level is too restrictive.

Solution: Set the security level to „Medium“.

In the Menu <Extras> select <Internet options>

Change tab to <Security>

Select <Adjust Level>



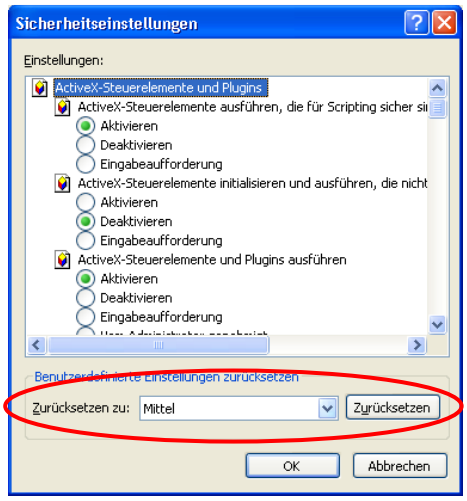
→ Change settings to „Medium“

→ Click on <Reset>

→ Click <OK>

→ Click <OK> again

Start IE again and proceed as described in the operating instructions.



Solution: Should you not be able to change these settings we recommend you try the browser Firefox (freeware).

Problems using Internet Browser Mozilla

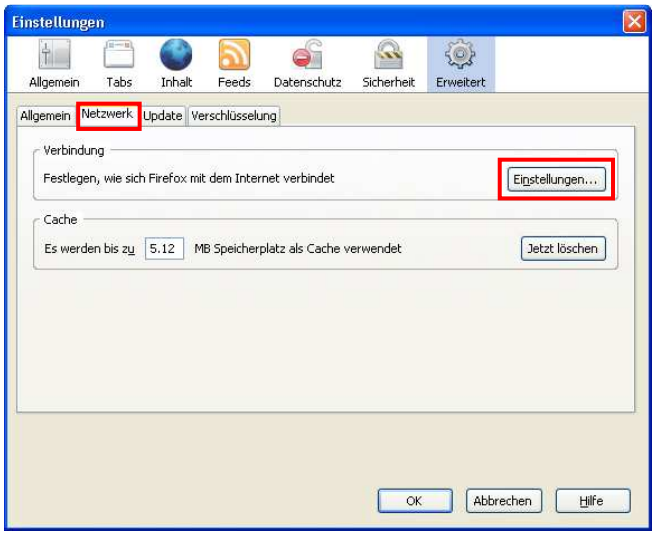
Cause: „Ping“ works but an error message appears - Proxy Server not found. A Proxy Server is defined.

Solution: Avoid the Proxy- Server.

In the Menu <Extras> select <Settings>

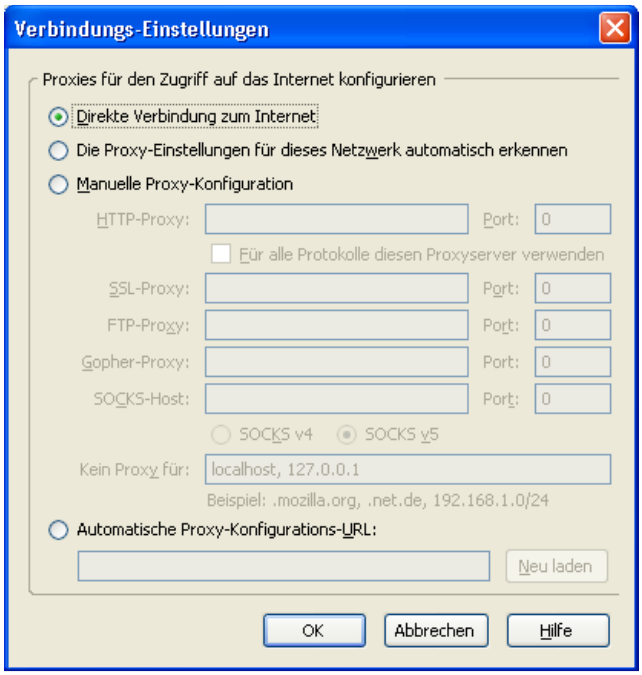
Change the tab to <Network>

Select <Settings>



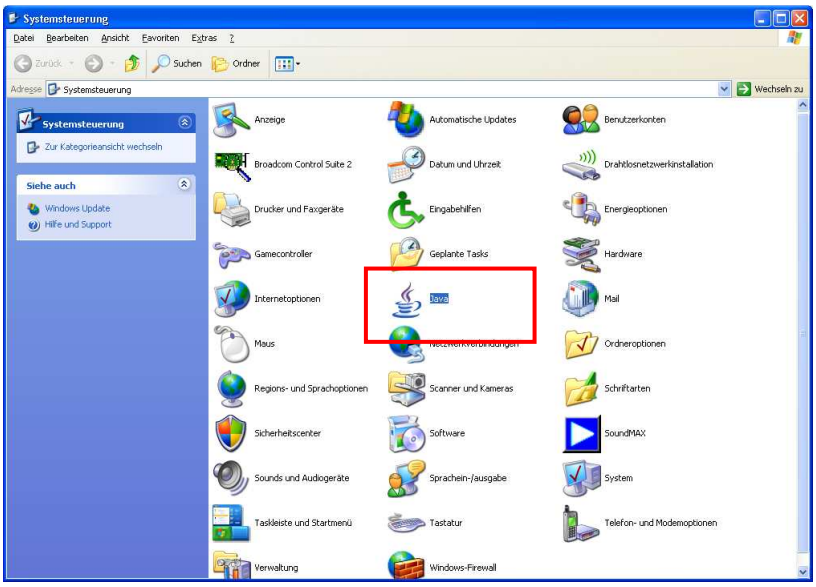
Select <Direct Connection to Internet>

Confirm with <OK>

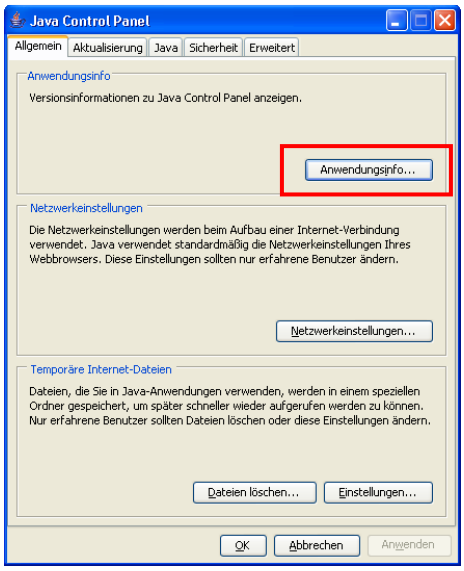


How do I see which Java Version is installed on my PC?

Solution (Win XP) Go to <Control Panel> And select <Java> (the coffee cup)



Select <Application Info…>



Further information on Java-Technologies and Applications can be seen at http://www.java.com