

Frequency and universal counters

1 mHz to 1.2 GHz from TOELLNER®

TOE 6722 · TOE 6723 · TOE 6725



The TOE 6722, TOE 6723 and TOE 6725 models represent three members of a new family of TOELLNER universal counters that come equipped with the latest computer technology and highly integrated CMOS logic.

The two-channel universal counters can measure frequencies up to 160 MHz, while the TOE 6725 model has a third channel that enables it to perform frequency measurements up to 1.2 GHz. All the counters use the reciprocal counting method which provides results with a high constant resolution of 8 digits at a gate time of 1 second over the entire specified frequency or period measurement range.

- ❖ Frequency measurement up to 1.2 GHz
- ❖ Period, rotary speed, time interval and ratio measurements up to 160 MHz
- ❖ Reciprocal measurement method
- ❖ Autoranging
- ❖ Pulse width measurement
- ❖ Frequency measurement in burst packets
- ❖ Phase measurement
- ❖ IEEE bus interface (option)

Operating modes

Besides the classical frequency and period measurement modes, the two-channel universal counters offer a variety of additional operating modes. However, to keep the control panel tidy and clear, only the most important operating modes are directly selectable. These modes are:

- Frequency measurement
- Period measurement
- Rotary speed measurement
- Time interval measurement
- Event counting
- Checking.

The other operating modes that are generally less frequently used, i.e.

- Frequency ratio measurement
- Pulse duty factor measurement
- Pulse width measurement
- Phase measurement
- Frequency measurement in burst packets

are indirectly selectable on the TOE 6723 and TOE 6725 models where they are called up in the "SPECIAL FUNCTION" mode. Once an operating mode has been programmed in this manner, it can be directly selected at any time in "SPECIAL FUNCTION" mode.

OVERVIEW

	TOE 6722	TOE 6723	TOE 6725
Frequency Min	1 mHz	1 mHz	1 mHz
Max	160 MHz	160 MHz	1.2 GHz
Period measurement	6 ns...10 ⁵ s	6 ns...10 ⁵ s	6 ns...10 ⁵ s
Rotary speed measurement	●	●	●
Time interval measurement	●	●	●
Event counting	●	●	●
Frequency ratio measurement	-	●	●
Pulse duty factor measurement	-	●	●
Phase measurement	-	●	●
Ext. arming	-	●	●
Mathematical functions	-	●	●
Gate time	1 ms...100 s	1 ms...100 s	1 ms...100 s
Trigger hold-off	●	●	●
Resolution (digits/s)	8	8	8
IEEE 488 Interface (option)	●	●	●
Time base: 10 MHz			
Temp. drift	Aging/year		
0° to 50 °C			
1 x 10 ⁻⁶	2 x 10 ⁻⁶	●	●
1 x 10 ⁻⁷	3 x 10 ⁻⁷	opt.	opt.
2 x 10 ⁻⁸	1 x 10 ⁻⁷	opt.	opt.
5 x 10 ⁻⁹	3 x 10 ⁻⁸	opt.	opt.

Frequency and universal counters

1 mHz to 1.2 GHz from TOELLNER®

TOE 6722 · TOE 6723 · TOE 6725

Gate time and hold-off time (trigger delay)

With the aid of the cursor functions, both gate and hold-off times are continuously adjustable over a range of several decades. The gate times can be varied from 1 ms to 100 s, permitting optimum adaptation to individual measurement tasks. Gate times can be preselected internally, and measurements can be started and/or stopped using external control via auxiliary channel F.

For various operating modes, a facility is provided for delaying the hold-off times by 10 μ s to 250 ms. This facility prevents multiple triggering for the duration of the preselected hold-off times, or prevents triggering altogether.

Mathematical functions

The computer intelligence available in these universal counters has been used to provide the TOE 6723 and TOE 6725 models with an integral mathematical function that allows the conversion of results into a form required by the user. With the function $K1 \times X + K2$, the result (X) of a measurement can be weighted by K1 and given a constant offset K2. This feature may be used, for example, to display the deviation from a given standard value either in % or ppm.

IEEE bus control

The universal counters can be optionally equipped with an electrically isolated IEEE 488 bus interface. This facility then enables all measuring functions and all manually selectable operating parameters to be remote controlled via the bus. The device address is entered as a digital value on the keypad, and is output on the display.

Non-volatile storage

All operating parameters of the universal counters are saved in a non-volatile memory and are available on request when the counters are switched on again.

Specifications

TOE 6722 operating modes

- ❖ Frequency measurement
- ❖ Period measurement
- ❖ Rotary speed measurement
- ❖ Time interval measurement
- ❖ Event counting
- ❖ Pulse width measurement (COM A activated)
- ❖ Checking

TOE 6723, TOE 6725 operating modes

- ❖ Frequency measurement
- ❖ Period measurement
- ❖ Rotary speed measurement
- ❖ Time interval measurement
- ❖ Event counting
- ❖ Frequency ratio measurement
- ❖ Pulse duty factor measurement
- ❖ Pulse width measurement
- ❖ Phase measurement
- ❖ Frequency measurement in burst packets
- ❖ Checking

Frequency measurement

Channel A: 1 mHz to 160 MHz
Resolution: Max. 10^{-11} Hz, 8 digits per second of gate time

Channel C:
(TOE 6725 only): 70 MHz to 1.2 GHz
Resolution: Max. 0.1 Hz, 8 digits per second of gate time

Period measurement

Channel A: 6.25 ns to 10^5 s
Resolution: Max. 10^{-8} ns, 8 digits per second of gate time

Rotary speed measurement

Channel A: 6×10^{-4} /min to 2×10^9 /min
Resolution: Max. 10^{-8} /min, 8 digits per second of gate time

Time interval measurement

Channel A to channel B:
Channel A max. 100 MHz
Channel B max. 50 MHz

Individual measurement:

Resolution: 100 ns to 10^5 s
Max. 100 ns
Mean value: 20 ns to 10^5 s
Resolution: Max. 10^{-2} ns to 100 ns

(resolution is increased by statistical averaging over max. 4×10^8 periods; minimum space between two time intervals is 250 ns)

Event counting

Channel A: 1 to 2×10^{15} , max. 160 MHz
Resolution: ± 1 event up to 2×10^9
> 2×10^9 , the exponents 10^3 and 10^6 are displayed

Gating: manual or via channel B or external (channel F)

Channel A \pm channel B (TOE 6723, TOE 6725 only): -1×10^{14} to $+2 \times 10^{15}$,
Channel A max. 160 MHz,
channel B max. 50 MHz

Resolution: ± 1 event in range -1×10^8 to $+2 \times 10^9$;

for range $< -1 \times 10^8$ and $> +2 \times 10^9$, the exponents 10^3 and 10^6 are displayed

Gating: manual or external (channel F)

Frequency ratio measurement (TOE 6723, TOE 6725 only)

Channel A to channel B:
Channel A max. 160 MHz,
Channel B max. 50 MHz

Range: 1×10^{-8} to 2×10^9

Channel C to channel B:
Channel C max. 1.2 GHz,
channel B max. 50 MHz
Range: 1×10^0 to 2×10^9

Pulse duty factor measurement (TOE 6723, TOE 6725 only)

Channel A: max. 2 MHz
Range: 0 % to 100 % x
(1 - 250 ns x pulse frequency)

Positive trigger edge:
positive pulse/pulse period

Negative trigger edge:
negative pulse/pulse period

Specifications

TOE 6722 · TOE 6723 · TOE 6725

Pulse width measurement (TOE 6723, TOE 6725 only)

Channel A: max. 2 MHz

Range: 20 ns to 10^5 s

Positive trigger edge:
width of positive pulse

Negative trigger edge:
width of negative pulse

Resolution: max. 10^{-2} ns to 100 ns
(resolution is increased by statistical
averaging over max. 5×10^9 periods)

Phase measurement (TOE 6723, TOE 6725 only)

Channel A to channel B:

Channel A and channel B max. 2 MHz

Range: 0° to 360° x
(1-250 ns x frequency)

Resolution: max: 1° to 0.01°

Frequency measurement in burst packets (TOE 6723, TOE 6725 only)

Channel A:

Frequency input; max. 100 MHz

Channel B:

Gate input for burst packets; minimum
burst packet length 100 ns; minimum
space between two burst packets
250 ns

Input characteristics

Channel A

Frequency range:

DC to 160 MHz, DC coupled;
10 Hz to 160 MHz, AC coupled

Sensitivity (ATTN x 1):

25 mV_{rms} sine, DC to 70 MHz;

50 mV_{rms} sine, 70 MHz to 160 MHz

Noise filter: low pass filter for noise
suppression with 3 dB frequency of
50 kHz, directly selectable

Channel B

Frequency range:

DC to 50 MHz, DC coupled;
10 Hz to 50 MHz, AC coupled

Sensitivity (ATTN x 1):

25 mV_{rms} sine, DC to 50 MHz;

Channel A and channel B

Attenuation:

ATTN x 1 and ATTN x 20,
directly selectable

Dynamic range:

70 mV_{pp} to 5 mV_{pp}, ATTN x 1;

1.4 mV_{pp} to 100 mV_{pp}, ATTN x 20

Input impedance: 1 MOhm/<35 pF

Trigger level: 250 mV to 50 V

Input coupling:

AC or DC, directly selectable

Max. input voltage:

AC and DC coupling

250 V (DC + AC_{rms}), DC to 40 kHz,

falling to 50 V_{rms} for > 100 kHz

Channel C (TOE 6725 only)

Frequency range: 70 MHz to 1.2 GHz

Sensitivity:

25 mV_{rms}, 70 MHz to 1 GHz

100 mV_{rms}, 1 GHz to 1.2 GHz

Input impedance: 50 Ohm

Max. input voltage: 5 V_{rms}

Other inputs/outputs

Channel D

10 MHz input for external time base

Channel E

10 MHz output for internal time base

Channel F (arming channel)

Input for external control of measure-
ment

Channel G

Output for GATE signal

General data

Display: 9-digit LED display with over-
flow LED, autoranging with display of
dimension in MHz, kHz, Hz, mHz, or s,
ms, μ s, ns

Display resolution

Max. 9 digits; reduction in display res-
olution possible down to 3 digits

Hold-off 1 ms to 100 s,
continuously adjustable

Trigger delay 10 μ s to 250 ms, continu-
ously adjustable

Mathematical functions

$K1 \times X + K2$, $K1$ = multiplication factor,
 X = measured value, $K2$ = offset

Time base

10 MHz - TCXO as standard

Temperature drift:

1×10^{-6} 0°C to 50°C

Aging: 2×10^{-6} /year

Mains voltage: 115 V / 230 V \pm 10%,
48 Hz to 60 Hz

Power consumption: 25 VA

Operating temperature: 0°C to 50°C

Storage temperature: -20°C to 70°C

Reference temperature: 23°C

Dimensions: (WxHxD)

216 x 88.5 x 332 mm

Weight: Approx. 3 kg

Housing: Aluminium

Ordering data

Universal counter TOE 6722

Universal counter TOE 6723

Universal counter TOE 6725

Options

IEEE 488 interface TOE 6720/015

Oven time base I TOE 6720/011

Temperature drift:

1×10^{-7} 0°C to 50°C

Aging: 3×10^{-7} /year

Oven time base II TOE 6720/012

Temperature drift:

2×10^{-8} 0°C to 50°C

Aging: 1×10^{-7} /year

Oven time base III TOE 6720/013

Temperature drift:

5×10^{-9} 0°C to 50°C

Aging: 5×10^{-8} /year

Analog recorder output TOE 6720/016

3 adjacent digits on the display are
treated as an analog value and can be
connected e.g. to a recorder input to
log the results.

Output: 0 to 999 mV, corresponding
to the value shown on the selected
3-digit display 000 to 999 (1 mV cor-
responds to 1 digit)

Accuracy: \pm 2 digits

Output impedance: 600 Ohm

Optical rotary-speed
measurement TOE 6720/017

Reflecting light barrier TOE 6720/018

19" adapter, 2HU TOE 9507

Lock link kit 322, 2HU TOE 9510

Software driver
under LabView TOE 9060/025