TMCON

Intelligent tachometer/line speed meter
T9ZX

Technical Manual
Version number: EN-V1-03

Thank you very much for choosing TMCON products,
In order to better use this product, please read the following before using.

■Safety precautions

⚠ Attention

Do not touch the terminals while power is on,
otherwise minor injuries may occur due to electric shock.

Do not allow metal objects, conductors, debris (such as cuttings) from
installationwork, moisture, or other foreign matter to enter the digital
controller, the setup tool ports, or between the pins on the connectors
on the Setup Tool cable.
Otherwise it may cause electric shock, short circuit or machine malfunction.

Do not use the product where subject to flammable or explosive gas.
Otherwise, it may cause mild injury due to the explosion.

Never disassemble, modify, or repair the product or touch any of
theinternal parts.
Otherwise, it may cause mild electric shock, fire, and equipment failure.

This equipment is an open processing controller. Do not use it in a control
cabinet where fire may occur.
When using more than 2 open-circuit switches, please turn off all
switchesbefore repair inspection, so that the product is in a power-off state.

■Main features

● DIN 48×96mm standard size, 6-position bright 0.52-inch LED digital tube display.

● With powerful functions, it can display speed, line speed, pulse frequency, flow rate, etc., and can also have one alarm output.

● There are four alarm modes available for setting: upper and lower limits, range, upper and lower limits.

● The measurement range is wide, whether it is ultra-low speed or ultra-high speed, it can measure accurately.

● With functions such as automatic zeroing, smoothing processing, and starting compensation timing.

● The prescaling function (signal and display ratio) is 0.0001~99.9999 can convert the tachometer into line speed meter.

● With RS485 communication interface, adopts the internationally recognized MODBUS-RTU communication protocol, and is friendly connection to the industrial internet.

● With 4-20mA transmission output function, it can convert speed measurement values into 4-20mA linear analog output.

● The humanized operation interface design makes the parameter setting of single row display easy to operate.

● High performance switching power supply design ensures stable operation of microcomputers.

● Strong anti-interference performance, precise and reliable measurement.

■Technical reference

T9ZX — ① ② ③ — ④
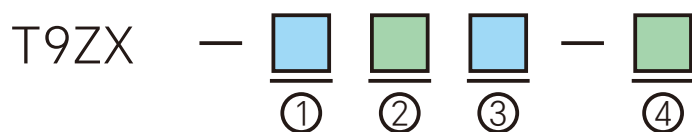
Models	①	②	③	④	Description
	Category	Communication function	Transmission output	Power supply	
T9ZX					48×96mm Intelligent tachometer/line speed meter
	N				Display Private Type
	1P				With 1 alarm output type
	2P				With 2 alarm output type
		N			No communication
		S			With RS485 communication port
			N		No transmission output
			X		With transmission output
				N or Not to write	Power Supply 100~240V AC
				D	Power Supply 12~24V AC/DC

■Technical reference

Models	T9ZX-N□□-□	T9ZX-1P□□-□	T9ZX-1P□□-□
Functional categories	Display dedicated type	With 1 alarm output type	With 2 alarm output type
External dimension (mm)	48(high)×96(wide)×99(depth)		
Hole size (mm)	45(high)×92(wide)		
Power supply	AC100~240V 50/60Hz or AC/DC12~24V (The default delivery is 100~240V, If you need 12~24V, please declare the voltage at the time of ordering)		
Permissible voltage range	85~110%		
Power consumption	About 5VA (AC240V) , about 3.2VA (DC24V)		
Display mode	Single row LED digital tube display		
Display range	0~999999 (6-digit)		
Counting speed	30Hz or 10KHz　(selectable switching)		
Measuring range	30Hz: 0.0001Hz~30.00Hz, 10KHz: 0.0001Hz~10KHz		
Detect rotation range	0.06~600000rpm (1 pulse/rotation)		
Measurement accuracy	± 0.1% FS. ± 1 digit max (23 ± 5°C)		
Pulse metering method	Cycle measurement method		
Alarm output mode	None	HI-LO, AREA, HI, LO	
Prescaling function	0.0001~99.9999		
Decimal point adjustment	0/0.0/0.00/0.000/0.0000(Selectable settings)		
Input signal	Counting signal, Hold signal		
Input method	No-voltage (NPN) input/voltage (PNP) input (Selectable settings) No-voltage inputs: ON impedance: 1KΩ max (Leakage current: 12mA at 0Ω) ON residual voltage: 3V max OFF impedance: 100KΩ min Voltage input: High (logic) level: 4.5 to 30VDC Low (logic) level: 0 to 2VDC (Input resistance: approx 4.7KΩ)		
Alarm output	None	1-way relay output, Contact capacity: 3A/AC250V resistive load	2-way relay output, Contact capacity: 3A/AC250V resistive load
Transmission output	4-20mA linear current output (output voltage ≥ 10.5V) (Only models with X at the end of the model have this function)		
Communication function	RS485 communication interface, Modbus-RTU communication protocol(models with S at the end of the model have this function)		
Auxiliary power output	12VDC ± 10% 100mA Max		
Insulation withstand voltage	AC2000V 50/60Hz 1min		
Usage environment	Temperature -10~+60°C (not freezing or exposed), humidity: 25~85% RH		

■The panel and the size


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TACHOMETER   T9ZX
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1 — Monitor
2 —
HOLD   K/P   OUT1   OUT2
TMCON

48mm

3   4   5   6   7

96mm
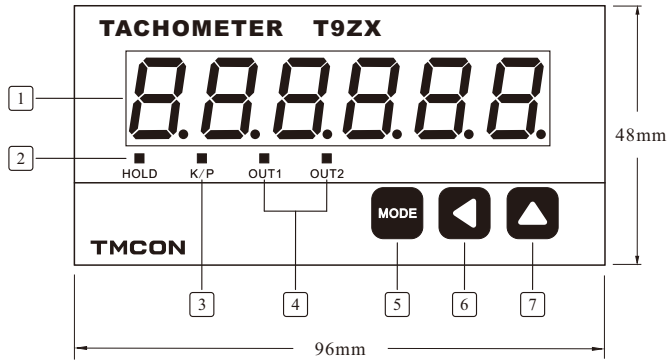
1 Monitor(Present Value)

2 Hold Indicator (Lit when the hold input)

3 Key Protection Indicator

4 Control Output Indicator

5 Mode Key(Used to switch mode and setting items.)

6 Data shift key

7 Up Keys

Flush Mounting Adapter

45.5mm

99mm

9.5mm

Panel Cutouts(mm)：

Min. 116

$45.5^{+0.6}_{-0}$

Min. 52

$91.5^{+0.6}_{-0}$
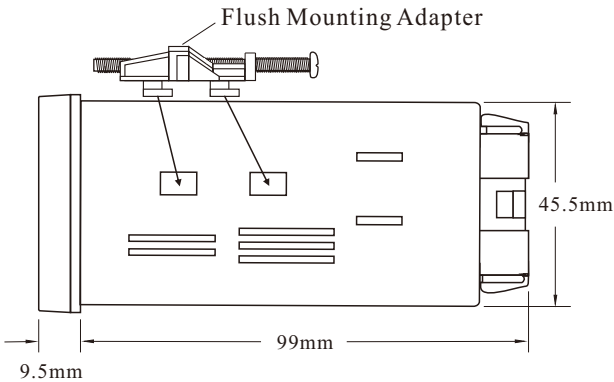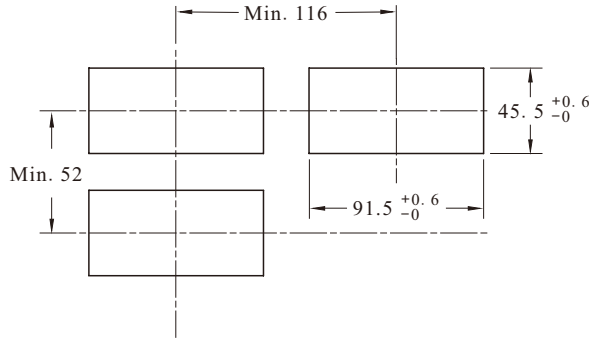
■Comparison value set（T9ZX-N doesn't have this set）

● T9ZX-1P Output Mode: HIHI or LOLO
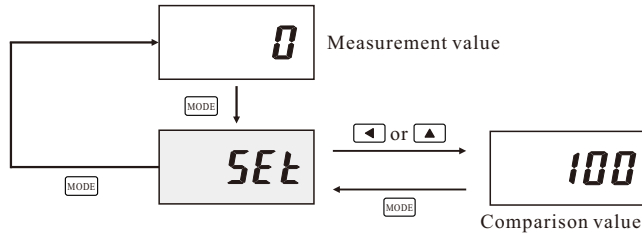
Comparison Value
Set comparison value. The measurement value is compared to comparison value and output is made according to the selected output mode.

● T9ZX-1P Output Mode: HI-LO or AREA
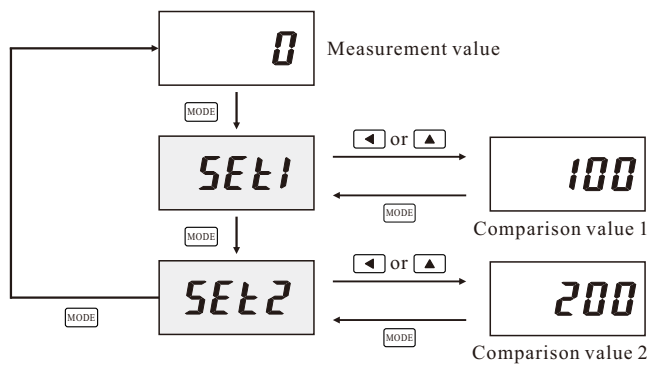
Comparison Value 1/Comparison Value 2
Set comparison value 1 and comparison value 2. The measurement value is compared to comparison value 1 and comparison value 2 and output is made according to the selected output mode.

■Settings for Advanced Functions

0 Run mode

MODE 3s min. | MODE 3s min.

Set each setting item using the ◄ and ▲ keys.

◄ or ▲

ōUtñ | Tachometer output mode   *T9ZX-N Without this parameter
| HᵢLō ←→ ArEA ←→ HᵢHᵢ ←→ LōLō
| (HI-LO)   (AREA)   (HI-HI)   (LO-LO)
MODE

◄ or ▲

CPS | Counting speed
| 30 ←→ 10Y
| (30Hz)   (10KHz)
MODE

◄ or ▲

dP | Decimal point position
| ------ ←→ -----.- ←→ ----.-- ←→ ---.--- ←→ --.----
| (No decimal point) | (One digit after decimal point) | (Two digits after decimal point) | (Three digits after decimal point) | (Four digits after decimal point)
MODE

◄ or ▲

PSCL | Prescale value
| 0.0001 ~ 99.9999
| (0.0001~99.9999)
MODE

◄ or ▲

HY | Control Output hysteresis   *dP determines the location of the decimal point
| 0 ~ 99999
| (0~99999)
MODE

◄ or ▲

AuG | Average processing
| ōFF ←→ 2 ←→ 4 ←→ 8 ←→ 16
| (No average processing) | (Average of 2 measurements) | (Average of 4 measurements) | (Average of 8 measurements) | (Average of 16 measurements)
MODE

◄ or ▲

AutΞ | Auto-zero time
| 0.1 ~ 999.9
| (0.1~999.9s)
MODE

◄ or ▲

Stñr | Startup time
| 0.0 ~ 99.9
| (0.0S~99.9s)
MODE

◄ or ▲

AdrS | Communication address   *Only with communication models
| 0 ←→ 255
| (0)   (255)
MODE

◄ or ▲

bPS | Communication baud rate   *Only with communication models
| 2400 ←→ 4800 ←→ 9600 ←→ 19200
| (2400)   (4800)   (9600)   (19200)
MODE

◄ or ▲

SᵢG | NPN/PNP input mode
| nPn ←→ PnP
| (NPN input)   (PNP input)
MODE

◄ or ▲

YP | Key protect level   KP-0:Unlock.
| 0 ←→ 1 ←→ 2   KP-1:Lock the Model parameters.
| (KP-0)   (KP-1)   (KP-2)   KP-2:Lock the Model parameters and comparison value.
MODE

■Explanation of Functions

● Counting Speed（CPS）

Set the maximum counting speed (30 Hz/10 kHz) for CP1 input. If contacts are used for input signals, set the counting speed to 30 Hz.Processing to eliminate chattering is performed for this setting.

● Decimal Point Position（dP）

Decide the decimal point position for the measurement value, OUT1 set value, and OUT2 set value.

● Prescale Value（$PSCL$）

It is possible to display the rate of rotation or the speed of a device or machine to which the T9ZX is mounted by converting input pulses to a desired unit. If this prescaling function is not used, the input frequency(Hz) will be displayed.
The relationship between display and input is determined by the following equation. Set the prescale value according to the unit to be displayed.

> Displayed value = f × a
>
> f: Input pulse frequency (number of pulses in 1 second)
>
> a: Prescale value

1. Displaying Rotation Rate

Display unit	Prescale value (a)
rpm	1/NX60
rps	1/N

N: Number of pulses per revolution
Example:In order to display the rate of rotation for a machine that outputs 5 pulses per revolution in he form □□.□ rpm:
    1. Set the decimal point position to 1 decimal place.
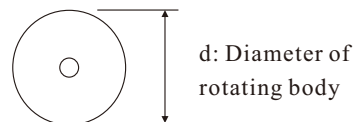   2. Using the formula, set the prescale value to 1/N × 60 =60/5 = 12.

2. Displaying Speed

Display unit	Prescale value (a)
m/min	πdX1/NX60
m/s	πdX1/N

N: Number of pulses per revolution
d: Diameter of rotating body (m)
πd: Circumference (m)

d: Diameter of rotating body

● Average Processing（AuG）

Flickering display and output chattering can be prevented using average processing (simple averaging).
Average processing can be set to one of four levels: no average processing, 2 times (i.e., the avera-ge of 2 measurement values), 4 times, or 8 times. The measurement cycle will be equal to the sampling cycle (200 ms) multiplied by the average processing setting (i.e., the number of times). Average proc-ssing enables fluctuating input signals to be displayed stably. Set the optimum number of times for the application.

● Auto-zero Time（$Aut3$）

It is possible to set the T9ZX so that if there is no pulse for a certain time the display is force-set to 0.
This time is called the auto-zero time.
Note: Set the auto-zero time to a time slightly longer than the estimated interval between input pulses and within the setting range(0.1 to 999.9 s). It will not be possible to make accurate measurements if the auto-zero time is set to a time shorter than the input pulse cycle. Setting a time that is too long may also result in problems, such as a time-lag between rotation stopping and the alarm turning ON.

● Startup Time（$Star$）

In order to prevent undesired output resulting from unstable input immediately after the power supply is turned ON,it is possible to prohibit measurement for a set time (0.0 to 99.9 s), the startup time. It can also be used to stop measurement and disable output until the rotating body reaches the normal rate of rotation, after the power supply to the T9ZX and rotating body are turned ON at the same time.

■Output Mode Settings

● T9ZX-1P(A group of alarm output)

Upper and lower limit (HI-LO)

(Upper-limit) set2 value
(hysteresis) Hy
Measurement value
(hysteresis) Hy
(Lower-limit) set1 value
OUT

ON condition for OUT:
measurement value ≤set1 value≥set2 value

Area (AREA)

(Upper-limit) set2 value
Measurement value
(Lower-limit) set1 value
OUT

Condition	ON condition for OUT
set1≤set2	Set1≤measurement value≤set2
set1>set2	Set2≤measurement value≤set1

Upper limit (HI-HI)

(Upper-limit) set value
(hysteresis) Hy
Measurement value
OUT

ON condition for OUT:
measurement value ≥set value

Lower limit (LO-LO)

Measurement value
(hysteresis) Hy
(Lower-limit) set value
OUT

ON condition for OUT:
measurement value ≤set value

● T9ZX-2P(Two groups of alarm output)

Upper and lower limit (HI-LO)

(Upper-limit) set2 value
(hysteresis) Hy
Measurement value
(hysteresis) Hy
(Lower-limit) set1 value
OUT1
OUT2

ON condition for OUT1:
measurement value ≤set1 value

ON condition for OUT2:
measurement value ≥set2 value

Area (AREA)

(Upper-limit) set2 value
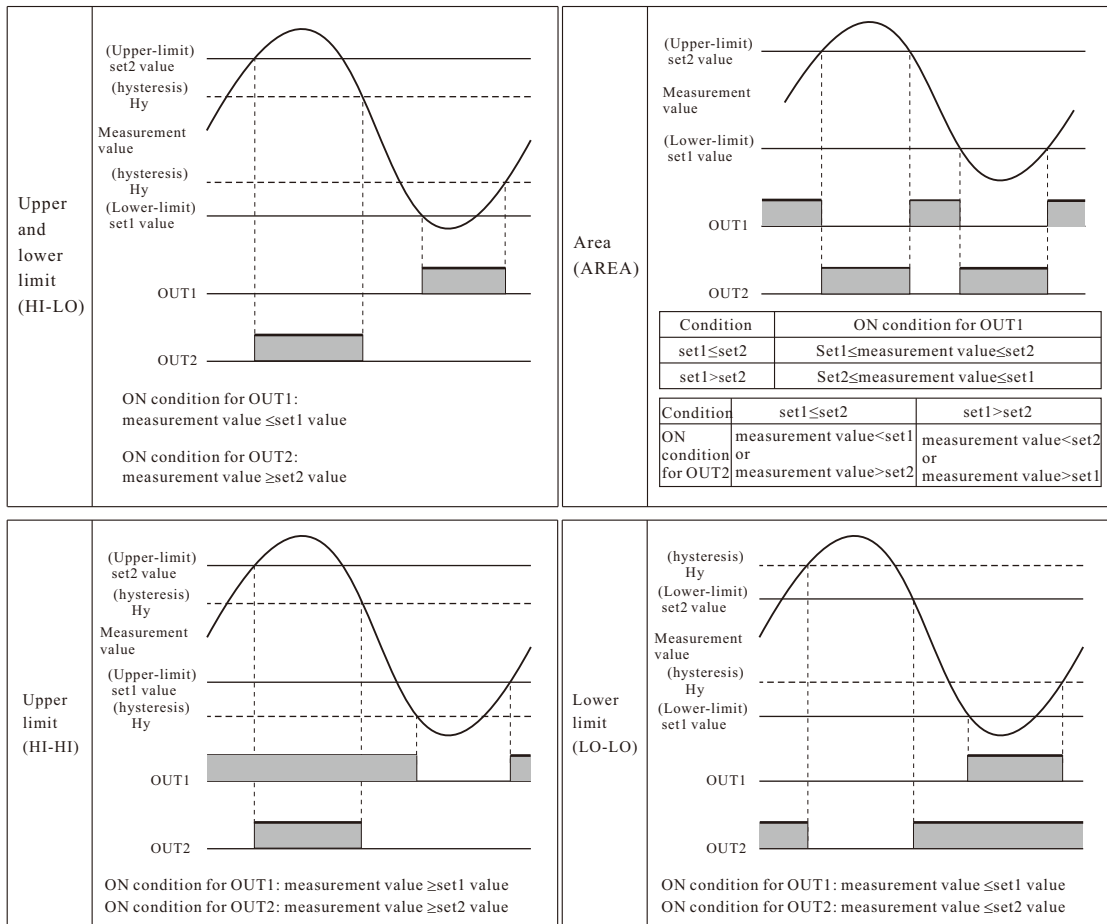Measurement value
(Lower-limit) set1 value
OUT1
OUT2

Condition	ON condition for OUT1
set1≤set2	Set1≤measurement value≤set2
set1>set2	Set2≤measurement value≤set1

Condition	set1≤set2	set1>set2
ON condition for OUT2	measurement value<set1 or measurement value>set2	measurement value<set2 or measurement value>set1

Upper limit (HI-HI)

(Upper-limit) set2 value
(hysteresis) Hy
Measurement value
(Upper-limit) set1 value
(hysteresis) Hy
OUT1
OUT2

ON condition for OUT1: measurement value ≥set1 value
ON condition for OUT2: measurement value ≥set2 value

Lower limit (LO-LO)

(hysteresis) Hy
(Lower-limit) set2 value
Measurement value
(hysteresis) Hy
(Lower-limit) set1 value
OUT1
OUT2

ON condition for OUT1: measurement value ≤set1 value
ON condition for OUT2: measurement value ≤set2 value

■Wiring diagram

• T9ZX-N

Terminals 10 11 12 13 14 15 16 17 18

Terminals 1 2 3 4 5 6 7 8 9

CP1   12V (100mA)   0V   (HOLD)   A B RS485   POWER

*Only with communication models

• T9ZX-1P/T9ZX-2P

OUT1   OUT2   *Only T9ZX-2P

Terminals 10 11 12 13 14 15 16 17 18

Terminals 1 2 3 4 5 6 7 8 9

CP1   12V (100mA)   0V   (HOLD)   A B RS485   POWER

*Only with communication models

Sensor input:

Sensor PNP NPN

Black (Yellow) OUT — CP1 HOLD
Blue (Blue) 0V — 0V
Brow (Red) +V — +12V

Tachometer

Contact Input:

Input signal is set to PNP

CP1 HOLD

+12V

Tachometer

Contact Input:

Input signal is set to NPN

CP1 HOLD

0V

Tachometer

DC voltage pulse signal input:

1:Active-high internal set PNP
2:Active-Low internal set NPN

CP1 HOLD

0V

Tachometer