Level Sensing System for Tunnel

TL－300BP／300BPH

# Specifications

TOKYO KEIKI INC.

CONTENTS

1．General

The Level Sensing System for tunnel, TL-300, is a device to measure continuously change of the level of the tunnel excavator during excavating.
The level value is measured with the Differential Pressure Sensor.
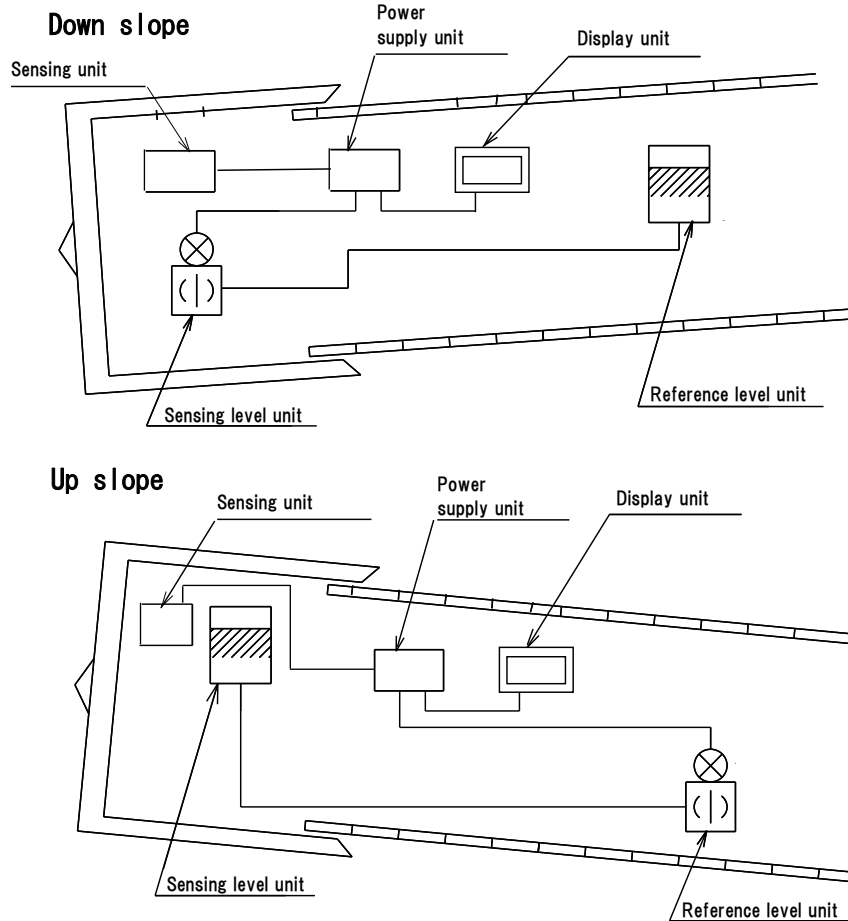The measured level value is digitally displayed on the display unit while outputting the serial signal to the external equipment.

Reference level unit must be placed higher than sensing level unit.

【Installation of the Level Sensing System(the pipe jacking method)】
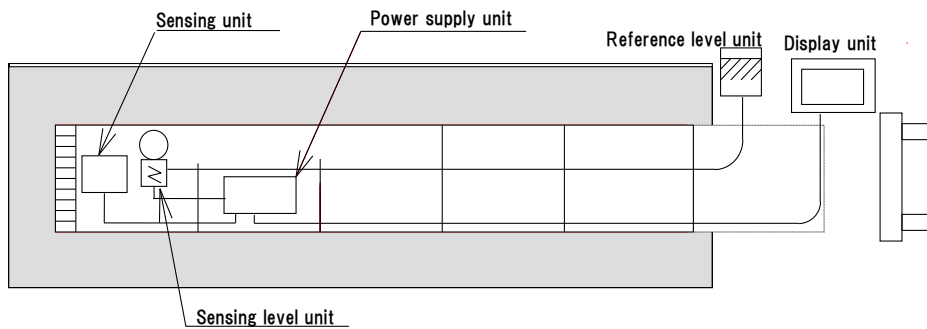
【Installation of the Level Sensing System(the shield method)】

2．Composition

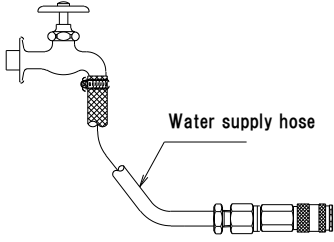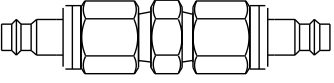| No.	Name	Quantity	Remarks
1	Reference level unit	1	
2	Sensing level unit	1	TL-300BP　or　TL-300BPH
3	Connection hose　92mm	1	For air opening(Reference level unit)
4	Water supply set	1set	
	Water supply hose 10m	1	
	Conversion coupler	1	
	Spare coupler	1set	
	Bucket	1	478×359×220
5	Cable	1set	
	Level cable　50m	1	For connection to the sensing level unit
6	Attaching bolts	1set	M10×40 (SUS), flat washer, spring washer (for Reference level unit) M8 ×50 (SUS), flat washer, spring washer (for Sensing level unit)
Option	Extension cable　50m		For the level cable　*1
	Hose　　　　　　50m		*2
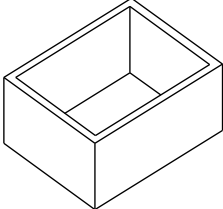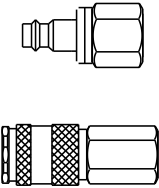
*1　The extension cable is required when the distance between the sensing level unit and the Power-supply unit is greater than 50m in the down slope, or when the sensing level unit is installed backward in the up slope.
　　Also it is required when there is possibility that the distance between the sensing level unit and the Power supply unit extends up to more than 50m in the temporary excavating.
*2　Hose length should be longer than driving length to release hose stress.
　　3m extra length hose may need per a Hume pipe.

Reference level unit

Power supply unit

Level cable 50m

Hose 50m + α

Sensing Level unit

Hose 3m
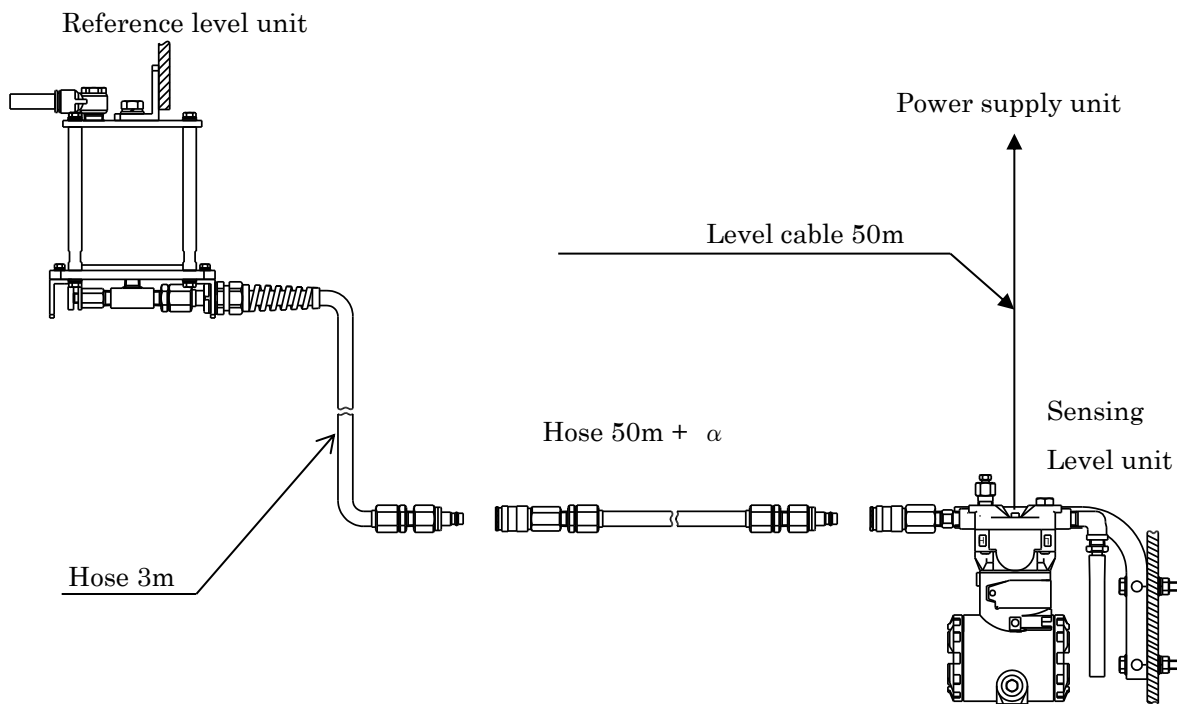
List of water supply set

No.	Item	Schematic
1	Water supply hose (10m)	Water supply hose
2	Conversion coupler For male-to-male	
3	Bucket Size:478×359×220	
4	Spare coupler	

3．Specifications

		TL-300BP	TL-300BPH
Measurable Range		−50 to −6300mm (down：−) ＋50 to ＋6300mm（up：＋）	−50 to −25350mm (down：−) ＋50 to ＋25350mm（up：＋）
DP sensor accuracy　　　　(*1)		0.18%（F.S.）	0.12%（F.S.）
Temperature differential drift	DP sensor	±0.85mm／5℃	±3.4mm／5℃
	Hose	−2.5mm／＋5℃（hose length:200m）	
Roll/Pitch angle correction(*2)		Correction with the pitch and roll angle and mounting position(mm)	
Output Signals		RS422 (note) RS232C signal for output is also provided.	
Power consumption		1VA　max.	
Environmental resistance	Structure	Drip-proof	
	Temperature	5 to 50℃	
	Humidity	95% or less RH	
Display contents	True level	0 to −6350mm (down：−) 0 to ＋6350mm（up：＋）	0 to −25400mm (down：−) 0 to ＋25400mm（up：＋）
	Level	±99999mm	
Liquid to be water　　　　(*3)		City water (Supply water pressure more than 196kPa)	
Evaporation of water　　　(*4)		Around 1.5mm／10days	

＊1 Some shock to hose cause level error.

＊2 Install the sensing level unit in the center of the tunnel excavator as far as possible.

＊3 Well water can not be used.

＊4 The amount of evaporation varies depending on temperature and humidity.

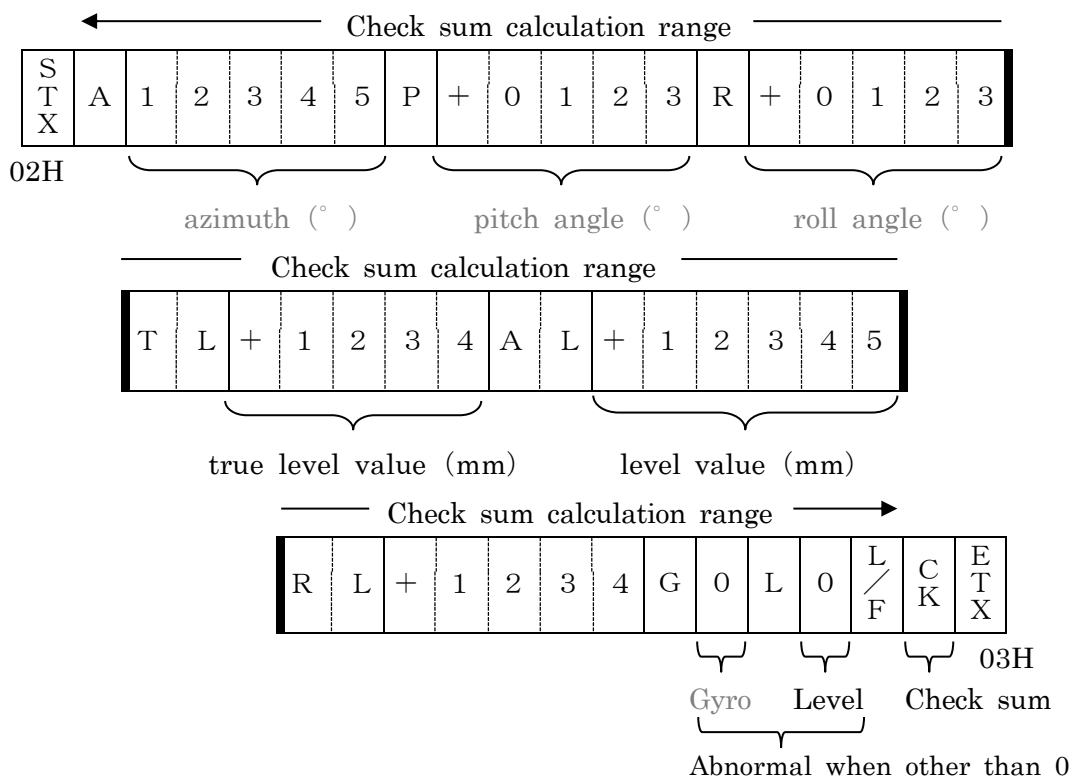Polarities of the Level Sensing System are follows.

Signal	Polarity
Level	Up（＋） Down（−）

4. Output Signal

The following serial signals are outputted from the display unit.

① Signal format　　　　:　RS422 one way signal
② Transfer speed　　　 :　2400 bps
③ Code　　　　　　　　:　ASCII
④ Data length　　　　　:　8 bits
⑤ Parity　　　　　　　 :　None
⑥ Stop bit　　　　　　 :　1bit
⑦ Transfer distance　　:　600m (19 AWG twisted pair wire with shield)
⑧ Interval　　　　　　 :　500 msec (Level communication format)

Level communication format

Check sum calculation range

| STX | A | 1 | 2 | 3 | 4 | 5 | P | + | 0 | 1 | 2 | 3 | R | + | 0 | 1 | 2 | 3 |

02H

azimuth (°)　　　　pitch angle (°)　　　roll angle (°)

Check sum calculation range

| T | L | + | 1 | 2 | 3 | 4 | A | L | + | 1 | 2 | 3 | 4 | 5 |

true level value (mm)　　　level value (mm)

Check sum calculation range

| R | L | + | 1 | 2 | 3 | 4 | G | 0 | L | 0 | L/F | CK | ETX |

03H

Gyro　Level　　Check sum

Abnormal when other than 0

(NOTE)

◎Calculation for Checksums : Checksum is calculated as follows ;

1st. : Sum up ASCII code of the character from A to L/F.

2nd.: Throw away overflowing value.

3rd.: Change it to 8 bits value.

4th.: Subtract from zero.

This is the check sum value.

In receiving side, the data are usable if the total sum of the added value from A to L/F and the checksum value get to be zero.