



ISO 9001/14001

# Model **SDT-420**

## Torque Tube, Displacement Type Level Transmitter



# SDT-420

## Introduction

The SEOJIN INSTECH model SDT-420 Displacement Level Transmitter is one of the most advanced level instruments based on displacer device.

The buoyancy principle has been well known for many decades as its high reliability and stability.

The SDT-420 operates under extremely harsh environment of 200kgf/cm<sup>2</sup> of pressure and 450 deg C.

Also interface measurement between two different liquids is possible.

The buoyancy principle of Archimedes is applied into its operation. The SDT-420 can be configured parameter values and monitored the measured values by using PC ( SIEMENS PDM S/W) or HART Communicator in Control Center where located far distance from site. It is also possible to be adjustment, operation, and control easily by using conventional remote keypad on site.



## Features

- Possible to communicate with HART or SIEMENS PDM.
- Measurement range : 300~5,000mm.
- Process temperature : Wetted parts -40 ~ 450 °C.
- Process pressure : 200 kgf/cm<sup>2</sup>.
- Output signal : 2-Wire type 4~20mA, HART, LCD.
- Range of specific gravity : 0.5~1.5.
- Allowable error :  $\pm 0.5\%$  of the Full Scale
- Possible to actuate general functions by means of using remote keypad on site.
- Installation the continuity of process and self-diagnosis function.
- Displaying with the units of %, mm, inch, mA, °C, and other physical units on site.
- Possible to compensate on site by inputting the conventional values of density, temperature, and of measurement distant of process, without acquiring the real value in site.
- Designed to ASME B31.1
- Weather proof
- Explosion-proof & Frame-proof
- Weld procedures approved to KEPIC MQ and ASME IX
- Material certification to ASTM, ASME, JIS, KS Standards
- Qualified to IEEE 323-2003, and IEEE344-2004



# Torque Tube, Displacement Type Level Transmitter

## Application

The SDT-420 can be applied in most of level measurement application including following fields :

- HP, LP, IP Feedwater Heater
- Hot Well
- Separators
- Storage Vessels
- Heavy Acids(SG=0.5~1.5) Tank
- Condensate Drums
- Industrial Boilers
- Receiver Tanks

The operating temperature of SDT-420 is from -40 deg<sup>o</sup>C to +450 deg<sup>o</sup>C under the process pressure from full vacuum to 200 bar.

This instrument measures liquid application. The Specific Gravity(S.G) range of applicable liquid process is from 0.5 to 1.5, and interface as low as S.G difference of 0.1 is also available. The measuring range of the SDT-420 is varied only on the element, although the 5,000mm is the maximum displacer length.



## Approvals

KOSHA (The Korea Occupational Safety and Health Agency)- Approval

Explosion proof Ex d IIC T6

(-20<sup>o</sup>C ≤ AMB ≤ 60<sup>o</sup>C)

General Area, Weather proof type IP65

TÜV- Approval

CE Certificate

EN-61010-1-2001

KTL(Korea Testing Laboratory)- Tested to verify the requirements of Nuclear Power Plant Quality Standards.

IEC Pub.60068 Basic Environmental Testing Procedures

KEPIC Certificate of Registration

MN-125

ISO 9001:2000/ISO 14000/2004

SEOJIN INSTECH has been assessed and approved by CREBIZ QM with respect to ISO 9001 : 2000 in the designing, development, assembly and re-calibration of the precision instruments and systems for the measurement and indication of electrical signals and , level, flow and water/steam systems.

## Quality Assurance

With over 30 year worldwide experience in the thermal power plant, nuclear power plant and petro-chemical industries.

SEOJIN INSTECH is able to accommodate testing, surveying and documentation requirements specified at the time of order. Inspection by customers or nominated inspection agencies can be arranged.

# SDT-420

## Operation Principle

The shape of entire torsion bar is L-figure.

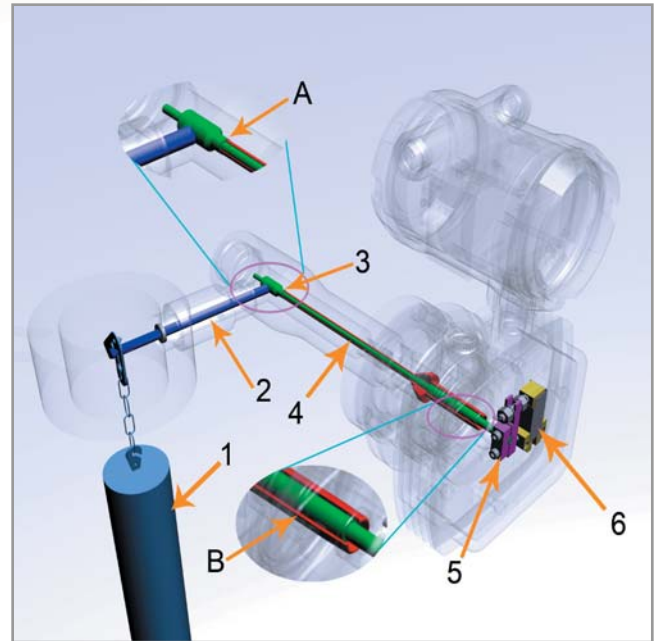
As the right side figure shows, torque tube(4) and rod(3) are connected to A portion, and this A portion can be twisted according to the displacer's buoyancy. On the other hand, B portion holds the twist movement of the A portion because torque tube(4) is fixed to main body.

When a displacer(1) is suspended on the operating rod(2), a twist stress is applied to the torque tube(4) by the weight(gravity force) of the displacer, and converted into a torque force.

At the same time, this torque force affects load cell through a bar fixture(5).

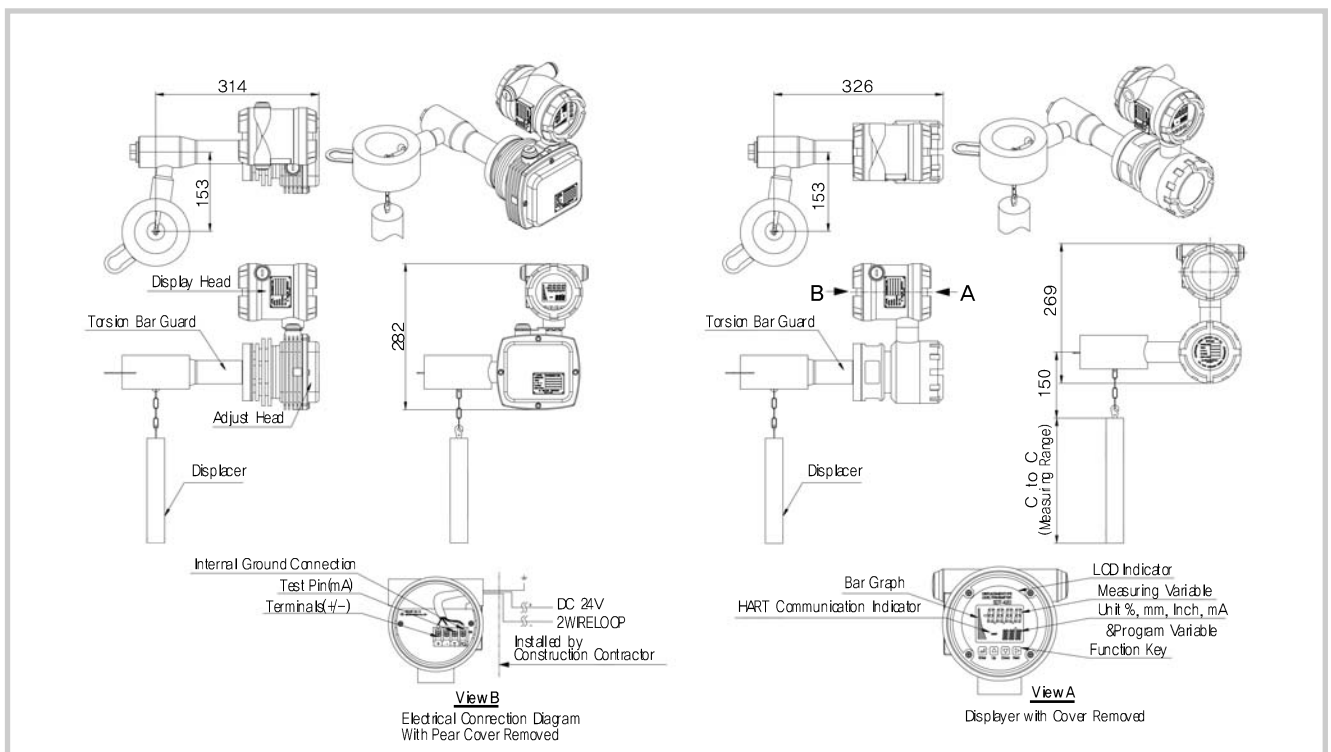
As water level goes up, the weight of displacer(1) is decreased due to increasing of buoyant force. In this case, the torque stress of torque tube(4) is decreased, and amount of the reduced torque force is transferred into the load cell(6) connected to bar fixture(5) by the movement of relaxation stress or compression stress through the rod(3), and an electricity signal corresponded to the torque force is generated.

This voltages from the load cell(6) is converted into 4~20mA of current signal of 2 wires through an amplifier device within the main PCB.



Since the resolution of the measurement is in proportion to both the volume of buoyancy and the sectional area of displacer(1), the outside diameter of displacer(1) is specified according to the measurement length.

## Dimension

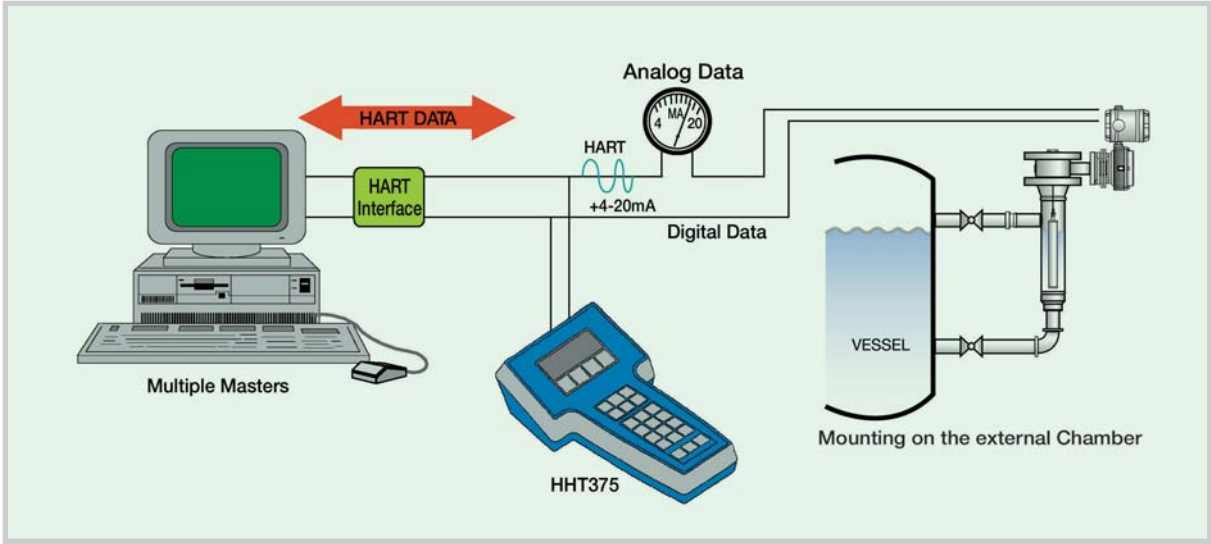


# Torque Tube, Displacement Type Level Transmitter

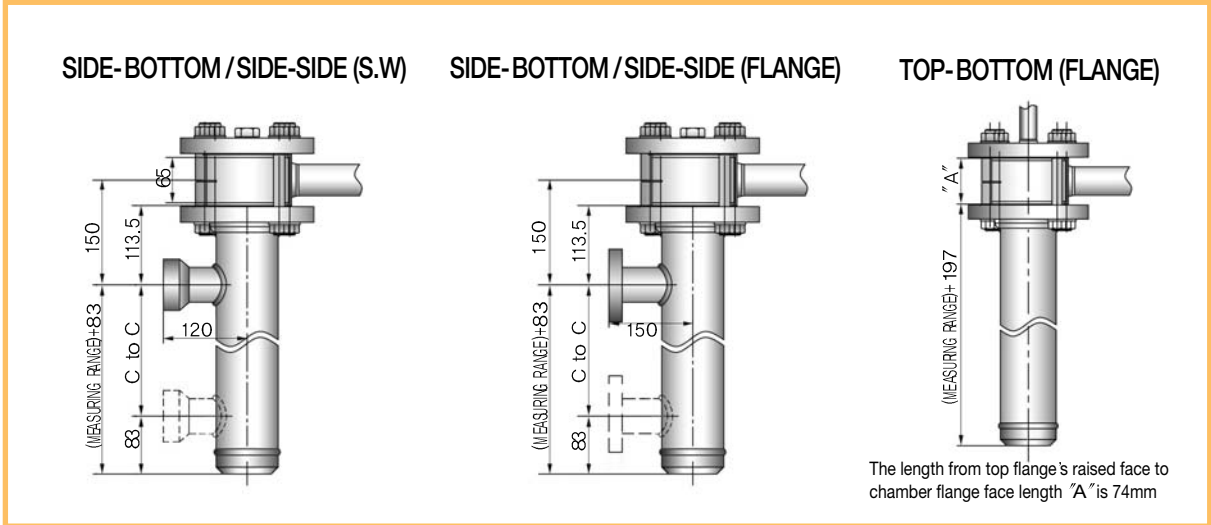
## Specification

<b>System Design</b>	
Measurement Principle	Buoyancy-continuous displacement utilizing a precision torsion bar
Measurement Medium	Liquid(Max. Viscosity : 1500 cP)
<b>Input</b>	
Measured Variable	Level, Determined by load cell affected by buoyancy force changes on continuous displacer
Measuring Range	Up to 5,000mm based on displacer length(Consult factory for longer ranges)
<b>Output</b>	
Type	4 to 20mA with HART Version 6.X 3.75 to 22mA useable
LCD Window Display	Bar graph, Millimeter, Inch, %, mA
Resolution	Analog :0.01mA,
Loop Resistance	240 Ω @24V DC
Diagnostic Alarm	3.8, 22mA or HOLD selectable
Damping	Adjustable 1- 30 seconds
Sampling Rate	Transmitter 10 times per second
<b>User Interface</b>	
Keypad	4-button menu-driven data entry and system security
Indication	Bar graph, HART Communication, 2 line x 4-character LCD display
<b>Power</b>	
Measured at Instrument Terminals	15-30V DC HART
Current	This device is operated under only functional isolation Minimum 3.8mA, Maximum 22.5mA This device provides only functional isolation
<b>Housing</b>	
Material	Aluminum alloy ADC12(KS;ALDC12, ASTM;383)
Cable Entry	1/2" PF(std.)
Ingress Protection	IP65 (NEMA 4)
<b>Chamber</b>	
Materials	Carbon steel 304/316/316L Stainless steel
Wetted Parts	316/316L and INCONEL(Torque Tube)
Process Connections	Tank Top: 3", 4" ANSI Flange Chambered: 1", 1-1/2", 2" S/W, Flange
<b>Process Conditions</b>	
Process Temperature Range	- 20 to 450 °C
Process Pressure Range	200kgf/cm <sup>2</sup> @ 25 °C
<b>Environment</b>	
Electronics Operating Temp.	-20 to 80 °C
Humidity	0-99%, Non-condensing
Electromagnetic Compatibility	CE Requirement EN61000-6-2-2005, EN61000-6-4-2007
Natural Frequency	42.7(X axis), 109.6(Y axis), 127.4(Z axis)
<b>Level Performance</b>	
Linearity	± 0.5% of full span
Accuracy	± 0.5% of full span
Repeatability	± 0.05% of full span
Hysteresis	± 0.05% of full span
Warm-up Time	< 3 seconds
Certificate	ATEX, KOSHA

**Installed Configuration**



**Overall Dimensions of Chamber**

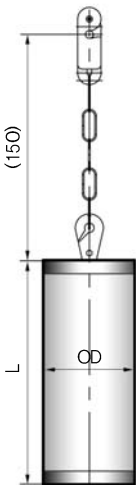


The drawing above shows the standard dimensions, but they can be changed according to user's demand.

**Dimensions of Displacer**



■ Patented displacer hook assembly.



L	OD
300-350	Ø60.3
351-500	Ø48.3
501-750	Ø42.2
751-1200	Ø33.4
1201-2000	Ø26.7
2001-3000	Ø21.3
3001-4000	Ø19.0
4001-5000	Ø15.9

(Unit:mm)

■ Torque Tube, Displacement Type Level Transmitter Chamber

SDT-420 CH A 1 A 1 A 1 A 1 A 1

**TYPE OF CHAMBER**

A = Side-Side  
 B = Side-Bottom  
 C = Top-Bottom  
 OP = etc.

**CHAMBER MATERIAL**

1 = Carbon Steel(Std.)  
 2 = 304 SS  
 3 = 316 SS  
 OP = etc.

**PROCESS CONNECTION TYPE**

A = Socket Welding Type  
 B = Flange Type  
 OP = etc.

**PROCESS CONNECTION SIZE**

1 = 2"(Std.)  
 2 = 1-1/2"  
 3 = 1"  
 OP = etc.

**TOP MOUNTING SIZE**

A = 3" ANSI RF(Std.)  
 B = 3" ANSI RJF  
 C = 4" ANSI RF  
 D = 4" ANSI RJF

**TEST FOR WELDING**

1 = Hydro Test Only  
 2 = PT Test + Hydro Test  
 OP = etc.(Customer Requirements)

**PAINTING**

A = MFR Std.(SEOJIN Spec.)  
 OP = etc.(Customer Requirements)

**DRAIN PARTS** (Side-Side Type Only)

1 = PT 1/2" With Plug(Std.)  
 2 = PT 1/2" With Globe Valve  
 OP = etc.

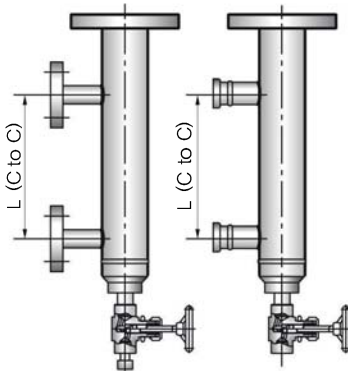
**LENGTH** (C to C)

A = 300 ~ 350mm  
 B = 351 ~ 500mm  
 C = 501 ~ 750mm  
 D = 751 ~ 1,200mm  
 E = 1,201 ~ 2,000mm  
 F = 2,001 ~ 3,000mm  
 G = 3,001 ~ 4,000mm  
 H = 4,001 ~ 5,000mm

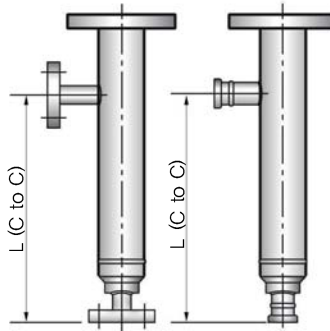
**PRESSURE RATING**

1 = 150#  
 2 = 300#  
 3 = 600#  
 4 = 900#  
 OP = etc.

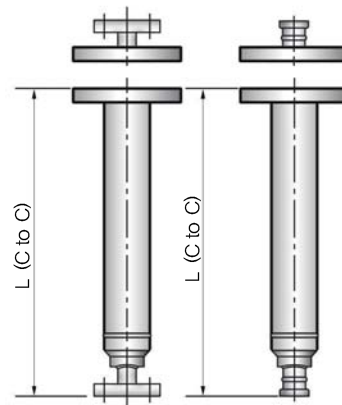
TYPE "A" (SIDE-SIDE)



TYPE "B" (SIDE-BOTTOM)



TYPE "C" (TOP-BOTTOM)



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SDT-420 31 A 1 A 1 A 1 A 1 A

**TAGGING METHOD**

A = 304SS Tag Fixed On Amplifier  
B = 304SS Tag Fixed With Wire

**CONDUIT CONNECTION**

1 = PF 1/2"(Without Cable Gland)  
2 = PT 1/2"(With Cable Gland)  
3 = NPT 1/2"(With Cable Gland)  
OP = etc.

**MOUNTING DIRECTION**

A = Righthand Mounted(Std.)  
B = Lefthand Mounted

**ELECTRICAL CLASSIFICATION(ENCLOSURE)**

1 = Weather Proof (IP65)  
2 = Explosion Proof (Ex d IIC T6/IP65 : KOSHA)  
3 = Intrinsic Safety (Ex ia IIC T4/IP65 : KTL)

**TORQUE TUBE MATERIAL**

A = 316 SS(Std.)  
B = INCONEL 600  
OP = etc.

**MEASURING PARTS LENGTH(C TO C)<sup>1)</sup>**

1 = 300 ~ 350mm  
2 = 351 ~ 500mm  
3 = 501 ~ 750mm  
4 = 751 ~ 1,200mm  
5 = 1,201 ~ 2,000mm  
6 = 2,001 ~ 3,000mm  
7 = 3,001 ~ 4,000mm  
8 = 4,001 ~ 5,000mm

**DISPLACER MATERIAL**

A = 316L(Std.)  
B = PTFE  
C = etc.

**TORSION BAR GUARD MATERIAL**

1 = Carbon Steel (Std.)  
2 = 316LSS  
OP = etc.

**TORSION BAR GUARD CONTACT FACE**

A = RF Raised Face Flange(available with 31, 33, 36, 41, 43, 46, 49)  
B = RJF Ring Joint Flange(available with 33, 36, 39, 43, 46, 49)  
OP = etc.

**TORSION BAR GUARD MOUNTING SIZE(Flange Size & Rating)**

31 = 3" 150# ANSI (Std.)  
33 = 3" 300# ANSI  
36 = 3" 600# ANSI  
39 = 3" 900# ANSI  
41 = 4" 150# ANSI  
43 = 4" 300# ANSI  
46 = 4" 600# ANSI  
49 = 4" 900# ANSI  
OP = etc.

NOTE : 1) Displacer length is measuring parts length + 30mm

