



ISO 9001/14001



ATEX



# Torque Tube type Displacer Level Transmitter

Model : SDT-420



**SeoJin Instech Co., Ltd.**

[www.seojin.biz](http://www.seojin.biz)

# SDT-420

## Torque Tube Type Displacer Level Transmitter



### Introduction

The SEOJIN INSTECH model SDT-420 Displacer 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 (PDM/AMS) 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.

### Operation Principle

The shape of entire torsion bar is left-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.

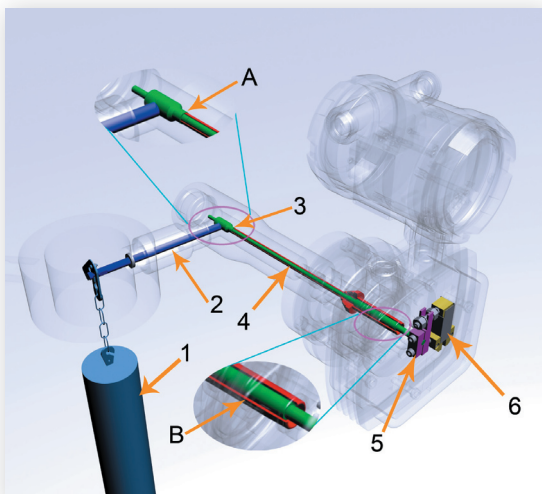
On the other hand, B portion holds the twist movement of the A portion because torque tube(4) is fixed to main body.

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 out side diameter of displacer(1) is specified according to the measurement length.

## Features

- Possible to communicate with HART or SIEMENS PDM.
- Measurement range : 300~5,000mm.
- Process temperature : Wetted parts -200 ~ 450°C.
- Process pressure : 200kgf/cm<sup>2</sup>.
- Output signal : 2-Wire type 4~20mA, HART, LCD.
- Range of specific gravity : 0.5~1.5.
- Accuracy : ±0.5% of the Full Scale (Option : ±0.25% F.S)
- 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
- Intrinsic Safety, 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 IEEE 344-2004



Torque Tube Type Displacer Level Transmitter

## Application

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

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

The operating temperature of SDT-420 is from -200°C to +450°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°C ≤ AMB ≤ 60°C)

General Area, Weather proof type IP65

TUV- 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

Explosion proof (Ex d IIC T6/IP67)

Intrinsic Safety (Ex ia IIC T5, T6/IP65)

KEPIC Certificate of Registration

MN-125 & EN-255

KC Mark (Korea Certification)

## ISO 9001:2015 / ISO 14001:2015

Seojin Instech has been assessed and approved by ICR QM with respect to ISO 9001 : 2015 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.

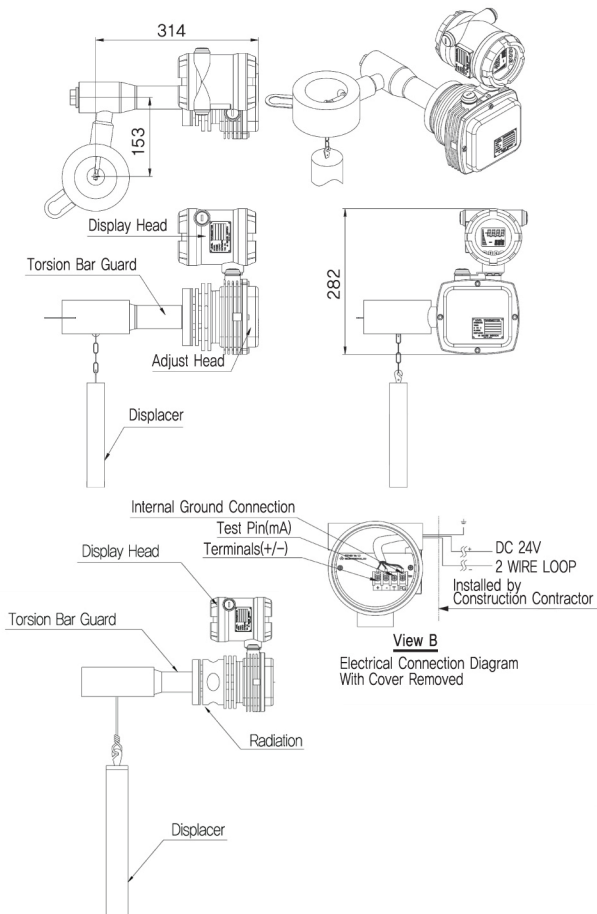
## Quality Assurance

With over 35 year worldwide experience in the thermal power plant, nuclear power plant and petro-chemical industries.

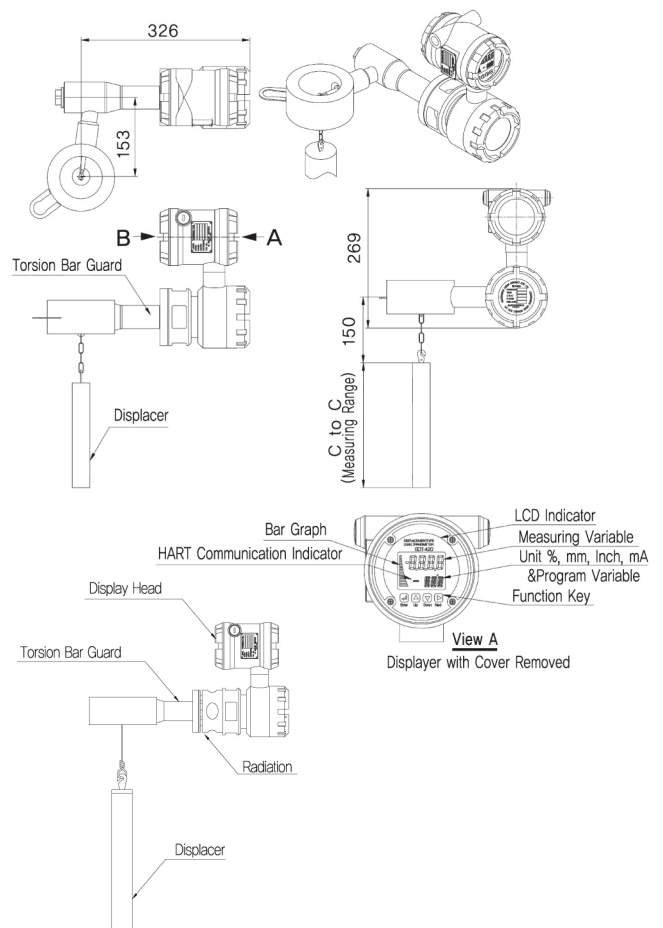
Seojin Instech is able to accommodate testing, surveying and documentation requirements specified at the time of order. Inspection by customers or nominated inspection agencies can be arranged.

## Dimensions

### Weather Proof /Intrinsic Safety



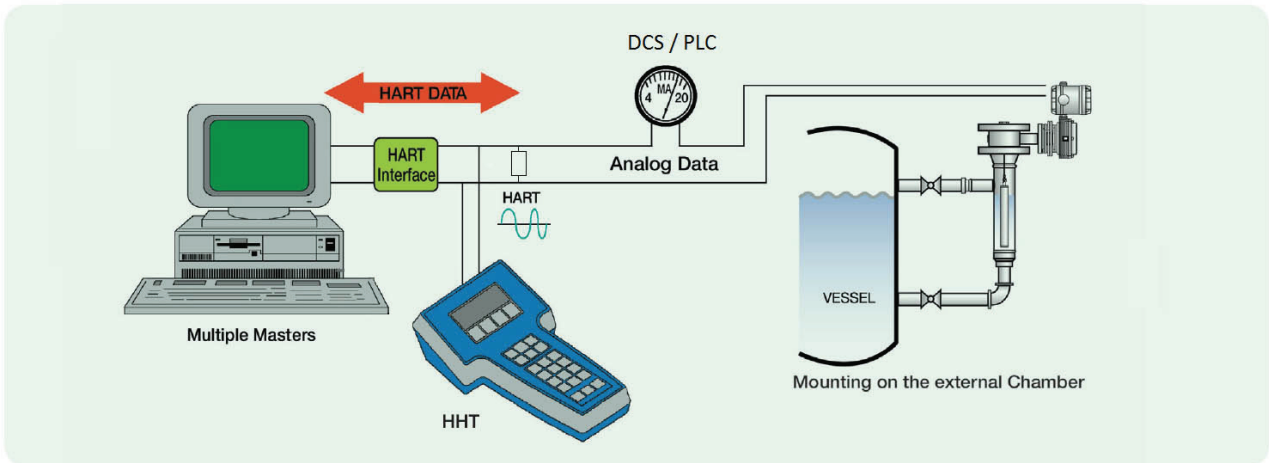
### Explosion Proof



## Specification

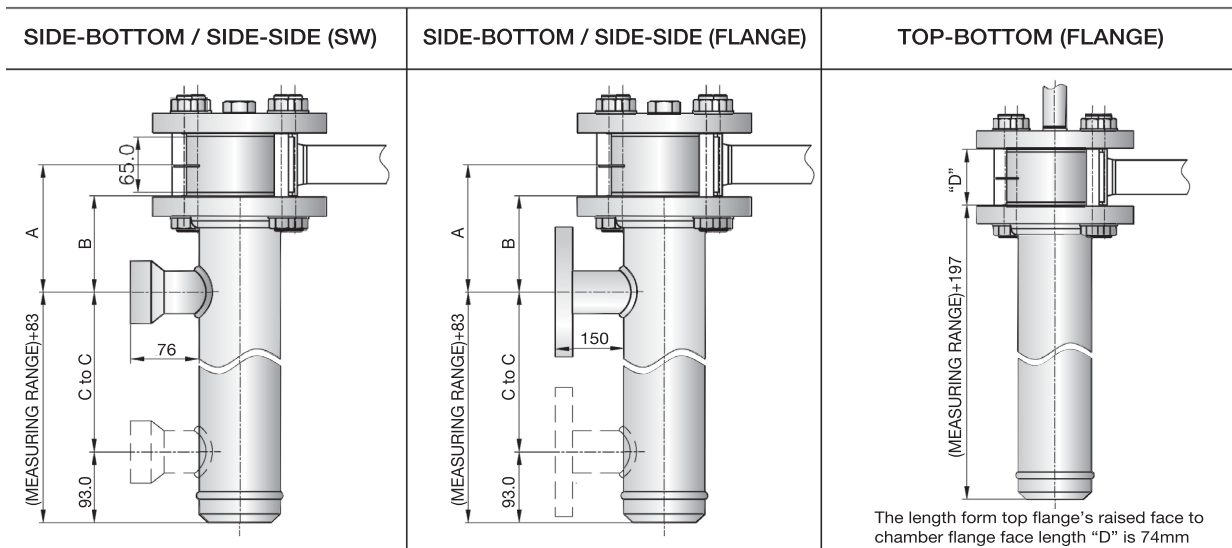
| System Design                 |   |
|-------------------------------|---|
| Measurement Principle         | Buoyancy-continuous displacement utilizing a precision torsion bar                        |
| Measurement Medium            | Liquid (Max. Viscosity : 1500 cP)   |
| Input                         |   |
| 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)               |
| Output                        |   |
| Type                          | 4 to 20mA with HART   |
| LCD Window Display            | Bar graph, mm, Inch, %, mA  |
| Resolution                    | Analog : 0.01mA,  |
| Loop Resistance (HART)        | 250 ~ 550Ω (24Vdc)  |
| Diagnostic Alarm              | 3.8, 22mA or HOLD selectable (12mA)   |
| Damping                       | Adjustable 1- 30 seconds  |
| Sampling Rate                 | Transmitter 10 times per second   |
| User Interface                |   |
| Keypad                        | 4-button menu-driven data entry and system security                                       |
| Indication                    | Bar graph, HART Communication, 2 line x 4-character LCD display                           |
| Power                         |   |
| Power Supply                  | General Operating: 12 ~ 30V(No Load)<br>Hart Communication: 17.5 ~ 30V                    |
| Current                       | MIN: 3.9mA / MAX : 21mA   |
| Housing                       |   |
| Material                      | Aluminum alloy ADC12 (KS;ALDC8, ASTM;383), 316LSS   |
| Cable Entry                   | 1/2" PF (std.)  |
| Ingress Protection            | Weather Proof / Intrinsic Safety: IP65, Explosion Proof: IP67                             |
| Chamber                       |   |
| Materials                     | Carbon steel<br>304/316/316L Stainless steel  |
| Wetted Parts                  | 316/316L and Inconel (Torque Tube)  |
| Process Connections           | Tank Top: 3", 4" ANSI Flange<br>Chambered: 1", 1-1/2", 2" S/W, Flange                     |
| Process Conditions            |   |
| Process Temperature Range     | - 200 to 450°C  |
| Process Pressure Range        | 200kgf/cm <sup>2</sup> @ 25°C   |
| Environment                   |   |
| Electronics Operating Temp.   | -20 to 60°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)   |
| Level Performance             |   |
| Linearity                     | ± 0.5% of full span   |
| Accuracy                      | ± 0.5% of full span (Option : ± 0.25% F.S)  |
| Repeatability                 | ± 0.05% of full span  |
| Hysteresis                    | ± 0.05% of full span  |
| Warm-up Time                  | < 3 seconds   |
| Certificate                   | KC, CE, KOSHA, KTL, KEPIC   |

## Installed Configuration



## Overall Dimensions of Chamber

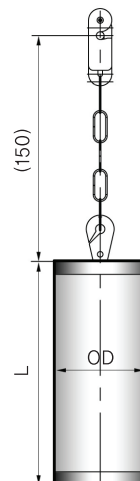
| Rating    | A   | B     |
|-----------|-----|-------|
| 150/300   | 150 | 113.5 |
| Above 400 | 200 | 163.5 |



## 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)

## Ordering Information

### ■ Torque Tube Type Displacer Level Transmitter

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" (Std.)  
2 = PT 1/2"  
3 = NPT 1/2"  
4 = NPT 3/4"  
5 = PF 3/4"  
6 = etc.

#### MOUNTING DIRECTION

A = Right hand Mounted (Std.)  
B = Left hand Mounted

#### ELECTRICAL CLASSIFICATION(ENCLOSURE)

1 = Weather Proof (IP65)  
2 = Explosion Proof (Ex d IIC T6/IP67)  
3 = Intrinsic Safety (Ex ia IIC T5, T6 /IP65)

#### TORQUE TUBE MATERIAL/PROCESS TEMP.

A = 316LSS(Std.); -200 ~240°C  
B = 316LSS: -200 ~450°C  
C = Inconel: -200 ~240°C  
D = Inconel: -200 ~450°C  
\*NOTE : 2)

#### 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 = 316LSS (Std.)  
B = PTFE  
C = Hastelloy-C  
D = 316SS+PTFE powder coating  
E = etc.

#### TORSION BAR GUARD MATERIAL

1 = Carbon Steel (Std.)  
2 = 316LSS  
3 = 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)  
C = 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  
50 = etc.

NOTE : 1) Displacer length is measuring parts length + 30mm  
2) Contact your Seojin sales office or Local Business Partner if temperatures drop below -60°C

■ When placing an order, selected ordering number should be indicated on the purchase order sheet.

## Ordering Information

### ■ Displacer Level Transmitter Chamber

SDT-420 CH A 1 A 1 A 1 A 3 A 1

#### TYPE OF CHAMBER

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

#### CHAMBER MATERIAL

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

#### PROCESS CONNECTION TYPE

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

#### PROCESS CONNECTION SIZE

1 = 2" (Std.)  
2 = 1-1/2"  
3 = 1"  
4 = 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  
3 = etc.

#### PAINTING

A = MFR Std. (Seojin Spec.)  
B = etc.

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

1 = Cap PT 1/2"  
2 = Globe valve PT 1/2" with Plug  
3 = Cap NPT 1/2" (Std.)  
4 = Globe valve NPT 1/2" with Plug  
5 = etc.  
6 = Cap NPT 3/4"  
7 = Globe valve NPT 3/4" with Plug

#### LENGTH (C to C)

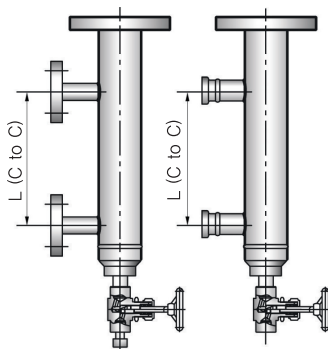
A = 300 ~ 350mm  
B = 351 ~ 500mm  
C = 501 ~ 750mm  
D = 751 ~ 1,200mm  
E = 1,201 ~ 2,000mm  
F = 2,001 ~ 3,000mm  
G = 3,001 ~ 4,000mm  
H = 4,001 ~ 5,000mm

#### PRESSURE RATING

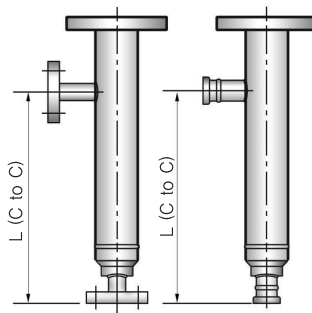
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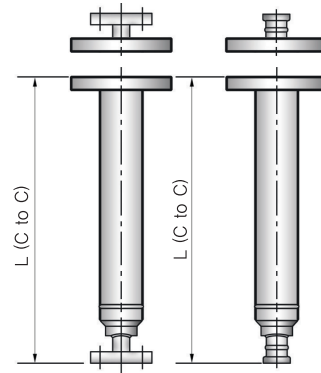
TYPE "A" (SIDE-SIDE)



TYPE "B" (SIDE-BOTTOM)



TYPE "C" (TOP-BOTTOM)



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■ Specifications subject to change without notice