Servo Gauge

139M

INTRODUCTION

The 139M Servo Gauge is an intelligent, microprocessor based instrument for accurate measurement of product level, interface level, density and temperature (external sensor required for temperature). With the addition of one or more precision pressure transmitters (HART® protocol) to the system, real time accurate measurement of product density is also possible. It also provides reliable and precise alarms on level, temperature and real time density. Local and remote calibration and check of its performance is possible. Remote indication of the measured data is available using Communication Interface Unit (CIU) or Single Tank Indicator (STI), which also interface with a standard PC and / or a standard dot matrix printer. Transmission is on two wire RS 485 bus which allows looping of 16 Servo Gauges.

OPERATION

LEVEL MEASUREMENT

The heart of the Servo Gauge is a weight sensor which continuously measures the tension in a wire which suspends a compact displacer. The wire is stored on a precision grooved drum. The tension, when the displacer is immersed in the liquid to a predetermined position, is the equilibrium tension.

A small change in the liquid level causes a corresponding change in the weight of the displacer and consequently the tension in the wire. If the tension change exceeds the set value, a variable speed positioner is energised which drives the wire drum (through magnetic coupling) to reposition the displacer so as to maintain the equilibrium tension.

While positioning the displacer, the positioner takes one step for each 0.0425 mm of displacer movement. Each step updates the level buffer by one increment. Positioner performance is continuously checked by an additional encoder mounted on the drive shaft.

INTERFACE LEVEL MEASUREMENT

Interface level measurement is executed on command. It programs another equilibrium tension which lowers the displacer to immerse in the lower liquid to a predetermined position.

INTERFACE LEVEL MEASUREMENT

The displacer is lowered to a predetermined level inside the liquid. The loss of weight of displacer in the liquid is sensed and divided by the programmed volume of the displacer to compute the product density (on demand).

FEATURES

- ☐ SIL2 Certified
- ☐ Level, Interface Level and Density measurement in one instrument
- ☐ Average temperature measurement with external temperature sensor
- ☐ Two density measurement options viz., on demand spot / average density and real time average density (using pressure transmitter)
- ☐ Two wire transmission bus allows looping, reduces cabling
- ☐ Automatic calibration of product level and compensation for density variation
- ☐ Automatic compensation for wire weight and tank deformation
- ☐ Wave integration in level measurement
- ☐ Accepts external current input and contacts to transmit data to control room
- ☐ Local and remote repeatability check
- ☐ Field calibration and checking through a portable programming unit possible without opening the instrument

REAL TIME DENSITY MEASUREMENT

For real time density measurement a precision pressure transmitter is employed to measure the head of the product column above this transmitter. Using this head (pressure) and the product level, Servo Gauge computes the product density (real time).

LPG LIQUID, VAPOUR & TOTAL MASS

A pressure transmitter is employed to measure vapour pressure in case of pressurised liquid storage . Using the measurements, strap table and ASTM tables, LPG Servo Gauge calculates mass of liquid as well as vapour component and total mass. The same is displayed and transmitted.

SPECIFICATIONS

LEVEL AND INTERFACE LEVEL MEASUREMENT

- ☐ Measuring range : 0-27000 mm (standard)
  0-37000 mm (on request)
- ☐ Level accuracy : ± 0.6 mm*
- ☐ Sensitivity : ± 0.1 mm*
- ☐ Repeatability : ± 0.1 mm*
- ☐ Interface accuracy : ± 2 mm*
- ☐ Resolution : 1 mm or 0.1 mm (selectable)
- ☐ Displacer speed : 2400 mm / minute (maximum)
- ☐ Displacer diameter : 90 mm (standard),
  45 mm & 65 mm (optional)

* Under Reference Conditions.

DENSITY MEASUREMENT ACCURACY

- ☐ On demand : ± 0.005 gm/cc
- ☐ Real time : ± 0.08 % *

* With a pressure transmitter of accuracy ± 0.04% of URL. Accuracy of real time density measurement is a function of the accuracy of pressure transmitter.

TEMPERATURE MEASUREMENT

(using external temperature sensor)

- ☐ Measuring range : -200^{0}C to +200^{0}C
- ☐ Accuracy : ± 0.2^{0}C
- ☐ Resolution : 0.1^{0}C
- ☐ Sensor type : RTD spot / Averaging
  (Multi-point / Multi-element)
  Maximum 14 nos.

LPG MASS MEASUREMENT

- ☐ Accuracy : ±1.3% of reading with SG density
  ± 0.3% of reading with manually entered density
- ☐ Resolution : 0.01 Metric Tonnes

ENVIRONMENT

- ☐ Ambient operating temperature : - 10^{0}C to + 60^{0}C (standard)
  - 50^{0}C to + 85^{0}C
- ☐ Storage temperature : - 50^{0}C to + 85^{0}C

DATA TRANSMISSION AND DISPLAY

Transmission

- ☐ To Communication Interface Unit : 2 way, 2 wire RS 485 ASCII coded / MODBUS
- ☐ Data protection : Longitudinal and vertical parity check
- ☐ To Tank Side : 2 way, 2 wire RS 485
- ☐ Indicator Controller : ASCII coded
- ☐ Baud rate : 1200 (standard) 2400 (optional)
- ☐ To Portable Programming Unit : Via infrared optical link
- ☐ Display : 2 line, 16 character backlit alphanumeric LCD display
- ☐ Motor limit : 2 programmable ML-HI and ML-LO with displacer stuck and wire break sensing
- ☐ Programmable : 4 for level (HH, H, L, LL) alarms 1 for temperature and 2 for density alarms (real time density)

SECONDARY OUTPUTS (OPTIONAL)

☐ 4-20 mA DC/ 4-20 mA + HART, isolated, maximum load 750 ohm proportional to level*

☐ Two / Four programmable relay contacts (potential free), NC/NO contact rated 6A @ 230VAC/28VDC (Resistive). For alarms or control of external field equipment through remote command

☐ SIL2 Compliant 4-20 mA DC (Proportional to Level) and / or 4 Relay outputs*

* Not available if real time density / LPG Servo Gauge option is chosen

POWER SUPPLY

☐ 110/230 VAC, ± 10%, 50Hz, 1Ø, mains isolated, 25 VA

Note: Additional 20VA for heaters for operation at -50^0 C

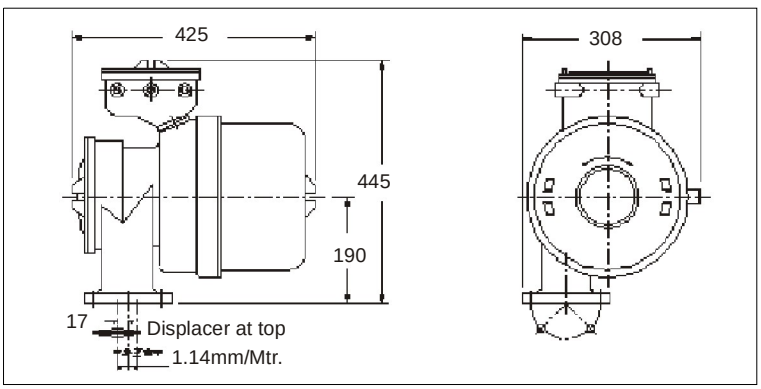
CABLING

- ☐ Power : 2 core, 2.5 mm^2 Copper
- ☐ Signal : 1 twisted pair, 1 mm^2
  R_{max} ≤ 200 ohms , C_{max} ≤ 1µF
- ☐ For Tank Side Indicator : 2 pair, 1 mm^2 Copper

CERTIFICATIONS

- ☐ Servo Gauge & terminal compartment enclosure : Flameproof as per 60079-1:2007 terminal suitable for Group IIA & IIB area certified from PESO
- ☐ Custody Transfer Approvals : Weights and Measures as per OIML-R85 standard

MECHANICAL DEIMENSIONS



MATERIALS OF CONSTRUCTION

- ☐ Displacer : SS 316*
- ☐ Measuring wire : SS 316*
- ☐ Main housing & drum compartment cover : See table below
- ☐ Servo compartment cover : Cast aluminium LM6
- ☐ Measuring drum shaft & magnetic Coupling cap : SS 316*
- ☐ Magnetic coupling : Strontium ferrite magnets
- ☐ Drum bearings : Carbon filled PTFE
- ☐ `O` rings : Viton - Standard
  PTFE (for high pressure drum side only) - Optional

Max. operating pressure (kg cm^2)	Material of main housing and drum compartment cover	Mounting flange	Weight of Servo Gauge
6	Cast Aluminium LM6	2" ANSI 150 lbs FF / RF	28 Kg
6	SS 316 / SS 304	2" ANSI 150 lbs RF	40 Kg
30	SS 316 / SS 304	2" ANSI 300 lbs RF	45 Kg

Material of Main Housing & Drum Cover also available in SS 316L/ SS 304L on special request.

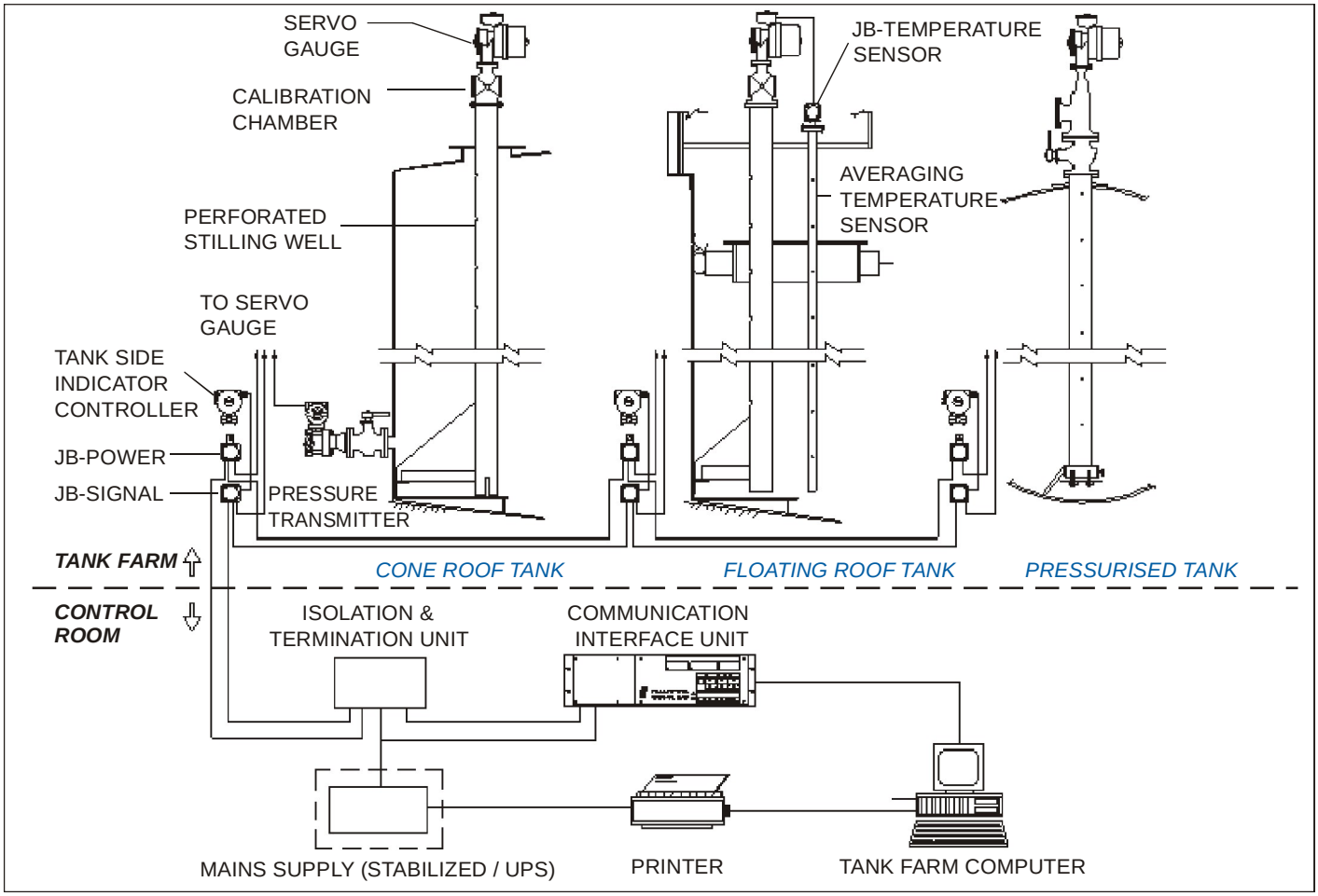
* Material of Displacer, Measuring Wire and Measuring drum shaft & magnetic coupling cap also available in SS 316L on special request.

OPTIONAL ACCESSORIES

Following is the list of accessories available. The respective product leaflet numbers are indicated within brackets.

- ☐ Calibration Chamber LF_CastCalChamber_139CC
  Fabricated Calibration Chamber LF_FabriCalChamber_139FCC
  This is a recommended accessory to enable automatic calibration of reference.
- ☐ Portable Programming Unit LF_PortPrgUnit_139PPU
  It is a hand held portable unit for programming / calibration of Servo Gauge from tank top.
- ☐ Tank Side Indicator Controller LF_TankSideIndContr_139TSIC
  It is a local indicator controller mounted at tank side which displays all parameters and also sends various commands to Servo Gauge.
- ☐ Communication Interface Unit LF_CommInterfaceUnit_133CIU
  It is control room indicator for multiple tanks providing relay and current output. One CIU can be used for Maximum of 64 tanks.
- ☐ Single Tank Indicator LF_SingleTankInd_139STI
  It is control room indicator for single tank providing relay and current output.
- ☐ Averaging Temperature Sensor LF_AvgTempSensor_133TMP (Multi-point)
  This is an accessory used for measurement of average temperature of product stored in bulk storage tanks.
- ☐ LPG Servo Gauge LF_ServoGaugeLPG_139M
  A variant for inventory calculations & measurements of liquids stored in pressurised vessels.

TYPICAL SERVO GAUGE BASED TANK INVENTORY MANAGEMENT SYSTEM



ORDERING INFORMATION

MODEL
139 M SERVO GAUGE

CODE	PRESSURE	MATERIAL OF MAIN HOUSING AND DRUM COVER
2	0-6 Kg/cm^2	Cast Aluminium LM6
4	0-6 Kg/cm^2	SS 304
6	0-6 Kg/cm^2	SS 316
7	0-30 Kg/cm^2	SS 316
8	0-30 Kg/cm^2	SS 304

CODE	DENSITY
0	Not required
1	Density (On demand)

CODE	TEMPERATURE MEASUREMENT AND SENSOR TYPE
0	No temperature sensor
1	Pt - 100 single point
2	Averaging temperature sensor

CODE	SECONDARY OUTPUTS
00	No secondary output
01	4-20 mA DC(proportional to level) *
02	Two relay contacts
03	4-20 mA DC + NO/NC contacts *
05	Four relay contacts
06	4-20 mA + HART (proportional to level) *
07	4-20 mA + HART (proportional to level) + NO/NC contacts*
08	4-20 mA DC (proportional to level)* *- SIL 2 Compliant*
09	Four relay contacts* *- SIL 2 Compliant*
10	4-20 mA DC (proportional to level) + four relay contacts* *- SIL 2 Compliant*

CODE	LEVEL MEASUREMENT RANGE
0	0 - 27 m (Standard)
1	0 - 37 m

CODE	POWER
1	110 VAC, 50 Hz, 1 ϕ (standard)
2	230 VAC, 50 Hz, 1ϕ

CODE	CABLE ENTRIES
1	1/2" NPT (F)
2	3/4" UNF (F)

CODE	TYPE OF SERVO GAUGE
0	Standard
1	Hybrid (Real Time Density Measurement)
2	LPG Servo Gauge
3	Level Servo Gauge for Cavern Application
4	Interface Servo Gauge for Cavern Application

139M	7	1	2	10	0	1	1	3	TYPICAL MODEL NO.

- For real time density measurement / LPG Servo Gauge, a pressure transmitter with high accuracy must be used. In such cases, all * marked options are not selectable
- Material of Main Housing & Drum Cover also available in SS 316L/ SS 304L on special request.
- Refer Functional Safety Manual for details of SIL2 compliant Servo Gauge

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