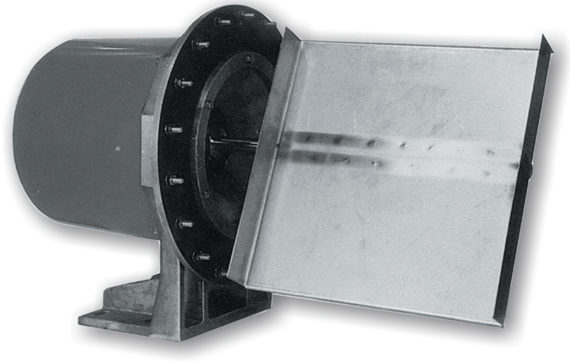
Instruction Manual · September 2003



milltronics

ILE-37

SIEMENS

Safety Guidelines

Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

Qualified Personnel

This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

Warning: This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

Note: Always use product in accordance with specifications.

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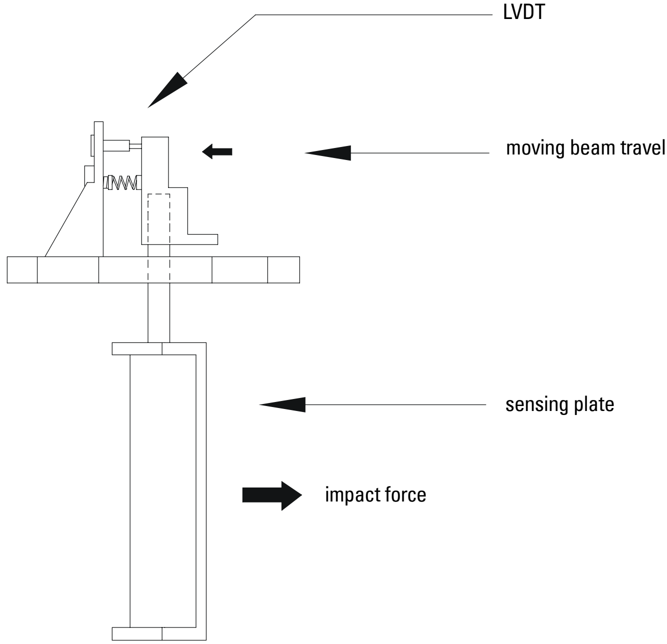
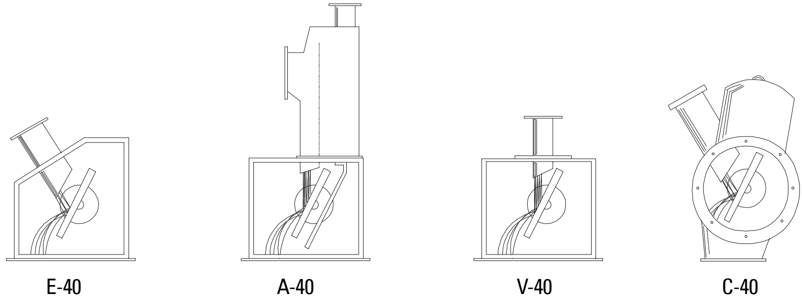
Milltronics ILE-37 Sensing Head

The Milltronics ILE-37 sensing head is an out-of-process sensing element for A, E, V, and C series solids flowmeters. It is used for continuous in-line weighing of powdered or granular dry bulk solid materials. The material is directed toward the sensing plate. The horizontal impact force of the material, deflecting the sensing plate, displaces the core of the sensing head LVDT (linear variable differential transformer). The LVDT output signal is proportional to material flowrate. A viscous fluid damper prevents oscillation of the mechanism and provides mechanical damping of pulsating material flow.



The ILE-37 sensing head is used with Milltronics E-40 (general purpose), C-40 (coal scale), A-40 (aerated gravity conveyor), and V-40 (vertical material drop) dry solids flowmeters.



Specifications

Operating Range

- 0 to 0.2 t/h (0 to 0.2 STPH) min., 0 to 40 t/h (0 to 44 STPH) max.

Particle Size

- fine powder to 13 mm (0.5")

Product Temperature

- –40 to 232 °C (–40 to 450 °F)

Ambient Temperature

- –40 to 60 °C (–40 to 140 °F)
- –40 to 50 °C (–40 to 122 °F) with optionally internally mounted LVDT card

Accuracy

- ± 1 % of full scale, higher accuracy with linearizing function of integrator

Repeatability

- ± 0.2 %

Construction

- dust-tight cast aluminum frame with fiberglass rear cover

Mounting

- side mount or base mount (to suit application)

Sensor Type

- LVDT (linear variable differential transformer)

LVDT Excitation

- 2.50 V AC @ 2.9 kHz (supplied byintegrator or LVDT conditioner card)

LVDT Output

- 0 – 0.75 V AC @ 2.9 kHz

Damping Fluid

- 1 – 100 cm^2/s (100 – 10,000 cs) silicone (Dow Corning 200 recommended)

Options

- Epoxy paint, synergistic polymer, or PFA coating of external aluminum casting surfaces
- Epoxy painted mild steel or stainless steel rear cover

Approvals

- CE
- Optional CSA. Class I, Groups C and D; Class II, Groups E, F, and G

Sensing Plate

Construction

- 304 (1.4306) stainless steel

Options

- 316 (1.4404) stainless steel
- UHMW polyurethane or Ceramic Tile abrasion resistant lining
- Synergistic polymer or PFA coating for low cohesion and low friction

LVDT Conditioner Card

Power

- ± 5 V DC (typically from a Siemens Milltronics Integrator)

Ambient Temperature

- –40 to 50 °C (–40 to 122 °F)

Input

- 0 to 1.0 V AC from LVDT

Output

- 0 to 50 mV DC to Siemens Milltronics integrator; [maximum 300 m (1000 ft) separation between conditioner card and integrator]

Approvals

- CE

Enclosure

- NEMA 4 (remote mounted unit)

Cable

For connection between LVDT Conditioner Card and Integrator

- Belden® [1] 8404, 4 conductor, shielded 20 AWG (0.5 mm^2) or equivalent, 150 m (500 ft) maximum
- Belden 9260, 6 conductor, shielded 20 AWG (0.5 mm^2) or equivalent, 300 m (1000 ft) maximum

For connection between LVDT and remote LVDT Conditioner Card, or directly between LVDT and Integrator

- Belden 8404, 4 conductor, shielded 20 AWG (0.5 mm^2) or equivalent, 300 m (1000 ft) maximum

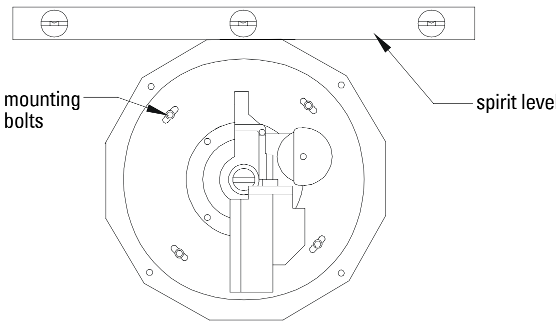
1. Belden is a registered trademark of Belden Wire & Cable Company.

Installation

The ILE-37 sensing head is available in two models: side mount and base mount. The base mount version should be used if the flowmeter will be subjected to excessive vibration, for flow rates below 1 t/h, or if handling product temperatures above 60 °C. The side mount version is factory-installed on Siemens Milltronics flowmeters designed for side mount sensing heads.

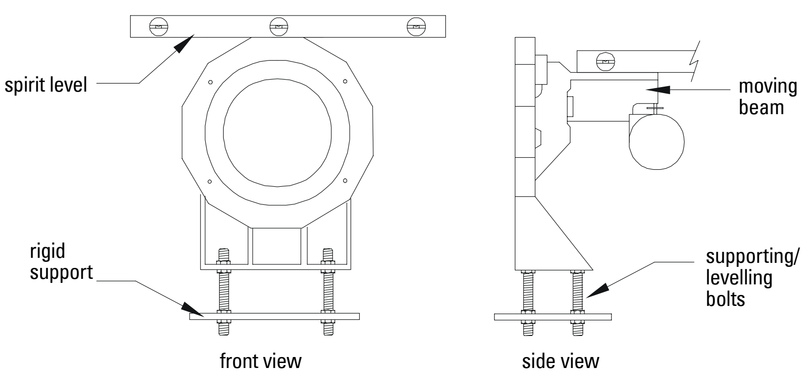
Side Mount

1. With the flowmeter housing installed, remove the ILE-37 sensing head cover.
2. Loosen the four ILE-37 mounting bolts.
3. Place a spirit level on the flat top of the ILE-37 frame: adjust the sensing head level by rotating it, and retighten the mounting bolts.



Base Mount

1. With the flowmeter housing installed, mount the ILE-37 to a rigid support structure.
2. With the outer gasket in place, bolt the ILE-37 to the housing.
3. Adjust the sensing head levelling hardware provided, to establish level in both horizontal planes.

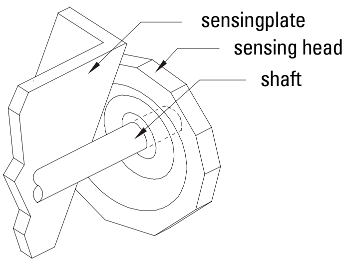


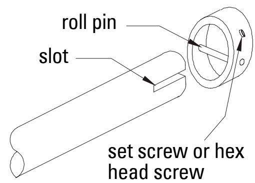
Note: Ensure that the structure used to support the base mount sensing head is capable of supporting the dynamic material impact forces as well as the static weight of the sensing head.

Sensing Plate

1. Open the flowmeter housing access door.
2. Remove the sensing head cover and insert the sensing plate shaft fully into the sensing head shaft socket*.
3. Tighten the set screw/hex screw to secure the sensing plate.

*__Note:__ Ensure the slot in the end of the shaft mates with the roll pin in the back of the socket.

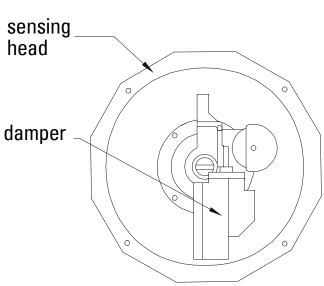


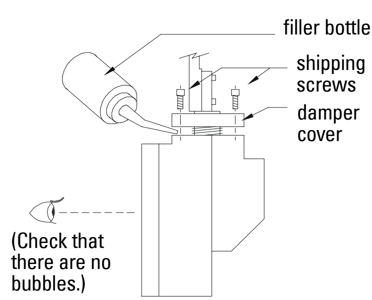


Viscous Damper

1. Remove the two damper cover shipping screws. The damper cover will be held up by a spring.
2. If necessary, top up the damper to near overflowing with the damping fluid supplied.
3. Store the damper cover shipping screws, remaining damper fluid, and filler bottle for future use.

Note: The damper must be full and free of air bubbles, with the damper cover in the UP position, during flowmeter operation.

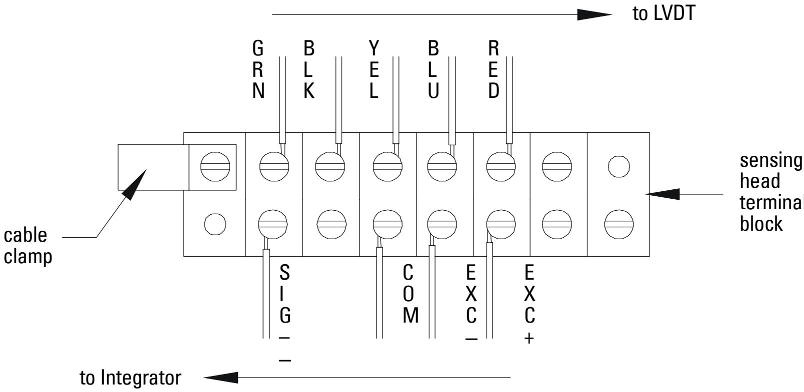




Interconnection

Non-Hazardous Unit without LVDT Conditioner Card

* See note below for Encapsulated (Hazardous-rated) LVDT color codes.

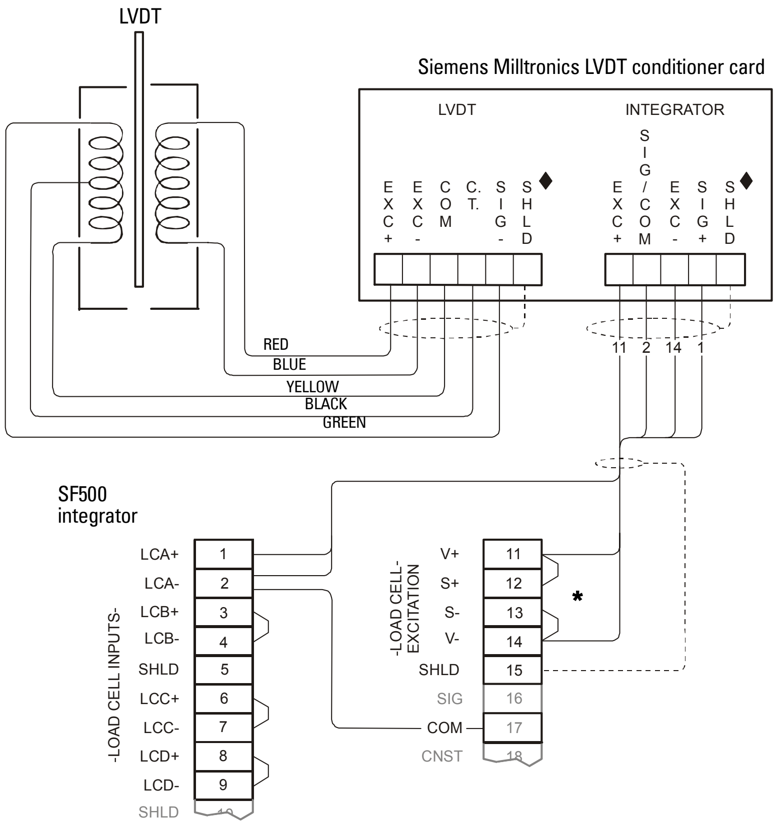


*For Encapsulated LVDT (hazardous)
YEL = WHITE
BLU = ORANGE
GRN = YELLOW

Note: Ground shield at Integrator only.

Non-Hazardous Unit with Sensing Head Mounted LVDT Conditioner Card

- Not applicable to Hazardous-rated units
- LVDT to LVDT Conditioner Card connections are made by Siemens Milltronics



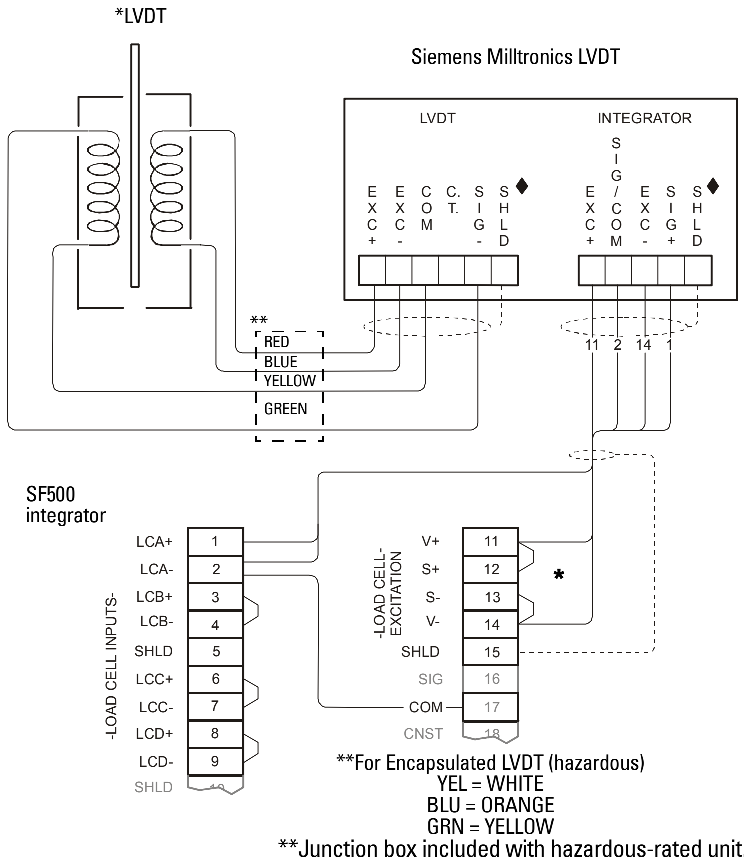
*Where separation between the integrator and LVDT conditioner exceeds 150 m (500 ft):

- Remove the jumpers SF500 terminal 11/12 and 13/14
- Run additional conductors:
  - from SF500 terminal 12 to conditioner terminal block marked "Integrator +EXC"
  - from SF500 terminal 13 to conditioner terminal block marked "Integrator –EXC"

For further connection information on specific LVDTs, consult Siemens Milltronics.

♦**Note:** Shields are common, but not grounded to chassis. Run cable shields through SHLD terminals and ground at Integrator only.

Non-Hazardous Unit with Remote-Located LVDT Conditioner Card



*Where separation between the Integrator and LVDT conditioner exceeds 150 m (500 ft):

- Remove the jumpers SF500 terminal 11/12 and 13/14
- Run additional conductors:
  - from SF500 terminal 12 to conditioner terminal block marked "Integrator +EXC"
  - from SF500 terminal 13 to conditioner terminal block marked "Integrator –EXC"

For further connection information on specific LVDTs, consult Siemens Milltronics.

♦ **Note:** Shields are common, but not grounded to chassis. Run cable shields through SHLD terminals and ground at Integrator only.

Calibration

A **Test Weight** is a calibration reference used to simulate a material impact force (test rate) on the flowmeter sensing plate during the integrato span calibration. The test weight is also used to perform a test to verify that the flowmeter sensing head is level.

The Test Rate should be 60 to 80% of the system design rate.

To determine the test rate produced by a specific test weight, calculate:

$$\text{Test Rate (TPH)} = \frac{\text{Test Weight (grams)}}{65^{1}\ \text{grams/TPH}}$$

Alternatively, to determine the test weight required for a specific test rate, calculate:

$$\text{Test Weight} = 65^{1}\ \text{grams/TPH} \times \text{Test Rate (in TPH)}$$

e.g. If the test weight used with an E-40 flowmeter is 500 grams:

$$\text{Test Rate} = \frac{500\ \text{grams}}{65\ \text{grams/TPH}} = 7.65\ \text{TPH}$$

> **Note:** Use metric tons per hour (t/h) or short tons per hour (STPH) as applicable for TPH.

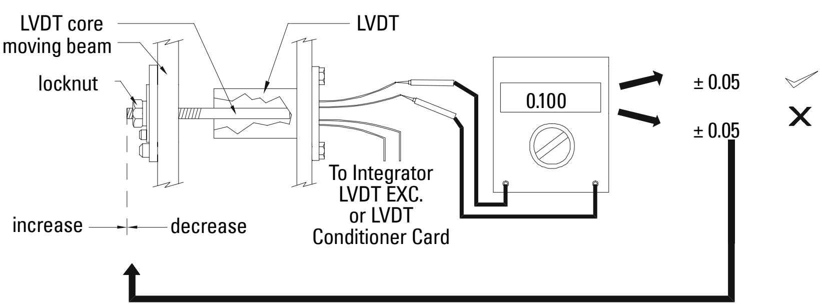
LVDT Output

Zero Adjustment (if required)

1. Connect a voltmeter across the LVDT green and yellow (or yellow and white; hazardous LVDT) wires.
2. With no load applied to the sensing plate, observe the V AC reading on the voltmeter.

If the LVDT output is 0.10 ± 0.05 V AC, skip to Span Test, otherwise, proceed as follows:

a. Loosen the locknut on the LVDT threaded core.
b. Turn the core in/out of the LVDT until 0.10 ± 0.05 V AC is obtained.
c. Tighten the locknut, ensuring the measured value is maintained.



> **Note:** Ensure the new position of the LVDT core allows free movement within the LVDT bore.

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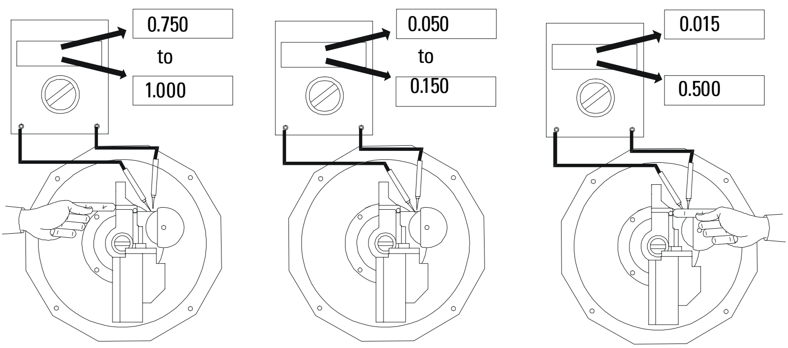
[1] Use 80 grams for A-40 flowmeters.

Span Test

1. Gently push the sensing head moving beam to the right. The LVDT output should steadily increase until a level of 0.75 to 1.0 V AC is achieved.
2. Gently push the sensing head moving beam to the left. The LVDT output should steadily decrease until zero is reached and then start increasing again to 0.015 to 0.5 V AC.
3. Ensure the LVDT output always returns to 0.10 ± 0.05 V AC, (to the right side of zero) when pressure on the moving beam is released.

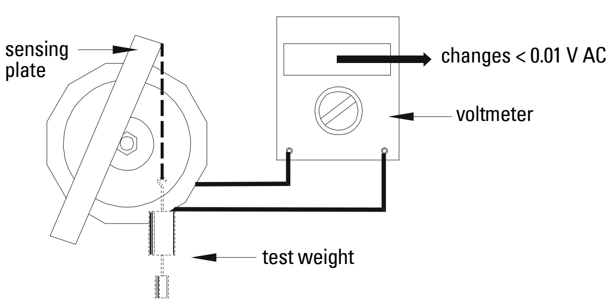
> **Note:**
> - The LVDT core must not contact the inside of the LVDT over the range of core travel.
> - The actual LVDT core travel during this procedure is less than 3 mm (1/8").



Sensing Head Level Test

1. With the voltmeter still connected to the LVDT output, hang the test weight directly off the sensing plate.
2. Check to ensure that the LVDT output does not change by more than 0.01 V AC.

> **Note:**
> - If the change is greater than 0.01 V AC, adjust the sensing head level, (refer to “Installation” on page 4) until the change with and without the test weight on the sensing plate is less than 0.01 V AC.
> - Remove the test weight and readjust the LVDT Output Zero, if necessary. If the level test is performed after the integrator has been calibrated, a new integrator Zero and Span calibration, Span Adjust, and Factoring, should be performed.



Integrator Calibration

Refer to the Integrator instruction manual for Integrator Calibration instructions.

Zero Calibration

Refer to the Integrator instruction manual for Zero Calibration instructions.

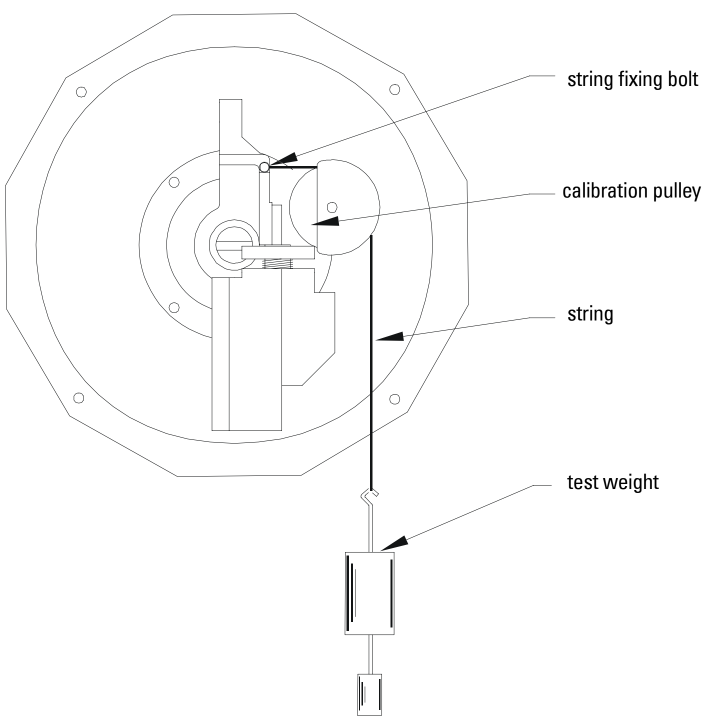
Span Calibration

After a successful zero calibration, apply the test weight for the span calibration:

1. Attach one end of a string (monofilament fishing line or fine flexible cable) to the test weight.
2. Route the other end of the string over the calibration pulley.
3. Attach the free end of the string to the string fixing bolt. Ensure the string rests in the groove of the bolt.

Note:

- Ensure there is no material flow during zero and span calibrations
- Ensure the test weight is suspended free of any obstructions.
- Accurate calibration is not assured until material tests and a manual span adjustment have been performed, as outlined in the Integrator instruction manual.



Maintenance and Spare Parts

Maintenance

Establish a program of routine maintenance to ensure the highest achievable level of performance. Follow good housekeeping practices in the area of the flowmeter.

Typical Maintenance Program

Maintenance Description	Frequency: Regular	Frequency: Monthly	Frequency: Semi-Annual	Frequency: Annual
Clean area around flowmeter	✓	✓	✓	✓
Check sensing plate surface[1]	✓	✓	✓	✓
Check damping fluid		✓	✓	✓
Check sensing head inner gasket		✓	✓	✓
Check sensing plate wear		✓	✓	✓
Check test weight Rate display			✓	✓
Test flowmeter linearity				✓

1. Remove any material buildup in the impact area of the sensing plate.

Spare Parts

Siemens Milltronics recommends the following spare parts be kept on hand:

- sensing head inner gasket
- sensing head outer gasket (base mount version only)
- damping fluid
- sensing plate

Contact Siemens Milltronics or your distributor for spare parts ordering information.

Unit Repair and Excluded Liability

All changes and repairs must be done by qualified personnel and applicable safety regulations must be followed. Please note the following:

- The user is responsible for all changes and repairs made to the device.
- All new components must be provided by Siemens Milltronics Process Instruments Inc.
- Restrict repair to faulty components only
- Do not re-use faulty components.

Range Springs

The range spring establishes the range of sensing head moving beam travel for a given range of material flow. This spring is installed in the flowmeter sensing head at the factory. The spring is selected according to the specified design rate of the application.

For best operation, the range spring should provide 0.75 to 2.4 mm (0.030 to 0.094") of moving beam travel from the static zero to the design rate operation position. The moving beam travel may be inferred from the value of the LVDT output, as measured between the LVDT green and yellow wires (or yellow and white wires in the case of a hazardous-rated LVDT unit).

With the 2.5 V AC, 2.9 kHz LVDT excitation supplied:

- 0.75 mm of moving beam movement = 0.188 V AC output
- 2.40 mm of moving beam movement = 0.600 V AC output

Should the design rate of the flowmeter application change, it may be necessary to select and install another range spring to obtain the optimum moving beam travel (LVDT output) range.

Range Spring Removal

1. Loosen the range spring locknut.
2. Remove the range spring mounting bolt and three flange mounting bolts.
3. Remove the range spring from the range spring assembly.

Range Spring Replacement

1. Install the new range spring in the range spring assembly.
2. Mount the range spring assembly by the three flange mounting bolts.
3. With the moving beam in the static zero position, thread the range spring until the base just touches the static beam and then turn one complete revolution more.
4. Install the range spring mounting bolt and tighten the range spring locknut.

Flowmeter Recalibration

After you have removed and replaced the range spring, recalibrate the flowmeter and integrator. (See the Integrator manual, CALIBRATION section, for details.)

1. Perform the LVDT output zero procedure.
2. Perform an integrator zero and span calibration.
3. Perform a span Adjust and factoring as required.

Troubleshooting

Every Milltronics ILE-37 sensing head is subjected to extensive quality assurance procedures to ensure the highest possible degree of quality, reliability, and performance is achieved.

The following listing indicates the probable cause, and proper course of action to be taken should the specified fault symptom occur.

Symptom	Cause	Action
Integrator rate display doesn't change when sensing plate is moved.	Wrong or bad integrator connection.	Refer to INSTALLATION/ Interconnection
	Viscous damper cover in shipping position.	Refer to INSTALLATION/ Viscous Damper.
	Integrator not prepared for operation.	Program and calibrate the integrator.
Span adjustment does not have enough range.	Range spring not suited to application	Refer to RANGE SPRINGS.
Measurement results are not repeatable.	Sensing head not level.	Refer to INSTALLATION and CALIBRATION/Sensing Head Level Test
	Moving beam travel is mechanically limited.	Ensure moving beam does not hit travel stops between –20% and 150% flowrates.
	Leaf springs are damaged.	Replace leaf springs, re-calibrate Flowmeter and Integrator.
	Material flow patterns vary.	Refer to the flowmeter instruction manual APPLICATIONS section.
Accuracy varies with material flowrate.	Non-linear operation	Refer to LINEARITY.

Linearity

To test linearity, at least three test weights are used. Each test weight represents a different Test Rate. Record the integrator rate display value associated with each test weight applied to the flowmeter.

If all the recorded display values are accurate, the flowmeter measurement is linear.

e.g. For an E-40 Flowmeter design rate of 12 TPH, the following three test weights could be used:

- 780 g (1.72 lb) = 100% Design Rate = 12.0 TPH
- 585 g (1.29 lb) = 75% Design Rate = 9.0 TPH
- 390 g (0.86 lb) = 50% Design Rate = 6.0 TPH

If non-linear results are obtained, ensure:

- at no flow, the moving beam does not rest on the zero stop bolt
- at 150% design rate, the moving beam does not reach the full flow stop nut
- at 150% design rate, the LVDT output does not exceed 1.0 V AC.
- the damper piston does not touch the damper cylinder wall at any flow rate
- the LVDT core does not touch the inside of the LVDT at any flow rate
- the viscous damper fluid is free of large air bubbles and the fluid level is correct
- the range spring operates in compression from 0 - 100% flow rate
- the sensing head leaf springs are in good condition

If the test weight linearity test is successful, yet actual material test results are non-linear, ensure there is no air circulation in the housing sensing plate area. If there is no significant air circulation in the flowmeter housing while you are running material, the material flow pattern is probably non-linear.

Non-linear material flow patterns can often be corrected by minor modifications to the material infeed, or upstream piping. Some integrators are equipped with a linearization function to compensate for non-linear material flow patterns. Stand-alone linearizing devices are also available for this purpose.

Electronic linearization should not be used to correct non-linear test weight results.

ILE - 37 Side Mount Outline and Mounting

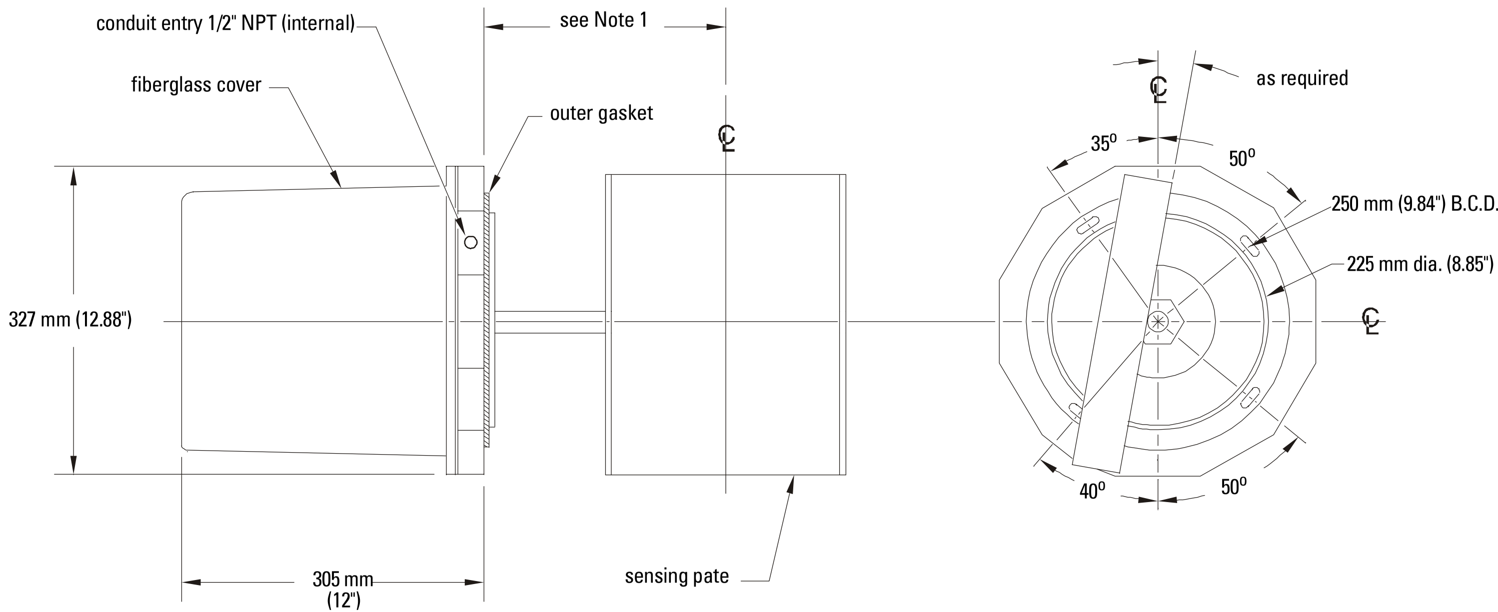
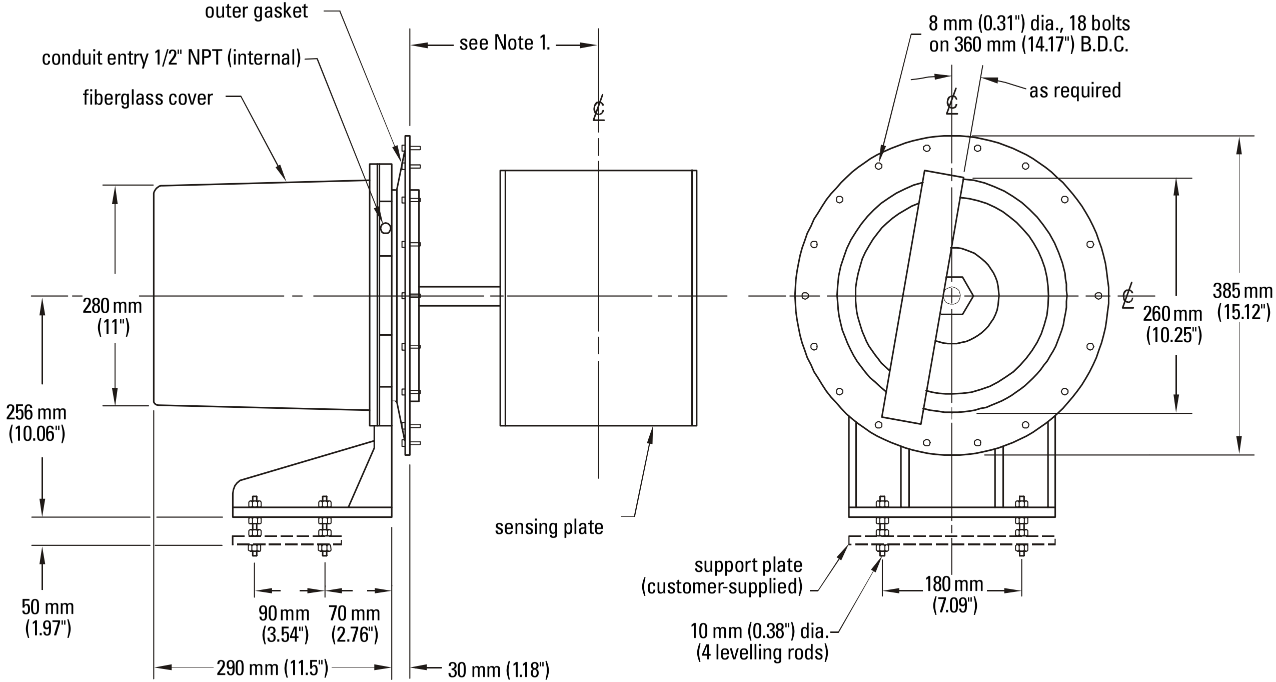


FIG. 1

Notes:

1. Refer to flowmeter drawing for the dimension from the sensing head mounting hole to the flowguide centerline.
2. Ensure that the outer gasket seal to the flowmeter housing wall is dust tight.

ILE - 37 Base Mount Outline and Mounting



Notes:

1. Refer to Flowmeter drawing for the dimension from the sensing head mounting hole to the flowguide centerline.
2. The sensing head support plate should be rigid and independent of the Flowmeter housing.
3. Ensure that the outer gasket seal to the Flowmeter housing wall is dust tight.

FIG. 2

ILE - 37 Part Identification Diagram

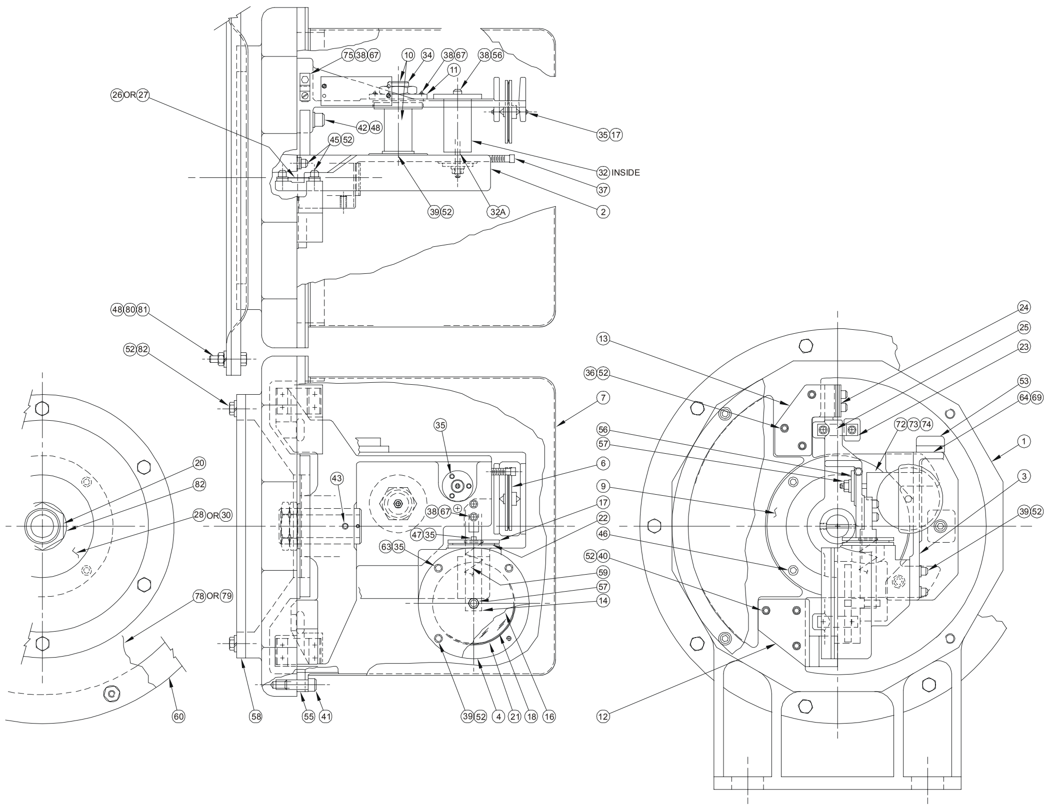


FIG. 3A

ILE - 37 Part Identification Table

Identification #	Description	Identification #	Description
1	ILE-37 body (cast frame) (side mount or base mount)	19	(not applicable)
2	Moving Beam (Dynamic Beam)	20	Bushing Locknut (2)
3	Block (Static Beam)	21	O-Ring, 3 1/4 x 3 1/2 x 1/8
4	Block (Damper Body)	22	O-Ring, 1 3/8 x 1 5/8 x 1/8
5	(not applicable)	23	Hinge Spring Spacer (8)
6	Calibrating Wheel	24	Hinge Spring Spacer (8)
7	Fiberglass Cover	25	Hinge Spring, 0.3mm/25mm (2)
8	(not applicable)	26 or 27	Hinge Spring, 0.55mm/25mm or 1.0mm/25mm (2)
9	Inner Diaphragm Ring	28 or 30	Diaphragm, silicone or neoprene
10	Range Spring	31	(not applicable)
11	Range Spring Adjustment Plate	32	VDT
12	Lower Hinge Block	32A	LVDT Core
13	Upper Hinge Block	33	Pivot Bearing (2)
14	Damper Piston Rod	34	Lock Nut
15	(not applicable)	35	Cap Screw M4 x 12 mm, stainless (6)
16	Damper Window	36	Cap Screw M6 x 40 mm, stainless (3)
17	Damper Cover	37	Cap Screw M4 x 30 mm, stainless (1)
18	Damper Piston	38	Cap Screw M5 x 15 mm, stainless (10)

FIG. 3B

Identification #	Description	Identification #	Description
39	Cap Screw M6 x 20 mm, stainless (7)	61	not applicable)
40	Cap Screw M6 x 30 mm, stainless (3)	62	Teflon Washer
41	Cap Screw M8 x 20 mm, stainless (4)	63	Nut M4, stainless (2)
42	Cap Screw M8 x 30 mm, stainless (3)	64	Split Lock Washer M3, stainless (2)
43	Set Screw (sensing plate) M6 x 20mm, stainless	65	(not applicable)
44	(not applicable)	66	Washer M5, stainless (2)
45	Cap Screw M6 x 16 mm, stainless (12)	67	Split Lock Washer M5, stainless (6)
46	Cap Screw M6 x 12 mm, stainless (4)	68	(not applicable)
47	Lock Washer M4, stainless (2)	69	Cap Screw M3 x 20 mm, stainless (2)
48	Lock Washer M8, stainless (3, add 18 for base mount)	70	O-Ring, 7/16 x 5/8 x 3/32
49 to 51	(not applicable)	71	(not applicable)
52	Lock Washer M6, stainless (24, add 6 for base mount)	72	LVDT Housing
53	Terminal Block	73	LVDT Spring Washer
or 53A	LVDT Conditioner Card	74	LVDT retainer nut Diaphragm, silicone or neoprene
54	(not applicable)	75	Ground Lug
55	Edge Foam Seal	76	(not applicable)
56	Calibrating Flange	77	Lock Nut, Pulley (2)
57	Nut M6, stainless (2)	78 or 79	Outer Gasket, silicone or neoprene
58	Inner Gasket Ring (base mount only)	80	Cap Screw M8 x 35 mm, stainless (18) (base mount only)
59	Damper Spring	81	Nut M8, stainless (18) (base mount only)
60	Outer Gasket Ring (base mount only)	82	Cap Screw M6 x 25 mm, stainless (6) (base mount only)

FIG. 3C

Notes

Notes

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