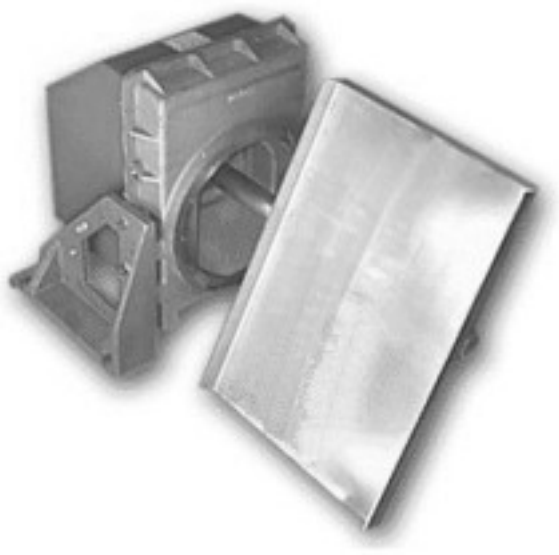
Instruction Manual · September 2003



milltronics

ILE-61

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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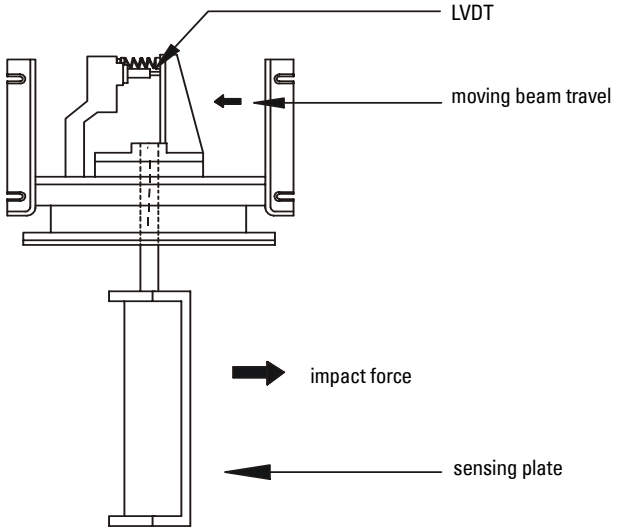
ILE-61 Sensing Head

The Milltronics ILE-61 sensing head is an out-of-process sensing element for A, E, and V 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.



The ILE-61 sensing head is used with Milltronics E-300 (general purpose), A-300 (aerated gravity conveyor), and V-300 (vertical material drop) dry solids flowmeters.

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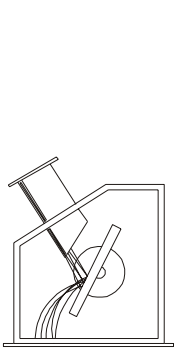
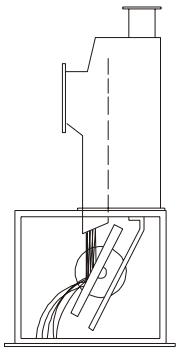
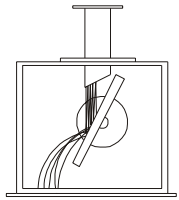

E-300


A-300


V-300

Specifications

Operating Range

- 0 to 20 t/h (0 to 22 STPH) min., 0 to 300 t/h (0 to330 STPH) max.

Product

- fine powder to 25 mm (1")

Product Temperature

- -40 to 232 °C (-40 to 450 °F)

Ambient Temperature

- -40 to 60 °C (-40 to 140 °F)

Accuracy

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

Repeatability

- ± 0.2 %

Range Spring

- selected to suit application

Construction

- dust-tight cast aluminum frame with fiberglass rear cover

Mounting

- base mount

Sensor Type

- LVDT (linear variable differential transformer)

LVDT Excitation

- 2.50 V AC @ 2.9 kHz (supplied by Flowmeter Integrator or LVDT Conditioner Card)

LVDT Output

- 0 - 0.75 V AC @ 2.9 kHz

Damping Fluid

- 10 - 100 cm^2/s (1000 - 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 friction

LVDT Conditioner Card

Power

- ± 5 V DC (typically from Siemens Milltronics integrator)

Ambient Temperature

- –40 to 50 °C (–40 to 122 °F)

Input

- 0 to 1.0 V from LVDT

Output

- 0 to 50 mV to Milltronics SF 500 (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

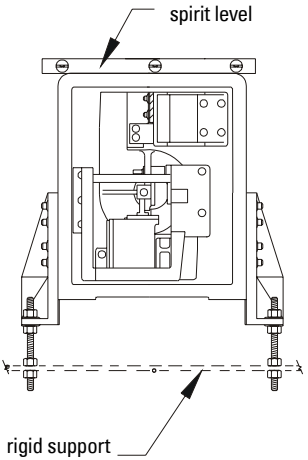
1. Belden is a registered trademark of Belden Wire & Cable Company.

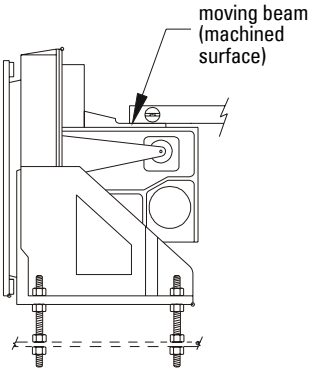
Installation

Sensing Head

1. With the flowmeter housing installed, mount the ILE-61 to a rigid support structure.
2. Remove the ILE-61 fibreglass cover. With the outer gasket in place, bolt the ILE-61 to the housing.
3. Adjust the sensing head leveling hardware (provided) to establish level in both horizontal planes.

Note: Ensure the sensing head mounting structure is capable of supporting the dynamic material impact forces as well as the weight of the sensing head.



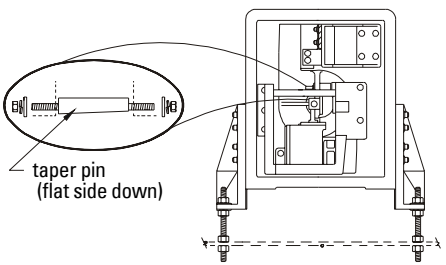


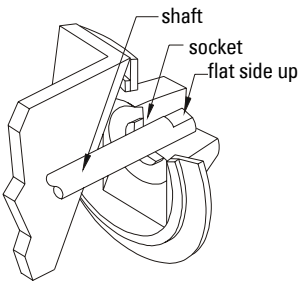
Sensing Plate

1. Open the flowmeter housing access door.
2. With the sensing head cover removed, remove the taper pin.
3. Insert the sensing plate shaft fully into the sensing head socket.

Note: Ensure the sensing plate shaft is installed with the flat side up.

4. Insert the taper pin (flat side down), from the left side.
5. Tighten the right taper pin nut to lock the sensing plate shaft in place.
6. Tighten the left taper pin nut.

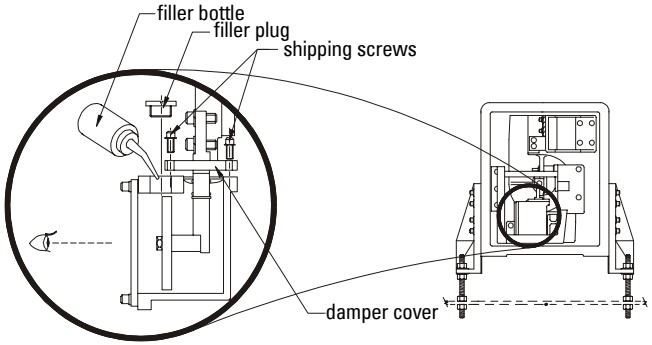




Viscous Damper

1. Remove the 2 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.

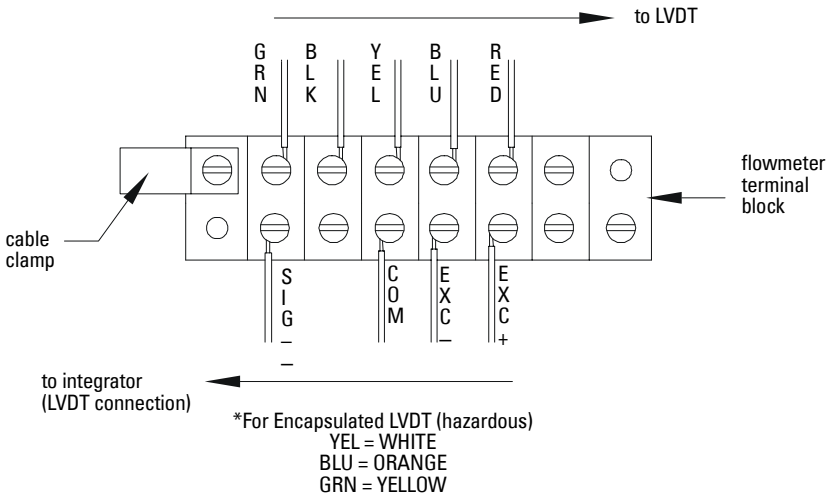
Note: The damper must be full and free of air bubbles with the damper cover in the UP position during flowmeter operation.



Interconnection

Non-Hazardous Unit without LVDT Conditioner Card

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

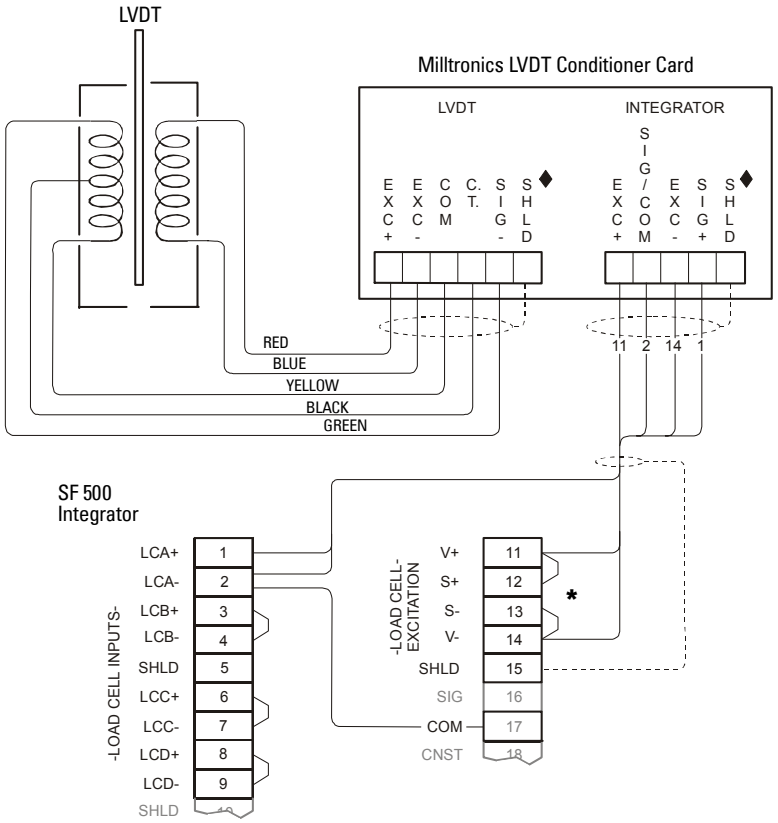


*For Encapsulated LVDT (hazardous)
YEL = WHITE
BLU = ORANGE
GRN = YELLOW

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 Milltronics



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

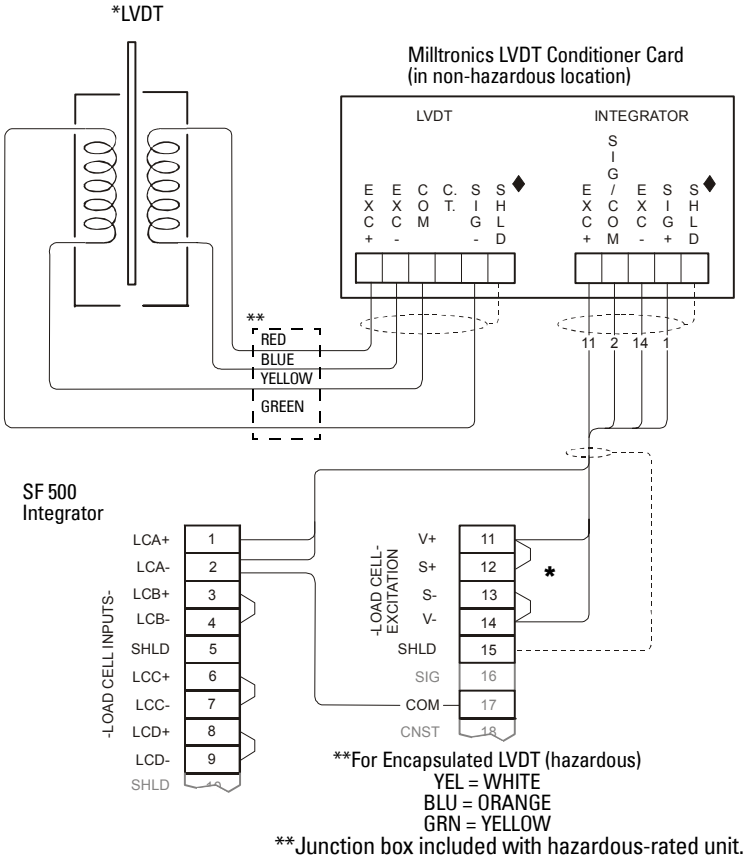
- Remove the jumpers SF 500 terminal 11/12 and 13/14
- Run additional conductors:
  - from SF 500 terminal 12 to conditioner terminal block marked"Integrator +EXC"
  - from SF 500 terminal 13 to conditioner terminal block marked "Integrator –EXC"

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

♦Note:

1. Shields are common, but not grounded to chassis. Run cable shields through SHLD terminals and ground at Integrator only.
2. Ensure that connection between TB 2 and TB 17 is made.

Non-Hazardous and Hazardous Units with Remote-Located LVDT Conditioner Card



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

- Remove the jumpers SF 500 terminal 11/12 and 13/14
- Run additional conductors:
  - from SF 500 terminal 12 to conditioner terminal block marked “Integrator +EXC”
  - from SF 500 terminal 13 to conditioner terminal block marked “Integrator –EXC”

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

♦**Note:**

1. Shields are common, but not grounded to chassis. Run cable shields through SHLD terminals and ground at Integrator only.
2. Ensure that connection between TB 2 and TB 17 is made.

Calibration

General

A test weight is a calibration reference used to simulate a material impact force (test rate) on the flowmeter sensing plate during the integrator 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 designrate.

To determine the test rate produced by a specific test weight...

$$\text{Test Rate (TPH)} = \frac{\text{Test Weight (grams)}}{45^* \text{ grams/ TPH}}$$

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

$$\text{Test Weight (grams)} = \frac{45^* \text{ grams x Test Rate (in TPH)}}{1 \text{ TPH}}$$

*Use **60 grams** for A-300 flowmeters.

e.g. If the test weight used with an E-300 flowmeter is 7000 grams...

$$\text{Test Rate} = \frac{7000 \text{ grams}}{45 \text{ grams/TPH}} = 155 \text{ TPH}$$

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

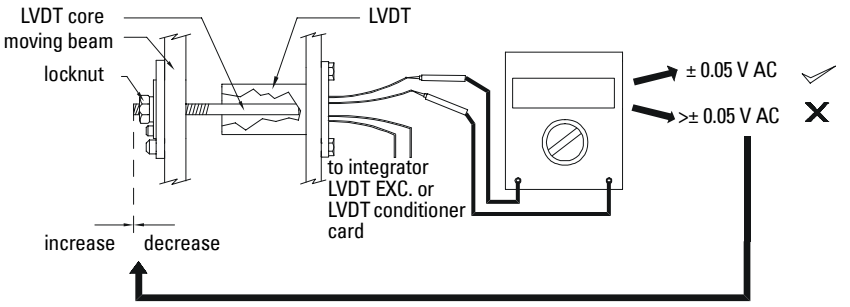
LVDT Output

Zero Adjustment

1. Connect a voltmeter across the LVDT green and yellow (or yellow and white) wires.
2. With no load applied to the sensing plate, observe 0.10 V AC on the voltmeter.

Note: If the LVDT output is 0.10 to 0.05 V AC, skip to span test, otherwise, proceed as follows:

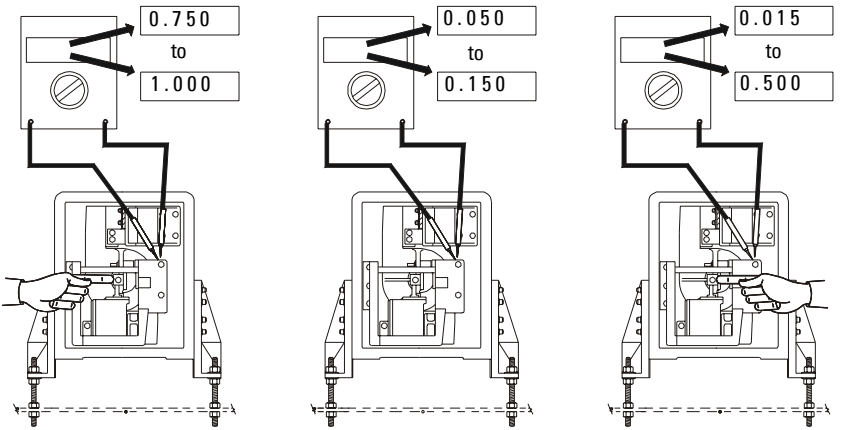
a. Loosen the locknut on the LVDT threaded core.
b. Turn the core in/out of the LVDT until 0.10 to 0.05 V AC is obtained.
c. Tighten the locknut, ensuring the measured value is maintained.



Span Test

1. Gently push the sensing head moving beam to the right. The LVDT output should increase steadily 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 decrease steadily until zero is reached and then increase to 0.25 to 0.50 V AC.
3. Ensure the LVDT output always returns to 0.10 to 0.05 V AC, (on the right hand side of zero), when pressure on the moving beam is released.

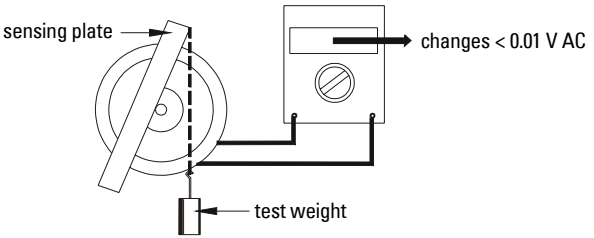
Note: The LVDT core must not contact the inside of the LVDT over the range of core travel. The actual LVDT core travel during this procedure is less than 3 mm (1/8").



Sensing Head Level Test

1. With the voltmeter still connected to the LVDT output, hang the test weight directly off the sensing plate.
2. Observe the display value 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 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 this procedure is performed after the integrator is calibrated, a new integrator zero and span calibration, span adjust, and Factoring (if required) should be performed.



Integrator Calibration

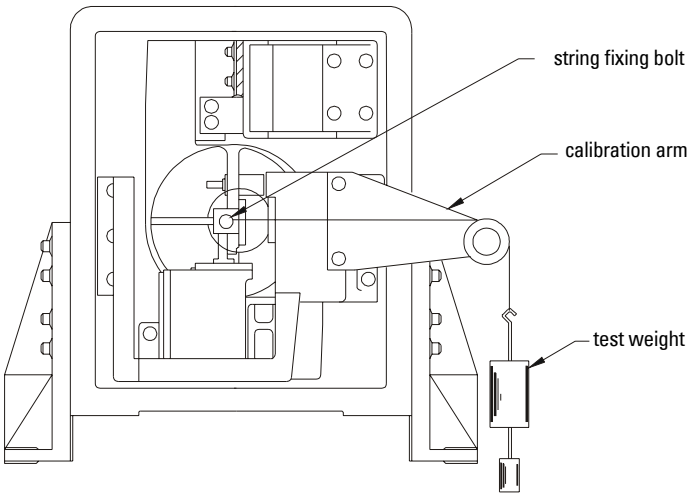
Refer to the flowmeter integrator instruction manual for integrator calibration instructions.

To apply the test weight for the span calibration:

1. Mount the calibration bracket (stored on the left side of the cast frame).
2. Attach one end of a string (monofilament fishing line or fine flexible cable) to the test weight.
3. Route the other end of string over the calibration pulley.
4. Attach the free end of the string to the string fixing bolt. Ensure the string rests in the bolt groove.

Note: Ensure the test weight is suspended free from obstruction.

5. When the calibration is complete, return the calibration bracket to the storage position.



Note: Accurate calibration is not assured until material tests and a span adjust are performed.

Maintenance and Spare Parts

Maintenance

A program of routine maintenance should be established to ensure the highest achievable level of performance is maintained. Good housekeeping practices in the area of the flowmeter are recommended.

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

* Material buildup (if any) in the impact area of the sensing plate should be removed.

Spare Parts

Milltronics recommends a spare inner and outer gasket, sensing plate, and spare damping fluid be kept on hand.

Contact 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.

Inner Gasket Placement

Should it ever be necessary to replace the sensing head inner gasket, refer to the Installation and Figures sections of this instruction manual prior to performing the following procedure.

1. Remove the ILE-61 fibreglass cover, (10 bolts).
2. Bolt down the viscous damper cover to the shipping position, (2 bolts).
3. Remove the sensing plate from the sensing head.
4. Remove the inner retaining ring, (6 bolts).
5. Remove the upper and lower hinge block bolts, (4 per block).
6. a. Hazardous versions, remove the LVDT core and LVDT, (3 bolts), or
   b. Non Hazardous, remove the LVDT cable TY WRAPs (2) and disconnect LVDT connections.
7. While supporting the main assembly, remove the secondary static beam bolts (3 per side).
8. Draw the main assembly away from the main frame.

Note: The main assembly is heavy and awkward to handle; ensure it is supported well.

9. Remove the outer retaining ring and inner gasket, (8 bolts).
10. Install the new inner gasket and reverse the procedure (steps 1 through 9).
11. Perform the LVDT output zero procedure.
12. Referring to the integrator instruction manual, perform an integrator zero and span calibration. Perform a span adjust if calibration accuracy appears affected.

Range Springs

General

The range spring establishes the range of sensing head moving beam travel for a given range of material flow. This spring installed, is selected and positioned 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 by the value of the LVDT green and yellow (or yellow and white) wires.

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

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

Should the design rate of the flowmeter application change, it may be necessary to reposition the original range spring, or select and install another range spring, to obtain the optimum moving beam travel (LVDT output) range. Moving the range spring to a location further away from the pivot point leaf spring, increases the maximum flowrate capacity.

Range Spring Removal

1. Observe the range spring mounting position. (3 positions are available)
2. Loosen the range spring locknut.
3. Remove the range spring center bolt and 4 flange mounting bolts.
4. 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 4 flange mounting bolts.
3. With the moving beam in the static zero position, turn the range spring until the base just touches the beam, and then turn 1 complete revolution more.
4. Install the range spring center bolt and tighten the range spring locknut.

Flowmeter Recalibration

After removing and replacing the range spring, the flowmeter and integrator should be recalibrated.

1. Perform the LVDT output zero procedure. Refer to Calibration.
2. Perform an integrator zero and span calibration. Refer to the integrator manual, Calibration.
3. Perform a span adjust and factoring as required. Refer to the integrator manual, Calibration.

Troubleshooting

Every Millltronics ILE-61 sensing head is subjected to extensive quality assurance procedures to ensure the highest 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 Viscous damper lid in shipping position Integrator not prepared for operation	Refer to Installation\Integrator LVDT Interconnection Refer to Installation/ Viscous Damper 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 Moving beam is mechanically limited Leaf springs are damaged Material flow patterns vary	Refer to Installation and Calibration/Sensing Head Level Test Ensure moving beam does not hit travel stops between -20 % and 150 % flowrates Replace leaf springs, recalibrate flowmeter, and integrator Consult Siemens Milltronics or your distributor
Accuracy varies with material flowrate	Non-linear operation	Refer to Linearity

Linearity

To test linearity, at least 3 test weights are used. Each 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-300 flowmeter Design Rate of 200 TPH, the following three test weights could be used:

- 9000 g (19.82 lb.) = 100% Design Rate = 200 TPH
- 6750 g (14.87 lb.) = 75% Design Rate = 150 TPH
- 4500 g (9.91 lb.) = 50% Design Rate = 100 TPH

If non-linear results are obtained, ensure:

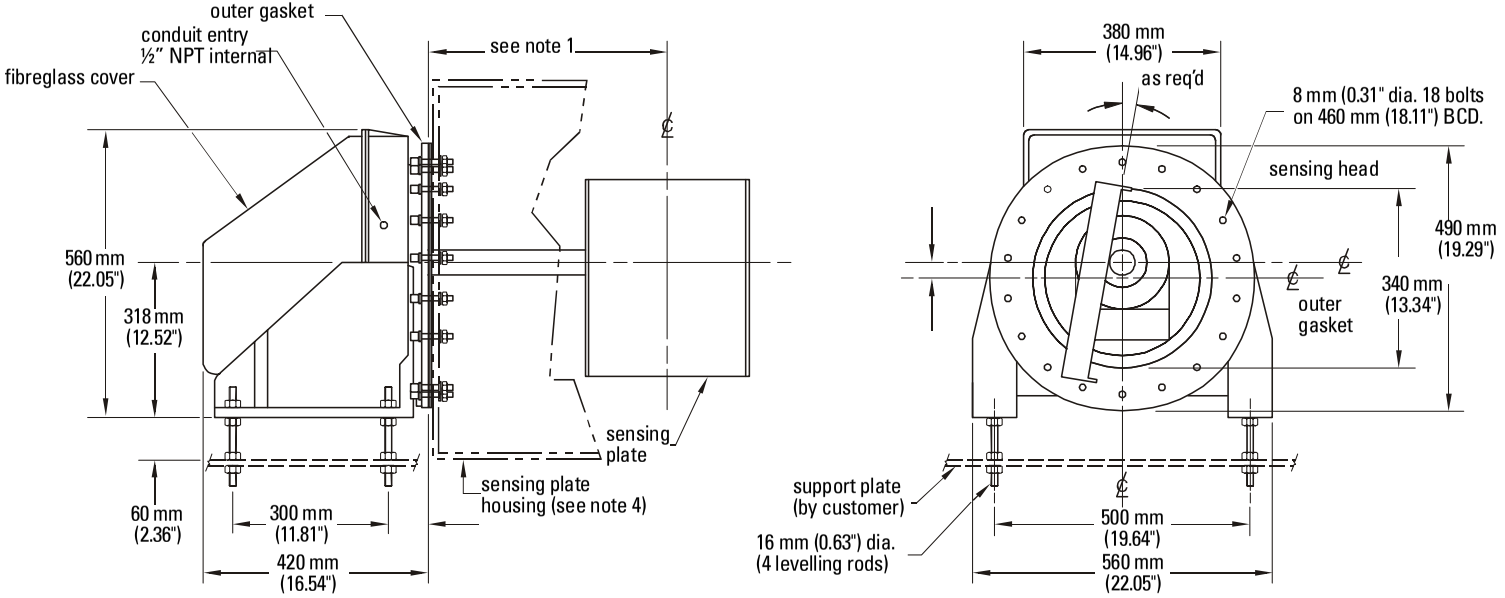
- at no flow, the moving beam does not rest on the zero stop bolt.
- at 150% Design Rate, the moving beam does not reach the full flow stop bolt.
- at 150% Design Rate, the LVDT output does not exceed 1.0 V AC.
- the damper piston does not touch the damper cylinder wall at any flow rate.
- the LVDT core 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 - 150% 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 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.

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

ILE - 61 Sensing Head Outline and Mounting



Notes:

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

ILE - 61 Part Identification Diagram

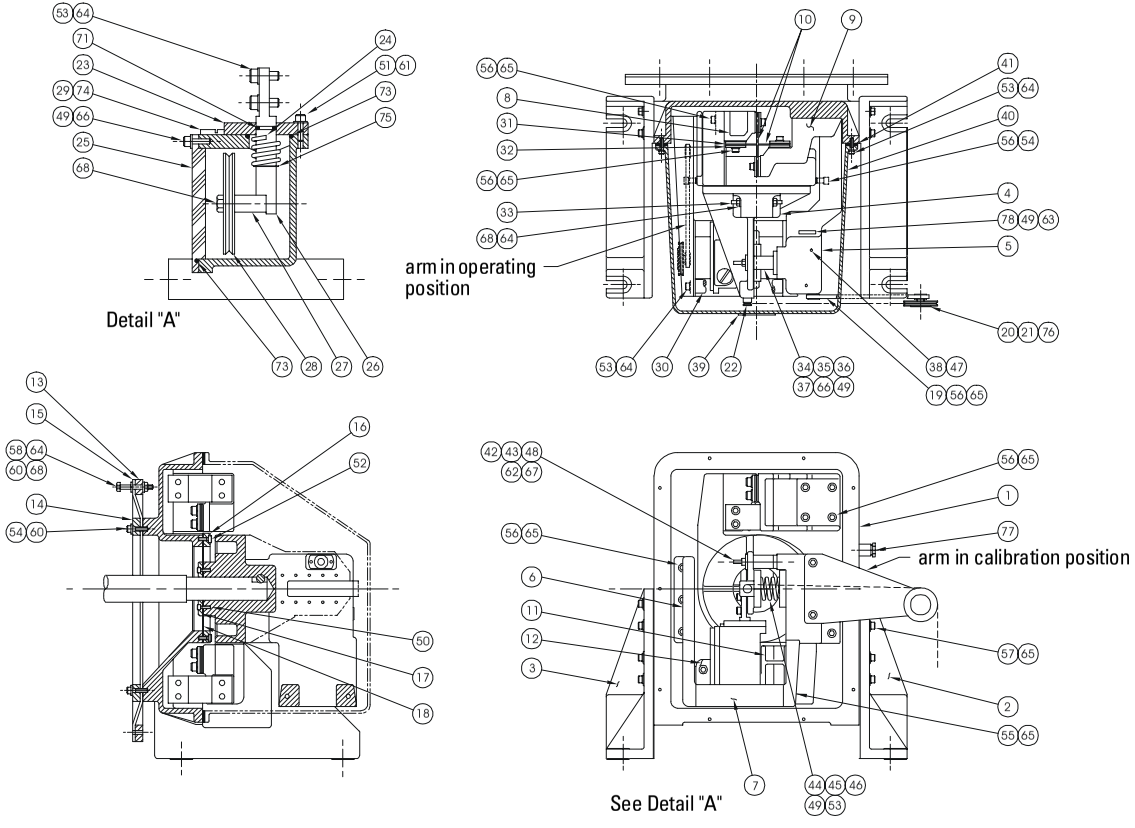


FIG. 3A

ILE - 61 Part Identification Table

Identification #	Description	Identification #	Description
1	ILE-61 body (cast frame)	20	Calibration Pulley
2	Mounting Bracket (RH.)	21	Calibration Pulley Shaft
3	Mounting Bracket (LH.)	22	String Fixing Bolt
4	Dynamic Beam (moving)	23	Damper Cover
5	Static Beam (RH.)	24	Damper Cover Spring
6	Static Beam (LH.)	25	Damper Window
7	Damper Cylinder	26	Damper Shaft
8	Top Inner Leaf Spring Bracket	27	Damper Piston
9	Top Outer Leaf Spring Bracket	28	Damper Piston Shaft
10	Leaf Spring, qty 4	29	Damper Fill Cap
11	Bottom Inner Leaf Spring Bracket	30	Static Beam Stiffening Rod
12	Bottom Outer Leaf Spring Bracket	31	Outer Leaf Spacer (qty 16)
13	Outer Gasket Outer Ring	32	Inner Leaf Spacer (qty 8)
14	Outer Gasket Inner Ring	33	Taper Pin
15	Outer Gasket (silicon or neoprene)	34	LVDT
16	Inner Gasket Outer Retainer	35	LVDT Spring
17	Inner Gasket Inner Retainer	36	LVDT Retainer
18	Inner Gasket	37	LVDT Transformer
19	Calibration Arm	38	Terminal Block (or 38A)

Identification #	Description
38A	LVDT Conditioner Card
39	Nameplate
40	Fibreglass Cover
41	Cover Gasket
42	LVDT Core
43	LVDT Calibrating Flange
44	Range Spring
45	Range Spring Retainer (RH.)
46	Range Spring Retainer (LH.)
47	Cap Screw M3x20, SS, (qty 2)
48	Cap Screw, M4x10, SS, (qty 3)
49	Cap Screw, M5x16, SS304, (qty 11)
50	Cap Screw, M6x12, SS, (qty 6)
51	Cap Screw, M6x20, SS304, (qty 2)
52	Cap Screw, M8x16, SS, (qty 8)
53	Cap Screw, M8x25, SS, (qty 15)
54	Cap Screw, M8x30, SS, (qty 14)
55	Cap Screw, M10x25, SS, (qty 4)
56	Cap Screw, M10x30, SS, (qty 38)
57	Cap Screw, M10x40, SS, (qty 10)
58	Bolt, Hex, M8x45, SS, (qty 18)

Identification #	Description
59	Washer, Elongated, SS, (qty 10)
60	Washer, Flat, M8, SS, (qty 30)
61	Washer, Lock, 6.1mm I.D., SS, (qty 2)
62	Washer, Lock, M4, SS, (qty 3)
63	Washer, Lock, M5, SS, (qty 8)
64	Washer, Lock, M8, SS, (qty 32)
65	Washer, Lock, M10, SS, (qty 52)
66	Washer, Plate, M5, SS, (qty 10)
67	Nut, Hex, M6, SS, (qty 1)
68	Nut, Hex, M8x1.25P, SS, (qty 23)
69	Nut, Lock, RS A, (qty 1)
70	Nut, Lock, RS B, (qty 1)
71	O-Ring, Damper Shaft (qty 1)
72	O-Ring, Damper Window (qty 1)
73	O-Ring, Damper Cover (qty 1)
74	O-Ring, Damper Fill Cap (qty 1)
75	Retaining Ring, Damper Spring (qty 1)

Notes

Notes

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