Quick Startup Guide for Nut Welding Applications

Sensotec Weld SensorGroup • p/n 008-0614-00 rev. -

Overview

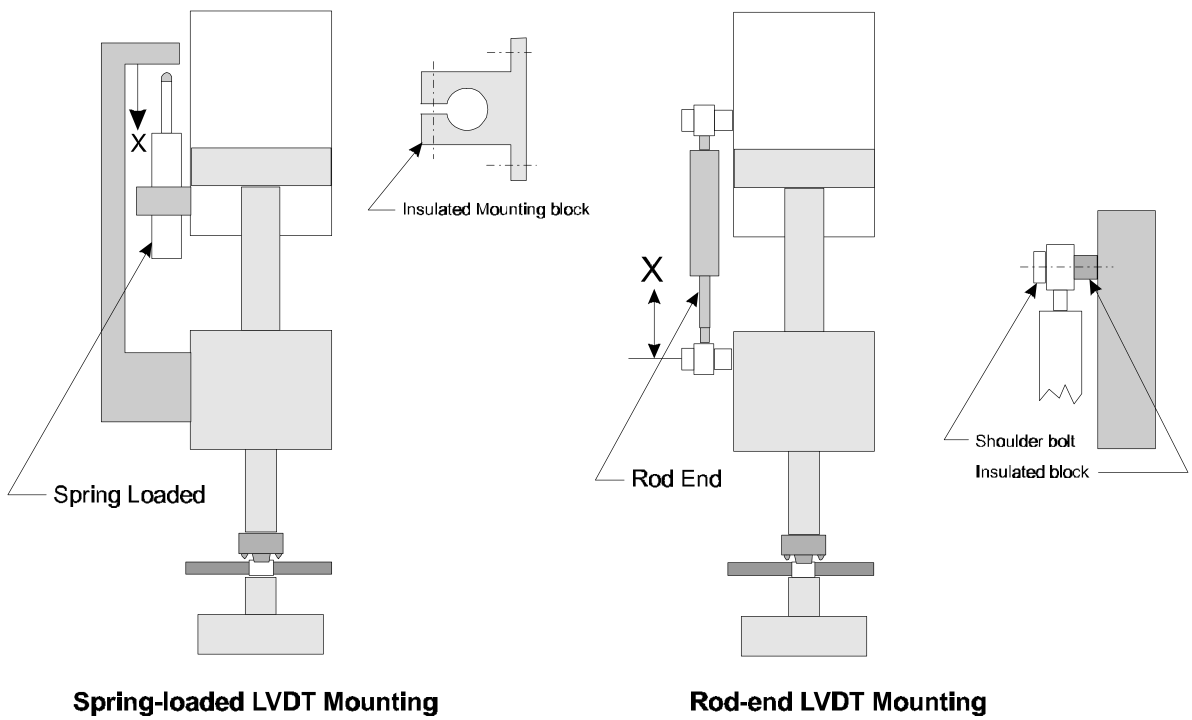
The Sensotec Weld Nut Monitoring and Control system can perform four functions:

- Detect missing nuts
- Detect upside-down or tilted nuts
- Signal fully-retracted cylinder
- Measure weld set-down

The standard equipment used for nut welding applications includes a displacement measuring transducer (LVDT), a WeldMeter, and a relay option cable. There are two common types of LVDTs depending on your application (spring loaded and rod-end).

Installation

Install the LVDT sensor according to the installation sketch below. Be sure the sensor is electrically isolated from any weld current. Piece parts may inadvertently touch the sensor, so isolating both ends is recommended. **Do not use set screws or other sharp-edged clamps for mounting. Do not side load LVDT shafts.**

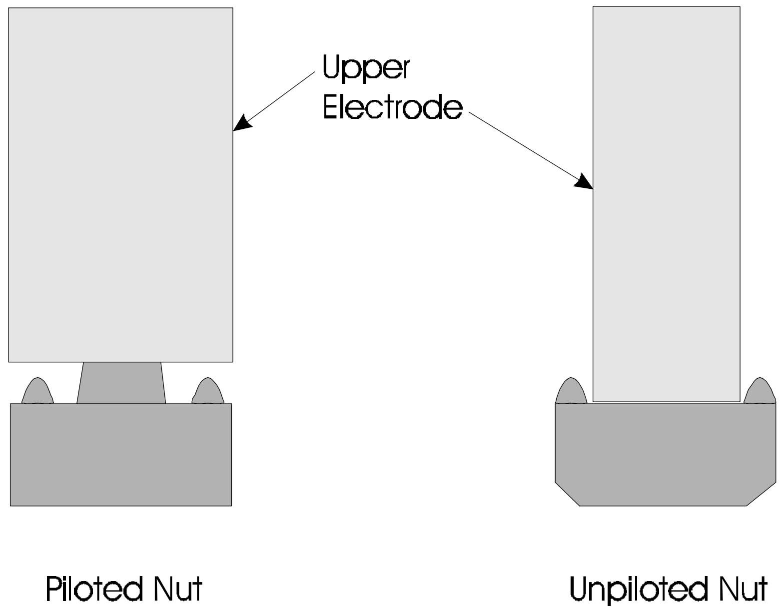


Connect the sensor to the WeldMeter by plugging the connector into the port labled "transducer". Plug the WeldMeter into a 120VAC supply.

Initial Setup

There are two basic types of weld nuts (piloted and unpiloted) and the Sensotec system can work with either. (Projection welded studs are similar in application to unpiloted nuts.)

Install the exact weld tooling you plan to use. Your tooling should include a retractable centering pin to align the nut with the hole in the stamping. If welding a “piloted” nut your electrodes may be larger in diameter than the nuts. If welding an “unpiloted nut” you must select an electrode diameter that transmits adequate force and current to the nut but is small enough to fit inside the projections when the nut is upside down and correctly centered. See sketch below.



Determine the weld force you plan to use. Set the regulator to achieve this weld force and check it with a Sensotec WeldProbe force calibrator.

Bring the weld cylinder down manually under full force so that the electrodes are “face to face”. Some adjustment to the centering pin or the upper electrode may be needed to get the electrode faces flat together.

With the electrodes “face to face” under full force, press the “zero” button on the meter.

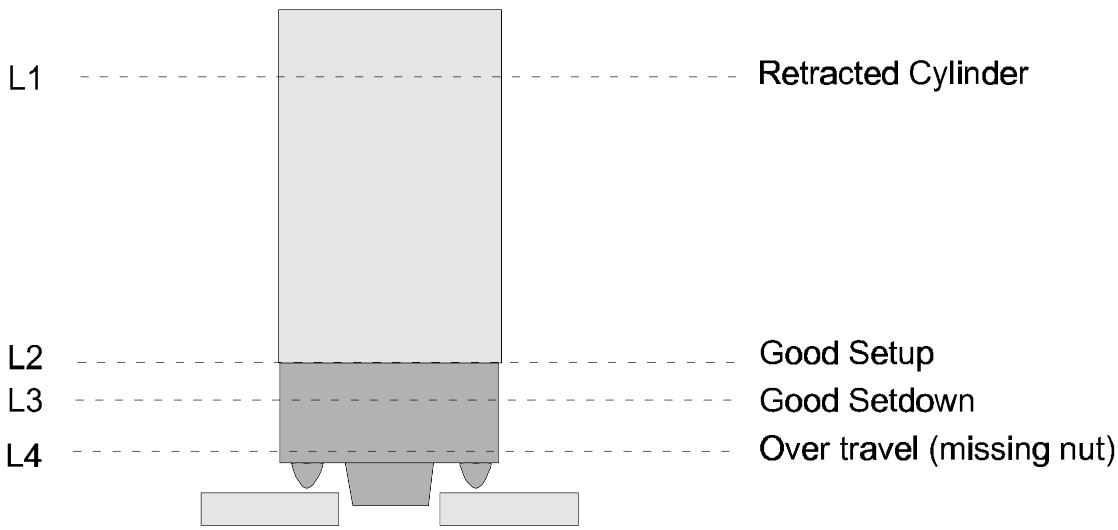
Move the weld cylinder up and down a few times making sure the meter registers “zero” at the bottom of the stroke each time.

> ***Note:*** *Setting the correct “zero” position is very important. Performing this step correctly will insure that you can change or dress electrodes with only a simple “rezero” procedure afterwards. Failing to set a correct zero may result in system malfunction or may require frequent parameter adjustments during operation.*

Look at the meter and determine the range of values displayed during the cylinder stroke. It should be zero at the bottom and some positive value (e.g. 1.345 inch) at the top.

Programming

Review the quick limits programming guide (attached). You'll need to be able to program the meter for the next few steps to set limit values that will trigger the relay outputs to achieve the four functions of the nut checking system. The figure below outlines the four limit positions that you can program.



Summary of Limits (L1 -- L4)

1. Detect a Missing Nut (Limit 4)
Select a low limit (Lo) of 0.100 inch so that that all ram positions lower than this will activate the limit L4 relay and therefore detect a missing nut. Use 0.002 inch for the hysteresis amount.

2. Signal Fully-Retracted Cylinder (Limit 1)
Select a high limit (Hi) with a value approximately 0.100 inch below the uppermost stroke of the ram (and a hysteresis of 0.002 inch). This activates the limit L1 relay to indicate that the ram is in the up and clear position ready for the next weld. This feature can eliminate the need for a micro switch to perform this function.

3. Perform a Dimensional Study for Limits 2 and 3
Obtain 30 fresh nuts and fresh stampings. (Note: fresh parts are important because there is always some amount of cold work (or deformation) of the projections and stampings when placed in a welder under full force conditions. Reusing parts can skew the measurement readings.)

Conduct a dimensional study using the results to set both Limit 2 and 3. For each nut and stamping in place on the lower electrode, bring the head down under full force and manually record the dimension displayed on the meter (setup height). Then make a good weld and record the dimension displayed on the meter after the weld (setdown height).

Calculate the average setup height and determine the range of setup heights. In the following example, average measured setup height = 0.585 inch with a range from 0.583 to 0.587 inch.

Calculate the average setdown height and determine the range of setdown heights. In this example, average measured set-down height = 0.555 inch with a range from 0.552 to 0.558 inch.

Verify that there is no overlap between the setup height range and the set-down height range. In the example above, the maximum set down height is 0.558 inch and the minimum setup height is 0.583 and thus do not overlap at the boundary area.

Using the work sheet attached, establish the tolerance bands required for both setup and set-down values:

a. Select a set point (Set.Pt) equal to the measured average value.
b. Select a deviation (d.tion) value that comfortably includes the measured range defined earlier (+/- 0.005" for this example).

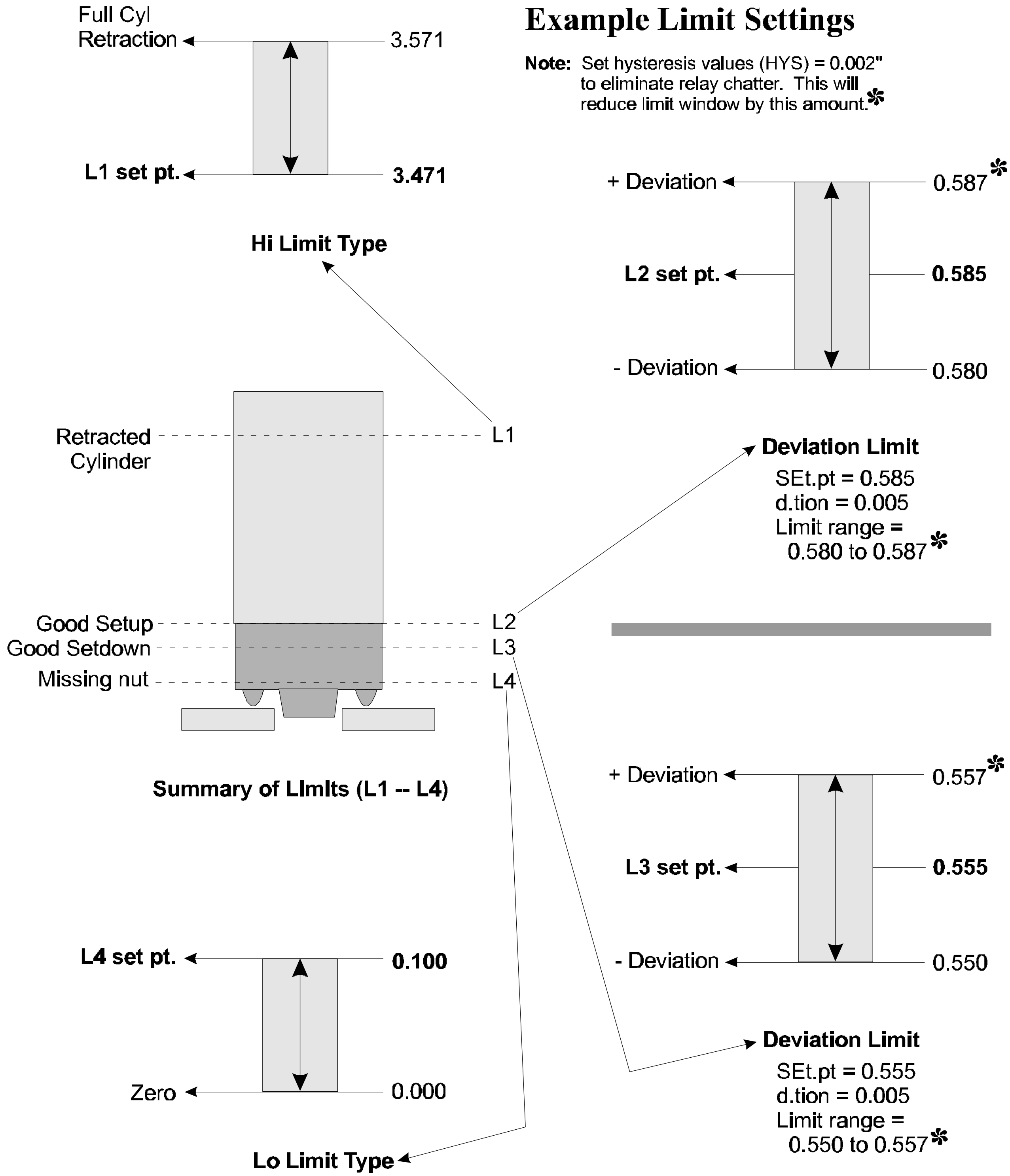
> ***Note:*** *Make sure that the lower range of Limit* 2 *and the upper range of limit 3 do not overlap.*

c. Select a hysteresis (HYS) value (usually 0.002 inch).

> ***Note:*** *The hysteresis value is selected to eliminate relay "chatter" near the outside limit values, but it also reduces the effective limit window and must be accounted for when setting deviation values.*

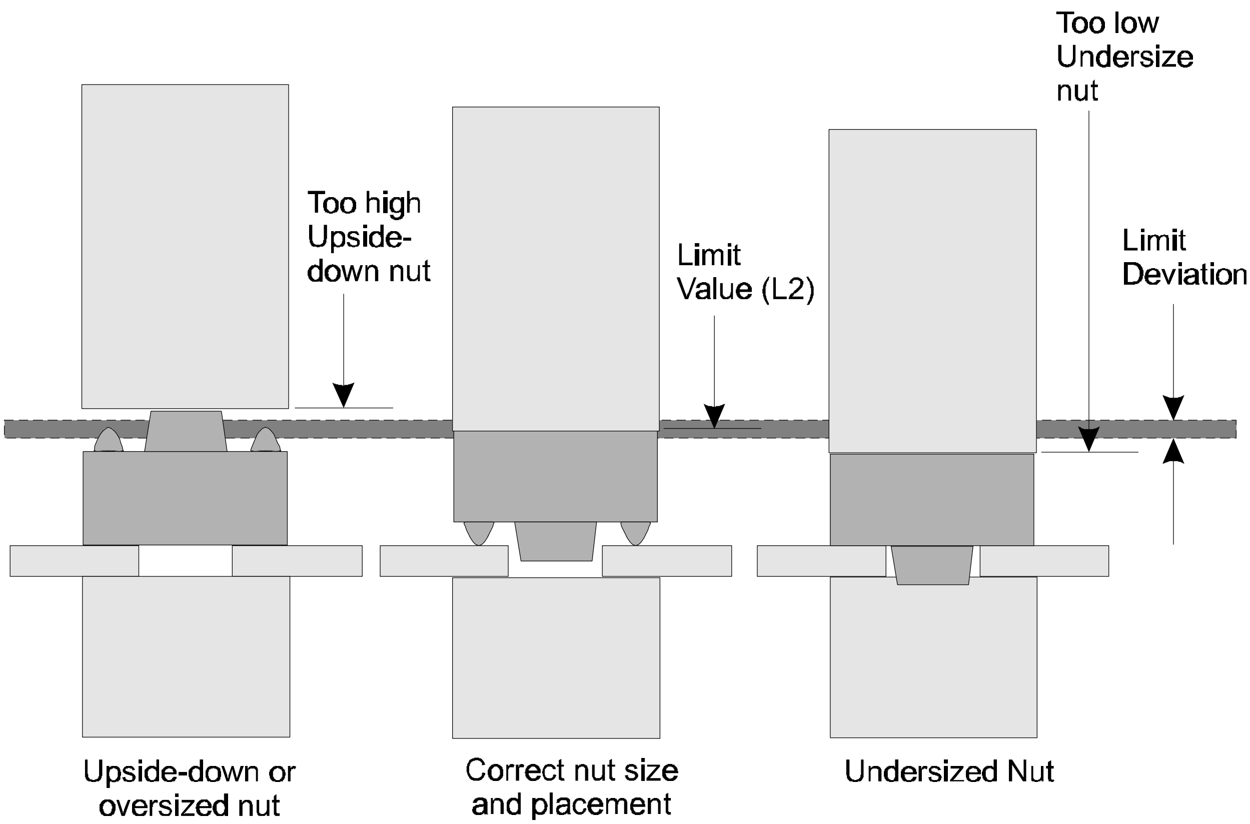
Example Limit Settings

Note: Set hysteresis values (HYS) = 0.002" to eliminate relay chatter. This will reduce limit window by this amount.*



4. Detect Good Setup/Upside-Down Nut (Limit 2)

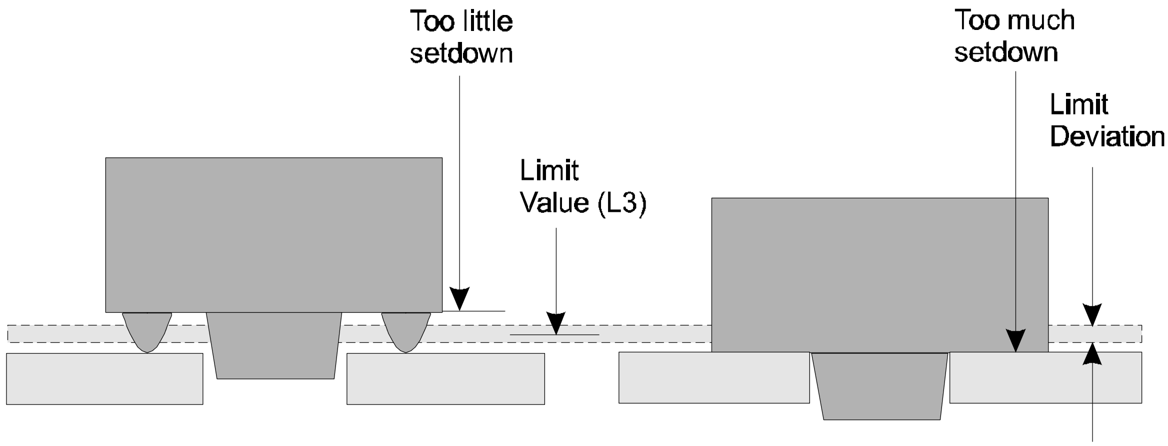
Select the deviation (d.tion) style limit. Use the average set up height as the set point (SEt.Pt). Use a deviation tolerance (d.tion) that overlaps the measured range. Use 0.002inch for the hysteresis (HYS) amount.



Limit 2 -- Correct Setup Height

5. Detect Good Setdown (Limit 3)

Select the deviation (d.tion) style limit. Use the average set down height as the set point (SEt.Pt). Use a deviation tolerance (d.tion) that overlaps the measured range.

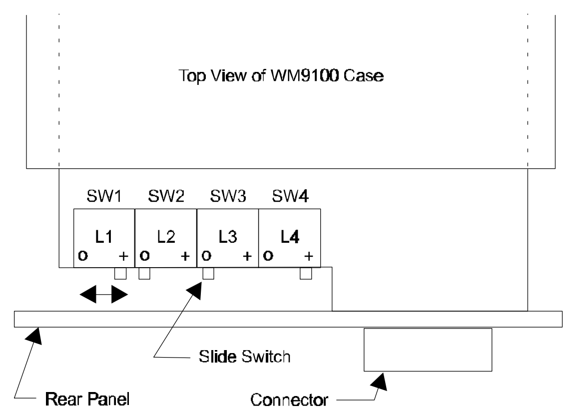


Setdown Summary (Limit 3)

Use 0.002inch for the hysteresis (HYS) amount.

6. Setup Relay Outputs

Refer to the WeldMeter Manual and the drawing to the right.



Adjust the relay contact selection switches in the back of the meter (inside the case):

Relay 1 = NO contacts, (+) right switch pos.
Relay 2 = NC contacts, (0) left switch pos.
Relay 3 = NC contacts, (0) left switch pos.
Relay 4 = NO contacts, (+) right switch pos.

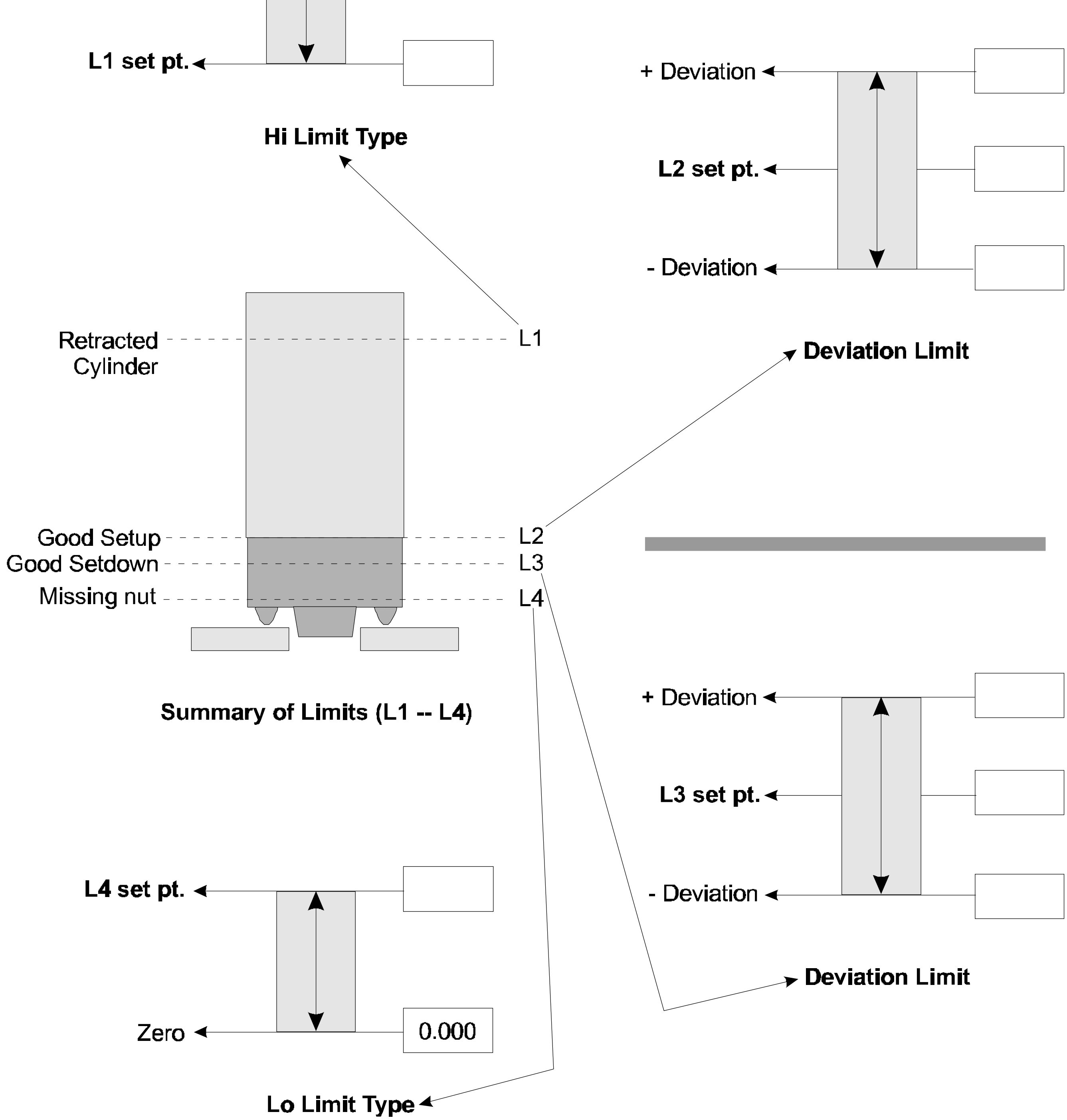
Attach the relay option cable (AW990) to the Weld Meter. The wiring code is:

PIN#	Function	Color
1	Relay 1 (NO/NC)	Red
2	Relay 1 Common	Grey
3	Relay 2 (NO/NC)	Yellow
4	Relay 2 Common	White
5	Relay 3 (NO/NC)	Orange
6	Relay 3 Common	Blue
7	Relay 4 (NO/NC)	Black
8	Relay 4 Common	Brown

If interfacing to a simple weld controller only, series the limit L3 contact into the “pressure switch interlock” circuit on the weld controller. This will insure correct nut placement before welding. If interfacing to a PLC, use each contact Ll, L2, L3, and L4 as a separate input and program your ladder logic according to your required results.

Limit Setting Worksheet

Note: Set hysteresis values (HYS) = 0.002" to eliminate relay chatter. This will reduce limit window by this amount.



WM9100 LIMITS--QUICK PROGRAMMING GUIDE

ACTION	DISPLAY RESPONSE
Power up meter by connecting 120VAC	Startup sequence display = **E725, 1.04, AC-4.00.0.4** Display ends with transducer value = **2.560**
Press and hold SETUP button 1 sec.	**UL1** (user menu for setting limits)
Press ENTER	**00000** (password prompt)
Press ▲	**00001** (default password for menu 1)
Press ENTER 5 times to accept	**Filt** (Please bypass this feature)
Press ▼	**L 1-4**
Press ENTER	**L1** (menu for limit 1)
Press ENTER (or ▲ ▼ for other limits)	**OFF** (or some other previously selected limit type)
Press ▲ or ▼ to choose limit type	**OFF** limit is off all the time **Hi** limit is on when signal is higher than set point **Lo** limit is off when signal is lower than set point **d.tion** limit is on when signal deviates from set point by +/- more than selected deviation amount
Press ENTER to accept	**Funct** flashes and then **n-IP** (or previously set input type)
Press ENTER to accept	**SEt.Pt** flashes then **0.0000** (or previous set-point value)
Press ▲ or ▼ to change first digit	**0.002**
Press ENTER to accept Press ▲ or ▼ to change each digit followed by ENTER to accept	**1.232** (desired set point)
Press ENTER (this selection occurs when **d.tion** type is chosen above)	**d.tion** flashes and then **0.007** (or other previously set deviation value)
Press ▲ or ▼ to change each digit followed by ENTER to accept	**0.007** (deviation value)
After last ENTER	**HYS** flashes, then **0.000** (or previous set hysteresis value)
Press ▲ or ▼ to change each digit followed by ENTER to accept	**0.002** (hysteresis value)
After last ENTER	**LAt-n** (or LAt-Y)
Press ▲or ▼ to select mode	**LAt-n** limit does not latch after being triggered **LAt-Y** limit stays latched after being triggered until reset
Press ENTER to accept	**L2** (or next limit in sequence)
Press RESET	**run**
Press ENTER	**- - - - - -** followed by **0.1234** (actual value of transducer)

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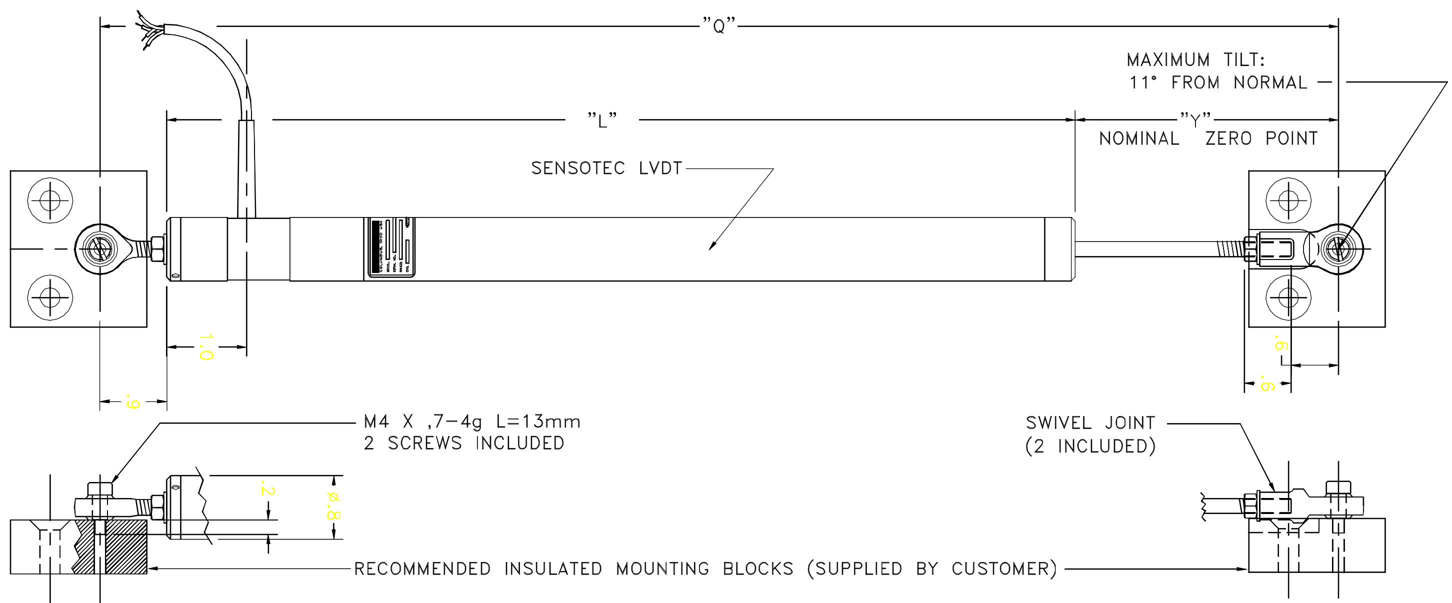

WIRING CODE

RED:	SUPPLY (CALIBRATED @ 3V RMS 5KHz)
YELLOW:	SUPPLY RETURN
BLUE:	OUTPUT
GREEN:	OUTPUT RETURN
BLACK:	SECONDARY CENTER TAP (NO CONNECTION)

SPECIFICATIONS:

SUPPLY VOLTAGE:	1 – 7V RMS @ 2–10 KHz
CALIBRATED SUPPLY:	3V RMS @ 5KHz
LINEARITY:	0.25% (MAXIMUM FULL SCALE ERROR)
TEMPERATURE EFFECT:	
ZERO:	±.006% F.S./°F
SPAN	±.006% F.S./°F
OPERATING TEMPERATURE:	–58°F TO 257°F

ORDER CODE	STROKE	"L"	"Y"	"Q"
AW641HU	0–12.0	25	7.6	25.9
AW641HT	0–8.0	17.8	5.6	18.7
AW641HS	0–6.0	16	5.1	16.9
AW641HR	0–4.0	11.6	3.6	12.5
AW641HQ	0–2.0	7	3.1	7.9
AW641HP	0–1.0	6	2.1	6.9

REV	DESCRIPTION	REVISED BY	APPROVED BY
A	XX-XXX: REVISE ENTIRE DWG. TO INCLUDE MOUNTING BLOCKS	MT 11/14/00	01/03/01

DRW: JWD 09/11/00 | CHK: | MFG: | ENG: NCG 09/13/00

SCALE: NONE
.X ±.1
.XX ±.01
.XXX ±.005
∡ ±1/2°

SENSOTEC INC.
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INSTALLATION DRAWING, AW641 LVDT W/ SWIVEL ASSEMBLIES

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SHEET 1 OF 1

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