



KEY FEATURES

- Rugged Construction
- Aluminium Body
- Long Life
- Excellent Linearity
- Regulated Output Options
- Optional Spring return

APPLICATIONS

- Motorsport control monitoring
- Vehicle and machine controls
- Structural Monitoring

Description

Our Linear Potentiometers are rugged and versatile, made in the United Kingdom.

The conductive plastic element with multi-point wiper gives superior linearity and stability, reducing track-wear and bounce when exposed to vibration or shock.

This manual is to make the user aware of the recommended setup, the characteristics of our devices and as a guide to making the correct choice for a given application.

Contents

Sealing.....	2
Fixings.....	2
Mechanical Set Up	3
Electrical Set Up	4
Spring Advance Sensors	5
Dimensions	6
Drawings.....	7

Sealing

- IP54 – Seal giving the lightest operation but lowest protection.
 Digit 5 = Dust protected at low level. Some debris ingress may occur
 Digit 4 = Protected against occasional water splashes from above
- IP65 – Medium seal giving added protection and with low movement resistance.
 Digit 6 = Dust-tight, no ingress of dust for up to 8 hours
 Digit 5 = Protected against low pressure water jet over a short period
- IP67 – High grade seal giving maximum protection but with higher movement resistance.
 Digit 6 = Dust-tight, no ingress of dust for up to 8 hours
 Digit 7 = Protected from immersion up to 1 metre depth for 30 minutes

Notes:

- Although IP67 gives the better seal, it cannot be used on the MS-19SR range. The spring pressure does not overcome the seal resistance whilst giving smooth movement, therefore MS-19SR has maximum seal rating option of IP65.
- Take care when choosing your seal rating to ensure it is the most suitable for your application, the highest rating is not always the better option as it has greater operational resistance.
- When mounting linear potentiometers in a damp environment or where temperature will fluctuate greatly, it is imperative that the seal faces downwards or at a minimum 90° to vertical. If mounted upwards moisture may seep past the seal over time. (see Figure 1)

Fixings

For drawings see figure 2.

- Rod-end joints (MS-RM): A flexible ball joint in a durable aluminium housing designed to allow small degrees of misalignment. Fixed by a screw through the hole in the ball. Our MS-13 has the option of a length-reduced Rod-end joint to shorten the overall length, designated by MS-13C.
 Plastic rod-ends can be supplied where specific electrical isolation is required. The pop joints also offer this isolation.
- Pop Joints (MS-PJ4): A flexible ball and socket joint with retaining clip with male threaded bar for fitment. Clip can be opened to separate the ball and socket but must be replaced to ensure the joint remains secure.
- Threaded plain end: A male thread on the shaft and optional thread on the rear of the sensor. If not specified, the rear of the sensor has a blanking cap with no thread.
- Body Clamps (DG): Metal “P” shaped clamps with a rubber grip surface designed to secure the main body of the sensor. Not recommended with Rod-ends or Pop Joints and not compatible with sensors with the Sleeve option. (The sleeve travels over the surface that the clamps would fit to.)
- Ball Tips (MS-BT): MS-19 range has a ball tip with female M5 thread to fit to the male thread on the shaft of the sensor.
 - * MS-94 and MS-13 have a ball tip with female M2.5 thread to fit to the male thread on the shaft of the sensor for manufacturing date up to and including 2020.
 - * MS-94 and MS-13 have a ball tip with male M2.5 thread to fit to a female thread cut into the shaft of the sensor for manufacturing date from 2020 onwards.
- Flange Mount: We offer the option of a flange mount fixings for the linear potentiometers which allows the sensor to be mounted through a plate or surface. The Flange comes in lieu of a standard end cap for the sensor therefore is unable to be retro-fitted to an existing sensor. For the sizing details please refer to Figure 3. (3.1 for 9.4mm, 3.2 for 13mm and 3.3 for 19mm) The sensor is supplied with a blank rear end-cap when using the Flange Mount.

Mechanical Set Up

Please refer to Figure 5 for graphical representation.

- The centre of travel coincides with the mid-point of the output range. It is always best (if possible) to make mechanical setup from the central point rather than relying on one end or the other. This can be done using physical measurement, or by relating the electrical output to the mechanical position.
- The end of electrical travel is approximately 1-2mm shorter than the end of the mechanical travel at each end of the sensor; Therefore if you set the start / finish position using the mechanical end-point you may have inaccuracies in your expected output versus your actual output.
- End Stops are only in place to prevent the sensor from coming apart in transit or storage, or to retain the spring on spring advance sensors. These are not to be used as a mechanical end-stop during your test.
- It is always recommended to allow more electrical / mechanical travel on the sensor than is required for your test. In this way the sensor will work about the centre of its range which will give the best results.
- If the mechanical characteristics of the test need to allow movement further than the range of the sensor, there must be a mechanical disconnect between the sensor and the mechanical structure when the sensor range is exceeded. If the sensor is pulled beyond its capability it will become irreparably damaged.
- Cable routing must be such that the cable does not become entangled with mechanical moving parts and must not cause the cable to be pulled tight. Incorrect cable management can result in cable failure / loss of signal. The use of cable-ties is common for this purpose and a small loop of cable at the sensor end is commonly made to allow for compliance in the structure.

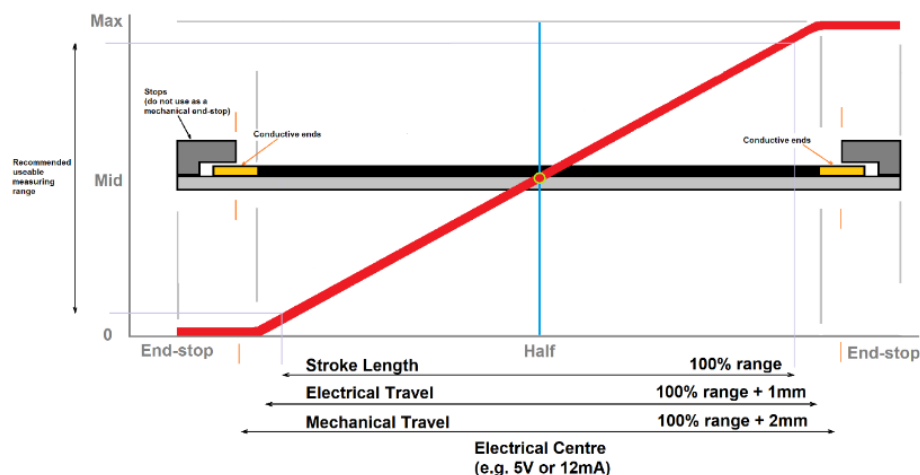


Figure 6

Electrical Set Up

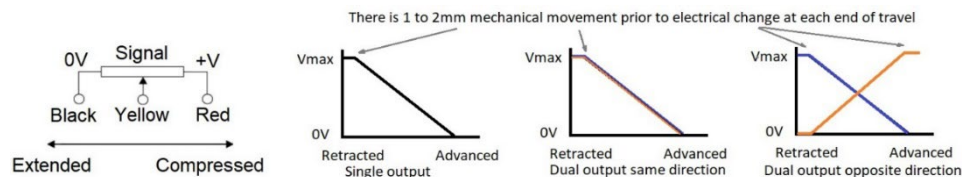
Potentiometric output. (Figure 4.1)

- Potentiometric output is the simplest setup for your linear potentiometer.
- Always connect your potentiometric linear potentiometer as a potential divider.
- Never use the potentiometer as a variable resistor or rheostat, it will draw too much current and overheat.
- The Red and black wires can be reversed in polarity to change the direction of the output. This will not cause any adverse effects in the operation.
- For single output 3 wire cable is used and for dual output 7 wire cable. In the 7 wire cable the green wire is not used.
- Dual output can be configured where both outputs are mirrored, or that one increases as the other decreases. This can be done by reversing the supply and GND wires for the output that requires reversing.

Connect as follows:

NOTE: MS-94 is not available with dual output

Single output	Red	+ Supply
Single output	Black	GND (0V)
Single output	Yellow	Signal
Dual output	Brown	+ Supply
Dual output	Blue	GND (0V)
Dual output	White	Signal
	Green	Not used

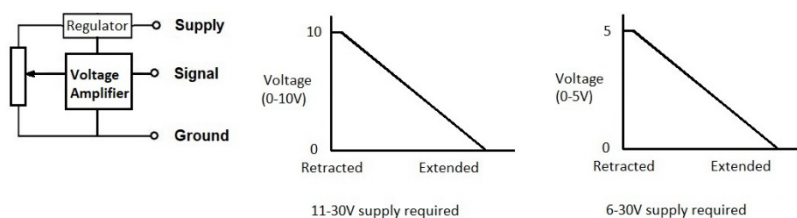


Regulated Voltage output. (figure 4.2)

- Connection for a voltage regulated sensor is the same as for potentiometric. The difference is that the output will not be ratio-metric to the input but over a fixed range of either 0-10V or 0-5V DC over FULL electrical travel.
- The red and black wires must be positive and negative input voltage respectively; they cannot be reversed. If the signal needs to be inverse of "normal" this can be requested from the factory at the point of ordering.
- Dual signal is not available with regulated output in our standard range.

Connect as follows:

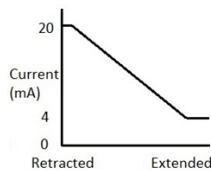
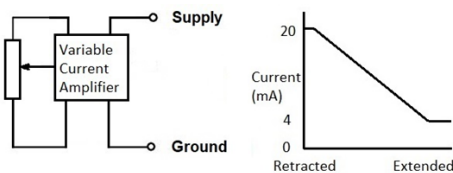
6-30V or 11-30V DC	Red	+ Supply
	Black	GND (0V)
0-5V or 0-10V	Yellow	Signal



Current output 4-20mA (figure 4.3)

- Connection for current output is two wires only. The sensor draws between 4 and 20mA from the power supply depending on the position.
- The Red and Black wires must not be reversed. If the signal needs to be inverse of “normal” this can be requested from the factory at the point of ordering.
- Dual signal is not available with current output in our standard range.

Connect as follows:



8-30V DC	Red	+ Supply
	Black	GND (0V)
	Yellow	Not used

Spring Advance Sensors

- MS-94, MS-13 and MS-19 Linear potentiometers have an option of Spring-advance which can be very beneficial in some applications.
- The MS-94SR and MS-13SR have an externally mounted spring around the shaft with a collar at each end for spring retention
- The MS-19SR has an internally mounted spring

Materials

All external springs are grade 302 Stainless Steel. This helps when in moist environments and is far less susceptible to corrosion compared to spring-steel.

The springs are strong enough to make a good contact with a surface even under vibration conditions. However the MS-19SR is not offered with the IP67 seal because the seal creates more friction than the spring can easily overcome and in tests has shown to give inaccurate results and potentially can lose contact with a surface.

As with all our linear potentiometers it is important to mount them with the body upwards and shaft pointing downwards to allow any moisture to fall away from the seal and spring.

Direction

The spring on our linear potentiometers all push the shaft to the extended position. Therefore applying pressure to the shaft to reduce the measurement length will be against the spring pressure.



NOTE: Standard spring return sensors do not have a varying electrical output in the first 1-2mm of travel, i.e. they will NOT detect the initial point of contact of tip. Custom units can be ordered to give immediate output on contact.

Dimensions

Please refer to the drawings section for reference Figure 1.

MS-94

Dimension Stroke	Standard					
	S	L	D	94M R	94P R	94A R
12.5	14.5	53	3.6	86	98	64.5
25	27	66	3.6	98	110	77.5
50	52	91	3.6	123	135	102.5
75	77	116	3.6	148	160	127.5
100	102	147	3.6	179	191	158.5
125	127	172	3.6	204	216	183.5
150	152	197	3.6	229	241	208.5
175	177	222	3.6	254	266	233.5

Dimension Stroke						
	S	L	D	94SRM R	94SRP R	94SRA R
12.5	14	53	4.9	94	106	76
25	27	66	4.9	120	132	96
50	52	91	4.9	176	188	136
75	77	116	4.9	200	212	176

MS-15

Dimension Stroke					15M R
	S	L	D		
100	102	182	5		248
150	152	232	5		298
200	202	282	5		348

MS-13

Dimension Stroke							
	S	L	D	13M R	13C R	13MP R	13CP R
25	27	107	4	173	142	153	140
50	52	132	4	198	167	178	165
75	77	157	4	223	192	203	190
100	102	182	4	248	217	228	215
125	127	207	4	273	242	253	240
150	152	232	4	298	267	278	254
175	177	257	4	323	-	303	-
200	202	282	4	348	-	328	-
225	227	307	4	373	-	353	-
250	252	282	4	348	-	378	-

Dimension Stroke						
	S	L	D	13SRC R	13SRCP R	13SRA R
25	27	97	7	184.5	184.5	156.5
50	52	122	7	234.5	234.5	201.5
75	77	147	7	284.5	284.5	251.5

MS-19

Dimension Stroke						19M R	19E R
	S	L	D				
25	27	107	6		173	-	-
50	52	132	6		198	-	-
75	77	157	6		223	-	-
100	102	182	6		248	-	-
150	152	232	6		298	-	-
200	202	282	6		348	-	-
250	252	332	6		398	-	-
300	302	382	6		448	-	-
350	352	452	6		-	518	-
400	402	502	6		-	568	-
450	452	552	6		-	618	-

Dimension Stroke						19SRA R	19SRM R
	S	L	D				
50	52	182	5		208	248	
100	102	232	5		258	298	
150	152	332	5		358	398	

Drawings

Figure 1

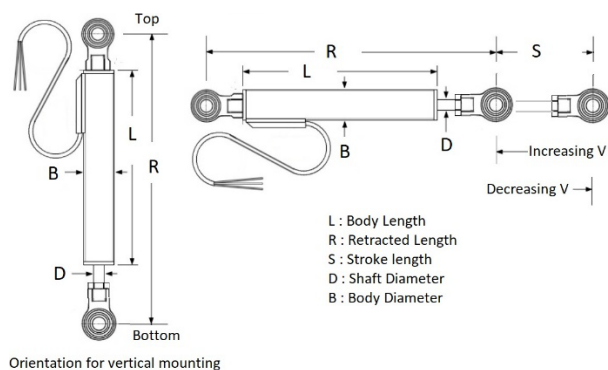


Figure 2

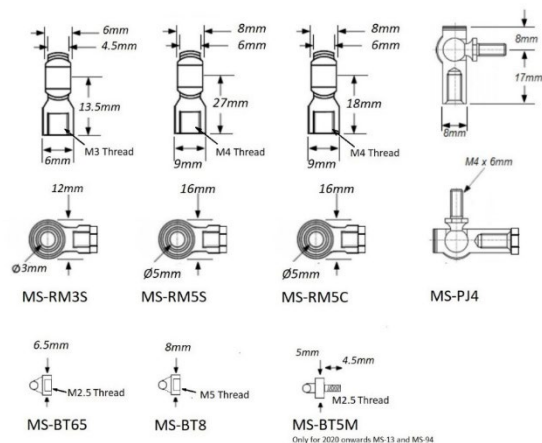


Figure 3

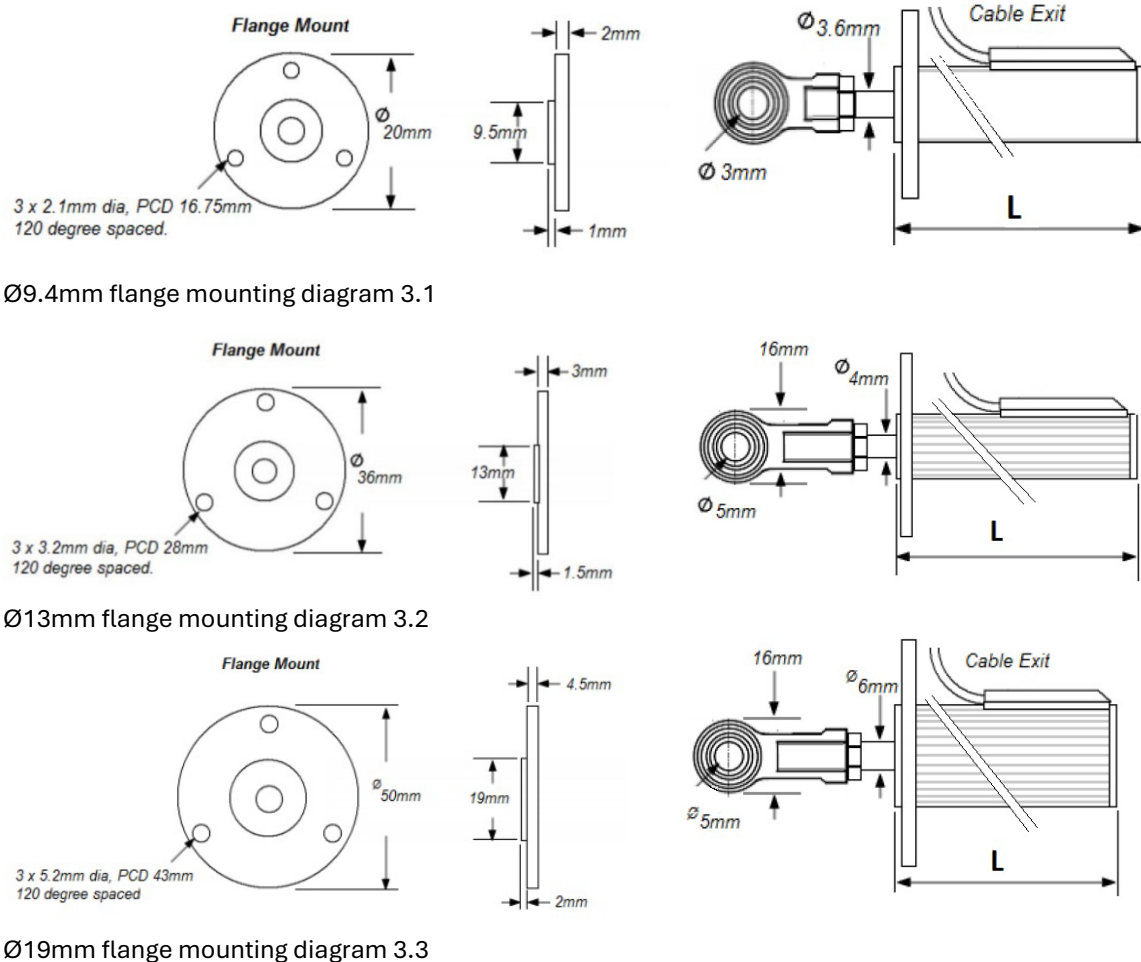
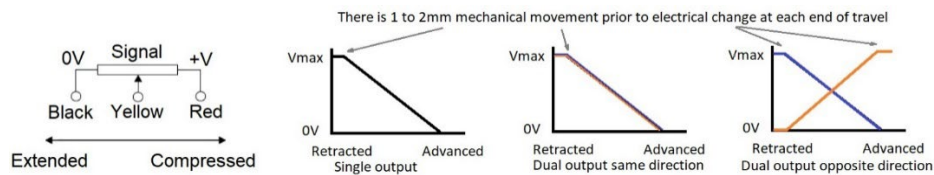
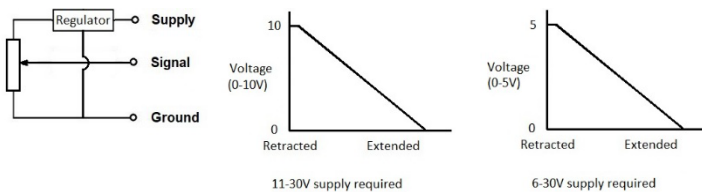


Figure 4
Potentiometric output 4.1



Regulated Voltage output 4.2



Current output 4.3

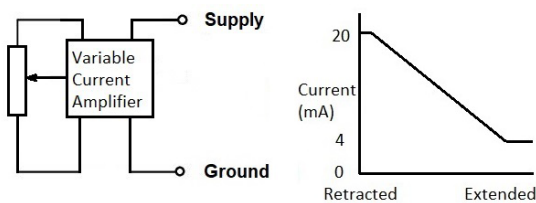
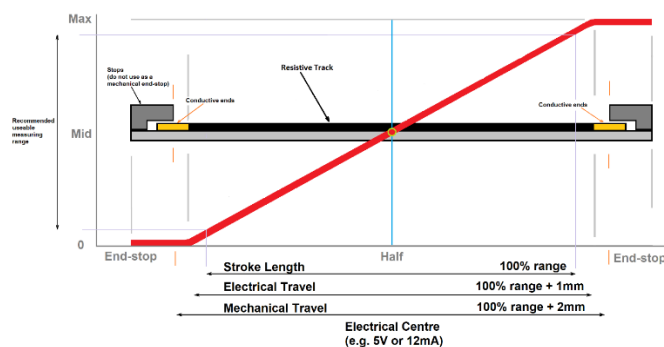


Figure 5



Figure 6



Please note that the electrical output over the sensor operating range (stroke length) is slightly less than the applied voltage.

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