



| SHG & MHG Series Incremental Linear Encoders



INSTALLATION GUIDE

FOR MODELS:
SHG-TT, SHG-TS SHG-PV, SHG-VP, SHG-VS
MHG-TT, MHG-VP

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1.0 INTRODUCTION

This manual will provide mounting instructions for Newall's SHG and MHG Incremental Linear Encoders. It is important that you read and understand this manual prior to beginning the installation.

If at any time during the installation you should have any questions, contact Newall or your local authorised representative.

1.1 Brackets

Due to the variety of machine types and applications, it will be necessary to design, make and fit custom brackets for the encoder assembly. If brackets are needed make certain they are rigid enough not to allow any flexing or distorting while the machine is in operation. Newall offers a variety of bracket kits to aid in the installation. Contact Newall or your local authorised representative for details.

1.2 Preparation

Prior to beginning the installation the machine should be studied to determine where the Encoder(s) will be fitted.

For best results, it is recommended that the Encoder be fitted as close to the machine lead screw or axial drive shaft as possible.

SHG: Overall Length = Travel + 258mm (10.2")

MHG: Overall Length = Travel + 187mm (7.4")

Outboard mounting of the scale support brackets will add approximately 20mm (3/4") to the stated travel. (Refer to Section 11.0)

For a more compact installation, scale travels of 300mm (12") or less may be fitted by supporting one end of the scale only by use of a single end mounting block. (Refer to Figure 6.4 and 6.10)

It is preferred the moving member of the encoder assembly is the Reader Head, the scale can be the moving member but only on certain applications.

Cable routing from the Reader Head should be examined (See Section 7). Extension cables are available in a variety of lengths. Contact Newall or your local authorised representative for further details.

For Encoders larger than 1500mm (60") travel, a setup tube (blank scale) is recommended.

1.3 Warnings

If for any reason the machine axis travel is greater than the actual scale travel it is recommended that 'mechanical stops' are fitted to the machine to avoid damage caused by over travel. Newall will not accept responsibility for Scale and Reader Head damage caused by machine over travel.

Both the Reader Head and the Scale are precision made components and it is important that they are handled with care. By design the Encoders can withstand the rigours of the harsh workshop environment. However, permanent damage can occur through bending or severe impact.

It is important that the Scale be kept at least 13mm (0.5") away from any magnetic bases on indicators or magnetic chucks.

2.0 TECHNICAL SPECIFICATIONS

	TT/TS	PV	VP/VS
Operating Voltage	5VDC \pm 5%	5-28VDC \pm 5%	5VDC \pm 5%
Maximum Power Consumption	<80mA + line receiver requirement	<120mA at 5V	< 300mA
Outputs	5v TTL Differential Quadrature line driver	5 - 28v Differential Quadrature line driver (Vin = Vout)	~ 1Vpp Differential

Construction:

Housing	Aluminium
Cable	6mm (1/4") Fully interlocked Stainless Steel conduit armour 9-way 'D-Type' connector or Flying lead

Dimensions (reader head):

MHG

Height	35.0mm	(1.378")	
Width	75.0mm	(2.953")	
Depth	25.0mm	(0.984")	
Weight	0.640Kg	(1.410lbs)	(max. inc. 3.5m cable)

SHG

Height	53.5mm	(2.106")	
Width	131.0mm	(5.157")	
Depth	28.5mm	(1.112")	
Weight	0.858Kg	(1.890lbs)	(max. inc. 3.5m cable)

Operating Temperature: 0 to 55°C

Storage Temperature: -20 to 70°C

Maximum Output frequency: 2,000,000 counts/sec (2Mhz), 500kHz per channel
(SHG-TT/TS, SHG-PV & MHG-TT)

Maximum cable length: 22m (using Newall supplied cables)

Required Moving Force:

MHG	10N
SHG	20N

Scale Type:

MHG	Carbon Fibre	5.64mm OD	(0.222")
SHG	Stainless Steel	15.24mm OD	(0.600")

Environmental Conditions: IP67 (fully submergible) according to IEC529.
Exceeds NEMA Type 6

EMC Compliance:

BS EN 50081-2 Electromagnetic Compatibility
Generic Emission Standard - Industrial Environment
BS EN 50082-2 Electromagnetic Compatibility
Generic Immunity Standard - Industrial Environment



Certificate No FM36096

NOTE: NEWALL MEASUREMENT SYSTEMS LIMITED RESERVES THE RIGHT TO CHANGE THE SPECIFICATION WITHOUT NOTICE

2.1 CABLE CONNECTIONS

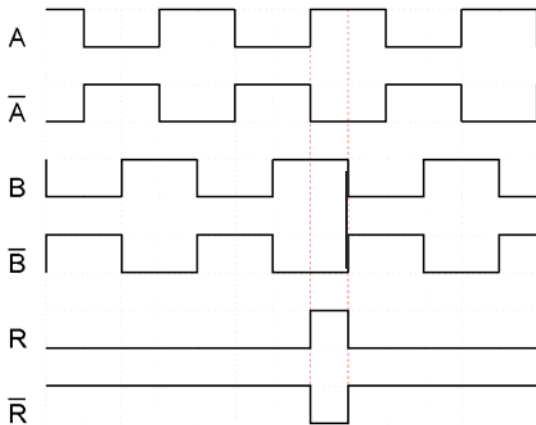
The following pinout details apply to SHG-TT/TS, SHG-PV, MHG-TT

9D Pin #	12B Pin # (Circular IP67)	Core	Function	Colour
1	A	26AWG	N/C (or 0V)	Orange
2	E	26AWG Twisted Pair	Channel A	Green
3	D		Channel /A	Yellow
4	G	26AWG Twisted Pair	Channel B	Blue
5	F		Channel /B	Red
6	B & C	18AWG	0V	White
7	J & K	18AWG	+V	Black
8	H	26AWG Twisted Pair	Channel RM	Violet
9	M		Channel /RM	Grey
Shell	Shell	Overall Braid	Gnd	- - -

Note: Pin 1 (Orange wire) is used during manufacture and should either not be connected or tied to 0V. If a signal is applied to this connection the head will cease to operate.

For SHG-VP/VS and MHG-VP please see 023-80750-3 - SCC 200 Data Sheet

2.2 Index Marker Synchronisation for SHG-TT/TS, SHG-PV and MHG-TT



The Index marker pulse is synchronised to the A and B channel High-High states

Encoder Type	Reference Marker Type	Period
SHG-TT/PV	Periodic	12.7mm (1/2")
SHG-TS	Single	N/A
MHG-TT	Periodic	5mm (0.19685")

The provided reference mark is typically used for machine homing purposes.

2.3 Resolution Options

The SHG-TT, SHG-TS, SHG-PV and MHG-TT are available, to order, with a range of pre-programmed resolutions as shown below.

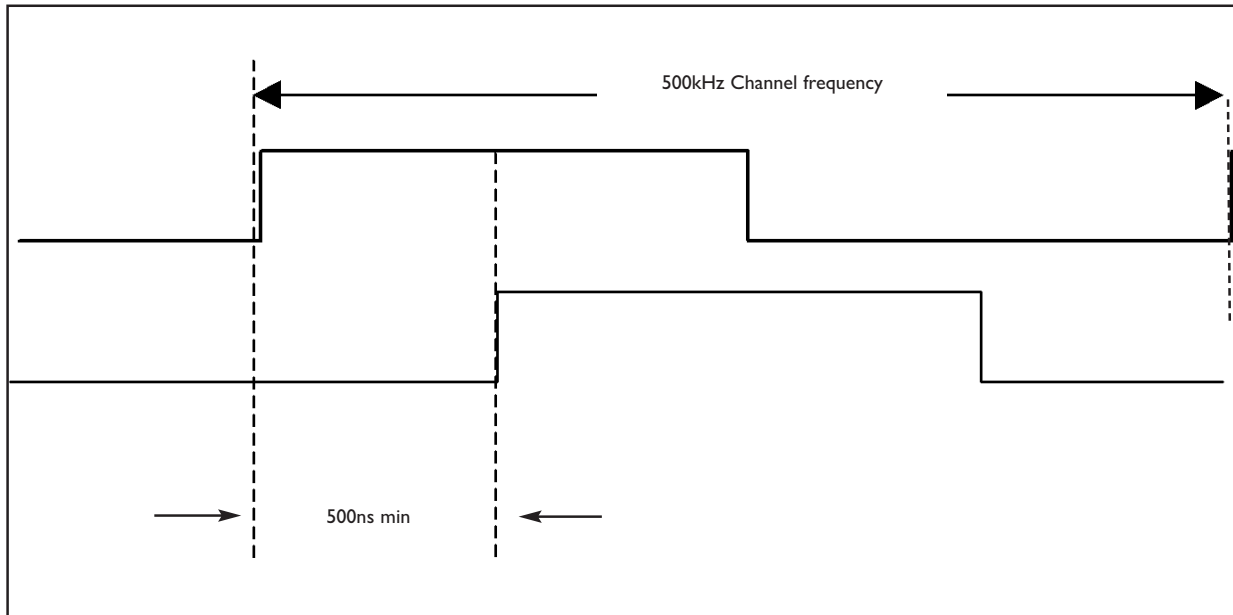
Resolution	SHG-TT/TS/PV	MHG-TT	Count/Inch Post Quadrature
0.2 μ m	X	√	127,000
0.5 μ m	√	√	50,800
1 μ m	√	√	25,400
2 μ m	√	√	12,700
5 μ m	√	√	5,080
10 μ m	√	√	2,540

In addition to the standard resolution options, customised resolution options are available, please contact Newall for further information.

For SHG-VP/VS and MHG-VP please see 023-80750-3 - SCC 200 Data Sheet

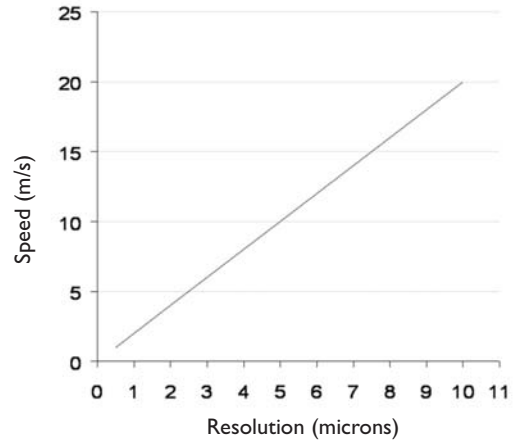
2.4 Maximum Traverse Rates

The SHG-TT, SHG-TS, SHG-PV and MHG-TT encoders have a maximum output rate of 2MHz.



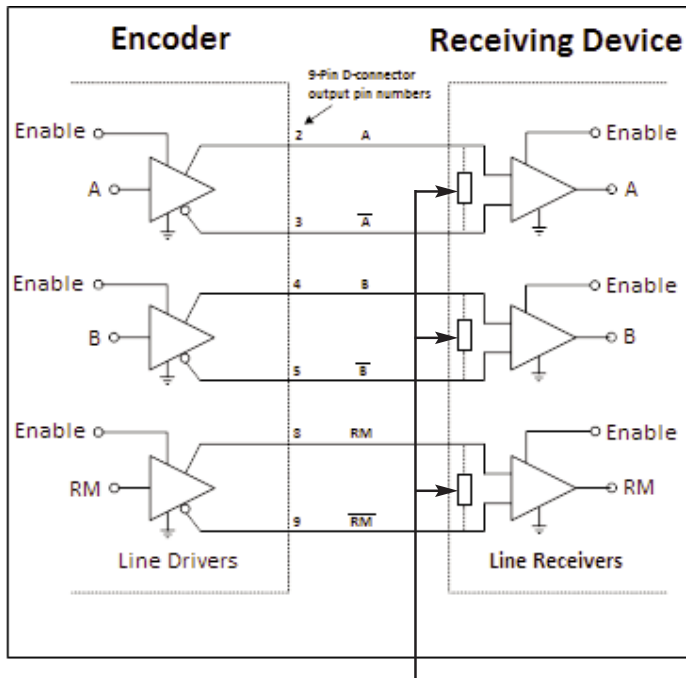
As a result, the maximum speed for a given encoder is proportional to the resolution at which it is operating.

Resolution	Traverse Speed (m/s)	
	SHG-TT/TS/PV	MHG-TT
0.2 μ m	N/A	0.4
0.5 μ m	1.0	1.0
1 μ m	2.0	2.0
2 μ m	4.0	4.0
5 μ m	10.0	10.0
10 μ m	20.0	20.0



For SHG-VP/VS and MHG-VP please see 023-80750-3 - SCC 200 Data Sheet

2.5 Recommended Encoder Connections

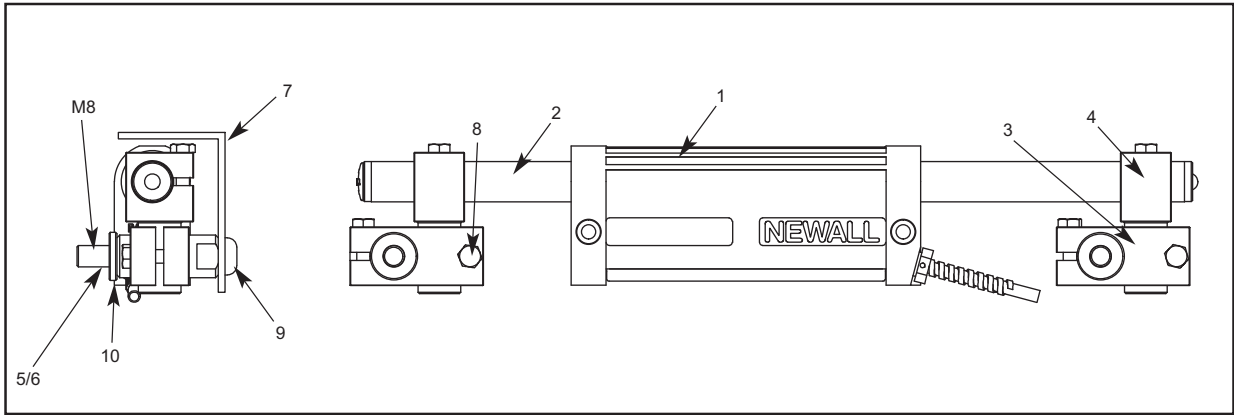


Newall SHG-TT, SHG-TS and MHG-TT encoders provide differential quadrature outputs at RS422 TTL levels.

Note. The cable screen should always be tied to ground.

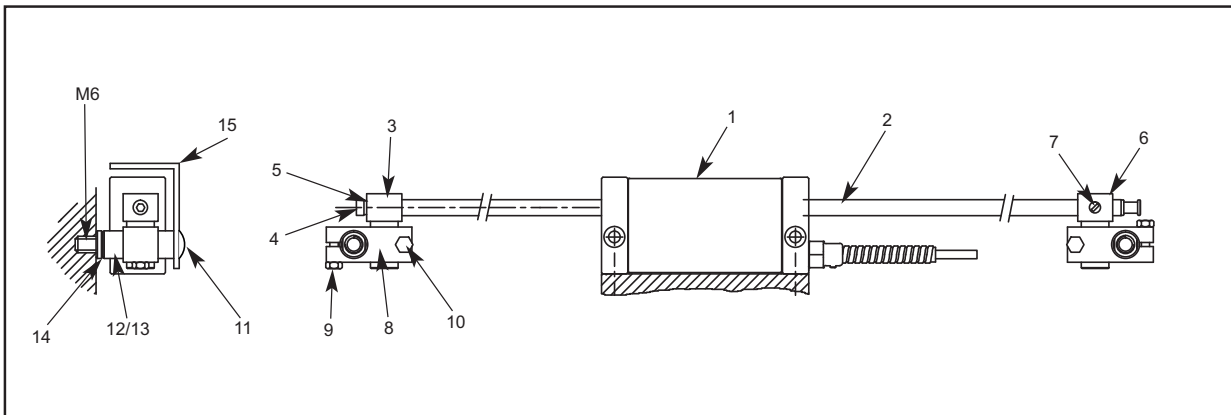
Optional termination resistors (100R - 120R)

3.0 SHG ENCODER ASSEMBLY (<2.5m/100'')



Item	Description	Qty	Item	Description	Qty
1	SHG Reader Head	1	6	Support Pillar Long	2
2	SHG Scale	1	7	Scale Cover	1
3	Scale Support Link	2	8	M5 x 20 Hex Head	6
4	Scale Anchor Pin	2	9	M8 x Socket Button Head	2
5	Support Pillar Short	2	10	Spacer Washer	2

4.0 MHG ENCODER ASSEMBLY



Item	Description	Qty	Item	Description	Qty
1	MHG Reader Head	1	8	Support Link	2
2	MHG Scale	1	9	M3 x 12 Hex Screw	4
3	Scale Anchor pin	1	10	M3 x 12 SHCS	4
4	M3 x 16 SHCS	1	11	M6 x 10 Socket Button Head	2
5	M3 Spring Washer	1	12	Support Pillar Short	2
6	Scale Support Pin	1	13	Support Pillar Long	2
7	M4 x 5 Nylon Set Screw	1	14	Spacer Washer	2
			15	Scale Cover	1

5.0 MOUNTING THE READER HEAD

5.1 SHG

Mount the Reader Head together with its bracket(s) to the machine and secure the assembly parallel with axis travel to within $\pm 0.05\text{mm}$ (0.002"). (Refer to Figure 5.1)

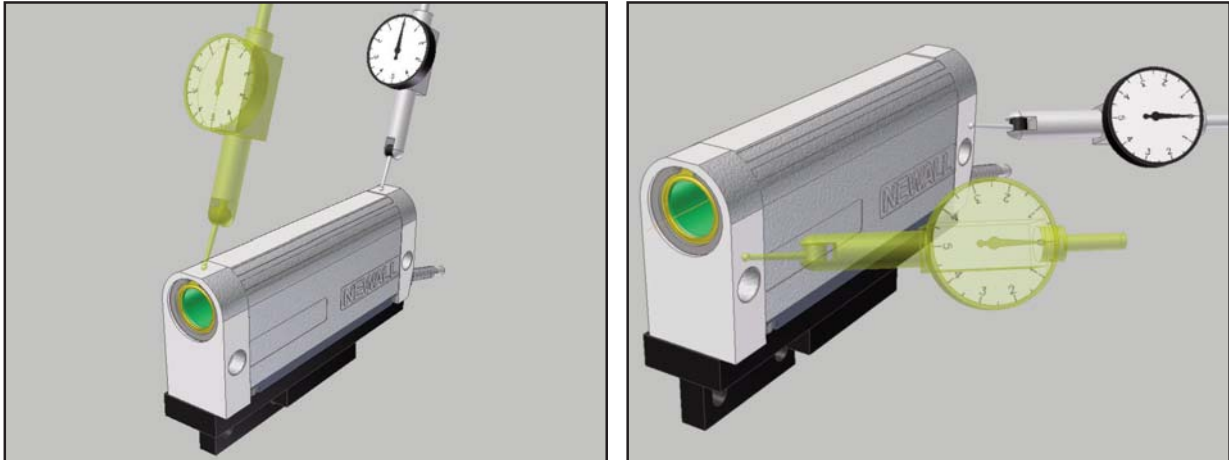


Figure 5.1 - Alignment of the SHG Reader Head

Final adjustments can be carried out by use of laminated shims, which are included with each encoder assembly. Each layer of shim is equivalent to 0.05mm (0.002").

5.2 MHG

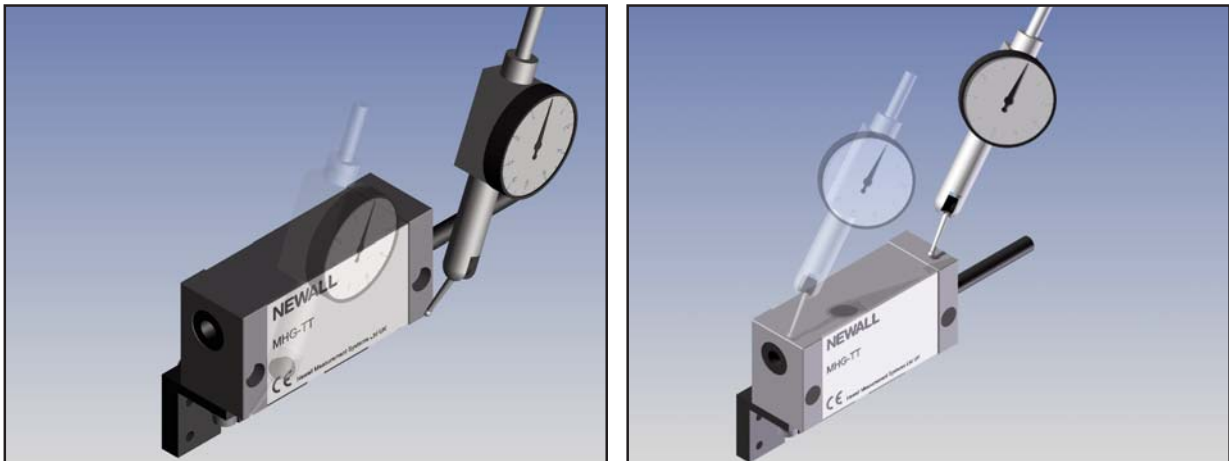


Figure 5.2 - Alignment of the MHG Reader Head

Mount the Reader Head together with its bracket(s) to the machine and secure the assembly parallel with axis travel to within 0.05mm (0.002"). (Refer to Figure 5.2)

6.0 MOUNTING THE SCALE

6.1 SHG

6.1.1 Double End Mounting

Note: Refer to section 6.1.3 for mounting scales in excess of 2.5m / 100”.

Each end of the SHG Scale is different and can be identified by the Newall end cap at the 'tensioner end' and a nylon snap rivet at the 'fixed end'.

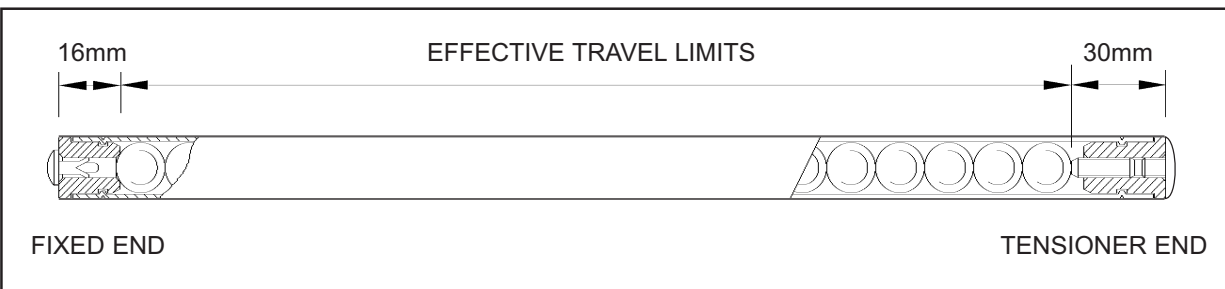


Figure 6.1 - SHG Scale

NOTES:

- (A) Erroneous readings will occur if the Reader Head is allowed to travel beyond the Effective Travel Limits. (Refer to Figure 6.1)
- (B) The pre-load on the balls are factory set via the set screw at the tensioner end. Do not tamper with or adjust the set screw as this will alter the calibration and accuracy specification of the scale. (Refer to Figure 6.1)

Once the Reader Head is secured and correctly aligned, the scale support brackets can now be fitted. The scale support brackets consist of the support pin, the support link and the pillar(s).

Traverse the machine to its maximum position toward the non-cable entry side of the Reader Head. Maximum position means all available travel, including hand winding past any electrical limits or trip dogs.

Carefully slide the blank scale (or SHG scale if less than 1500mm (60") travel), allowing for a sufficient amount of scale to project from the Reader Head in order to fit the scale support brackets.

Assemble the scale support link to the scale support pin leaving approximately 3mm (1/8") gap between the bottom of the pin shoulder and the top of the link.

Slide the link/pin assembly onto the scale to approximately 5mm (0.2") away from the end of the Reader Head.

Transfer punch through the support link and into the machine casting. It is important that the support link is kept square to its mounting surface at all times.

Remove the link/pin assembly and the scale from the Reader Head. Drill and tap M8 x 18mm deep into the machine casting as marked by the transfer punch. Fit the pillar(s) to the machine casting by using one of the methods shown in Figure 6.3. The pillar should fit square and flush to the machine surface.

A maximum of two support pillars may be screwed together to allow for sufficient adjustment of the scale. If two pillars are insufficient to enable the scale to be mounted, then additional brackets will be necessary. These brackets must be sufficiently rigid to eliminate any axial movement of the scale.

Loosely fit the support link/pin assembly onto the pillar and pass the scale through the Reader Head and into the support pin. While gently sliding the scale forward and back 25 - 50mm (1" - 2") through the support pin, carefully tighten the hex screws on the support link, ensuring that the scale slides smoothly through the Reader Head and into the support pin. If any interference is detected then fully loosen the hex screws on the support link and repeat this step.

Note: Do not force the Scale through the Support Pin

IMPORTANT WARNING:
 THE CENTRE LINE BORE OF THE READER HEAD MUST BE IN DIRECT ALIGNMENT WITH THE CENTRE LINE BORE OF THE SUPPORT PIN. PERMANENT DAMAGE TO SCALE AND/OR ERRONEOUS READER WILL OCCUR IF THIS WARNING IS NOT FOLLOWED. REFER TO FIGURE 5.2

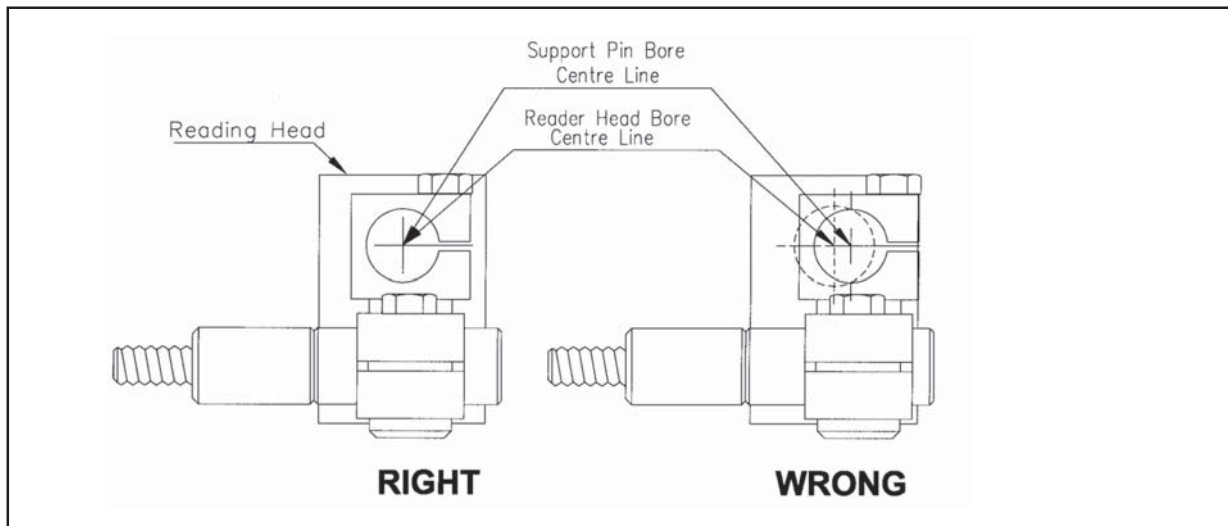


Figure 6.2 - Reader Head and Bracket Alignment

Remove the scale from the Reader Head and traverse the machine to its full extent in the **opposite direction**. Full extent means hand winding past electrical limits.

Assemble the scale support link to the scale support pin leaving approximately 3mm (1/8") gap between the bottom of the pin shoulder and the top of the link.

Slide the link/pin assembly onto the scale making certain that there is sufficient clearance between the Reader Head and the support link to prevent damage to the Reader Head cable. Do not secure the support pin to the scale at this time.

Transfer punch through the support link and into the machine casting. It is important that the support link be kept square to its mounting surface at all times.

Mounting the Scale

Remove the link/pin assembly and the scale from the Reader Head. Drill and tap M8 x 18mm deep into the machine casting as marked by the transfer punch. Fit the pillar(s) to the machine casting by using one of the methods shown in figure 6.3. The pillar shoulder fits square and flush to the machine surface.

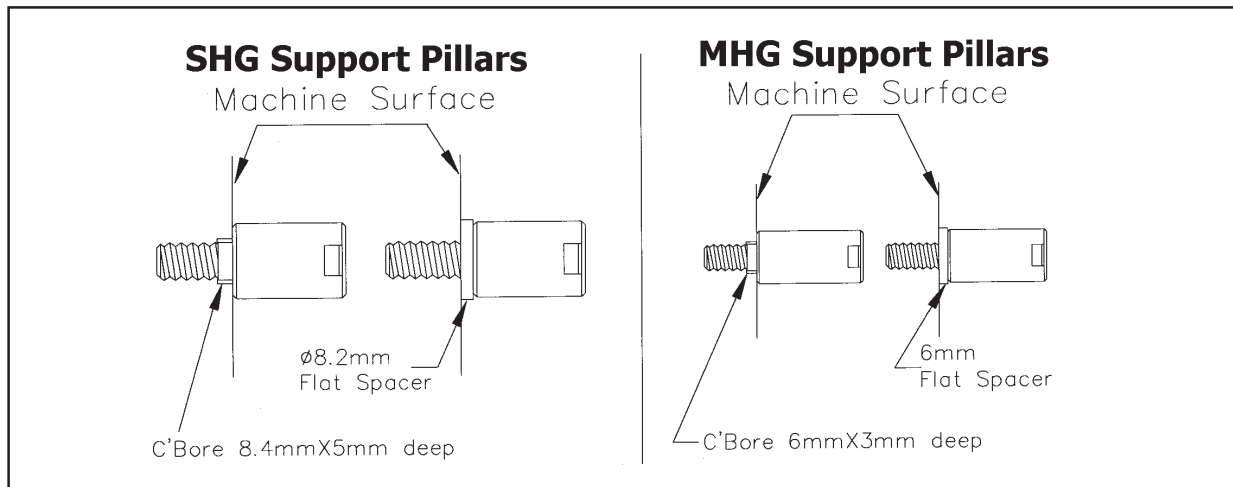


Figure 6.3 - Support Pillars

A maximum of two support pillars may be screwed together to allow for sufficient adjustment of the scale. If two pillars are insufficient to enable the scale to be mounted, then additional brackets will be necessary. These brackets must be sufficiently rigid to eliminate any axial or radial movement of the scale.

Loosely fit the support link/pin assembly onto the pillar and pass the scale through the Reader Head and into the support pin. While gently sliding the scale forward and back 25 - 50mm (1" - 2") through the support pin, carefully tighten the hex screws on the support link, ensuring that the scale slides smoothly through the Reader Head and into the support pin. If any interference is detected then fully loosen the hex screws on the support link and repeat this step.

Repeat the above steps at the other end of the machine. Then carefully slide the SHG Scale through the support pin, through the Reader Head and into the opposite support pin. Tighten the hex screws on the anchor pins.

6.1.2 Single End Mounting

Note: The maximum total length of the scale must not exceed 610mm (24") when using a single end mounting kit. The single end mounting kit is sold separately, ask for part number 600-63610.

Remove the white rivet from the fixed end of the scale, by prying out with a straight edge screwdriver/tool.

After the Reader Head has been installed slide the scale through the Reader Head and insert the fixed end of the scale into the single end mounting block. (Refer to Figure 6.4)

Once the position for the single end mounting block has been determined mark the machine casting using the slot in the mounting block as the guide. Drill and tap M6 x 12mm deep. Fit the mounting block using the M6 socket head cap screw and washer.

Check the alignment by gently sliding the scale through the head and in and out of the mounting block, adjustments may be carried out by altering the M5 jacking screws. When the alignment is complete secure the scale by inserting the M5 screw and washer through the mounting block and into the fixed end of the scale.

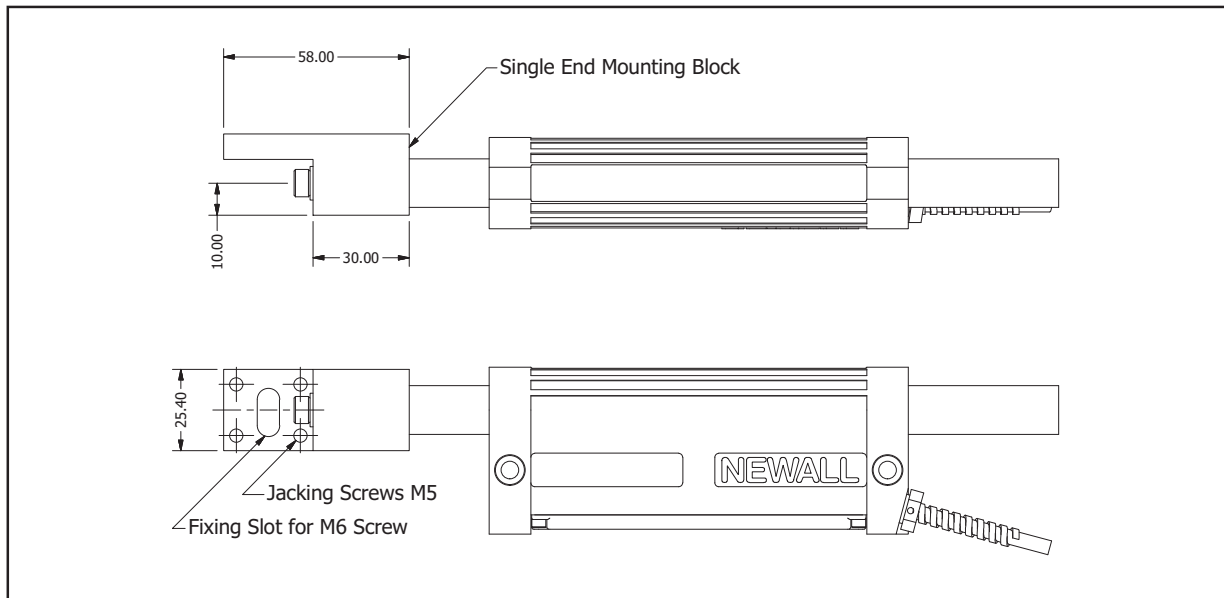


Figure 6.4 - SHG Single End Mounting

6.1.3 Scales in Excess of 2.5 Metres (100")

Traverse the machine to fullest extent of travel including hand winding past any electrical limits or trip dogs.

Insert the short blank length of SHG tube into the Reader Head, allowing for a sufficient amount of scale to project from the Reading Head in order to fit the scale mounting brackets.

Assemble the angle bracket to the scale clamp (Refer to Figure 6.5). The jacking plate is included in each bracket kit, this will only be required if the machine mounting face is not a machined surface. Slide the assembly onto the scale allowing approximately 10mm clearance from the end of the Reader Head.

Mark the position of the jack plate (if required) or the angle support bracket. Drill and tap the necessary fixing holes and assemble the bracket to the machine.

Remove the blank tube and the bracket assembly from the Reader Head. Drill and tap M8 x 18mm fixing holes. Fit the jack plate (if required) and secure to the machine. Assemble the scale clamp and the angle bracket to the jack plate but do not secure. Traverse the Reader Head as near to the bracket assembly as possible. Slide the blank tube through the Reader Head into the scale clamp. Adjust the brackets into position and carefully tighten the screws. Check that the blank tube slides through the Reader Head and into the scale clamp smoothly without any fouling or interruption.

Remove the blank tube and traverse the machine to the full extent in the opposite direction. Remember the "full extent" is the absolute maximum travel up to the mechanical "dead stops".

Check the overall length of the actual scale and measure from the outside edge of the scale clamp already fitted to the machine and mark the position of the scale on to the machine.

Slide the SHG blank tube into the Reader Head, assemble the remaining scale bracket assembly including the jacking plate (if required) and slide onto the tube.

Set the outside edge of the scale clamp level with the mark that indicates the overall length of the SHG Scale and mark the fixing position for the bracket assembly.

Mounting the Scale

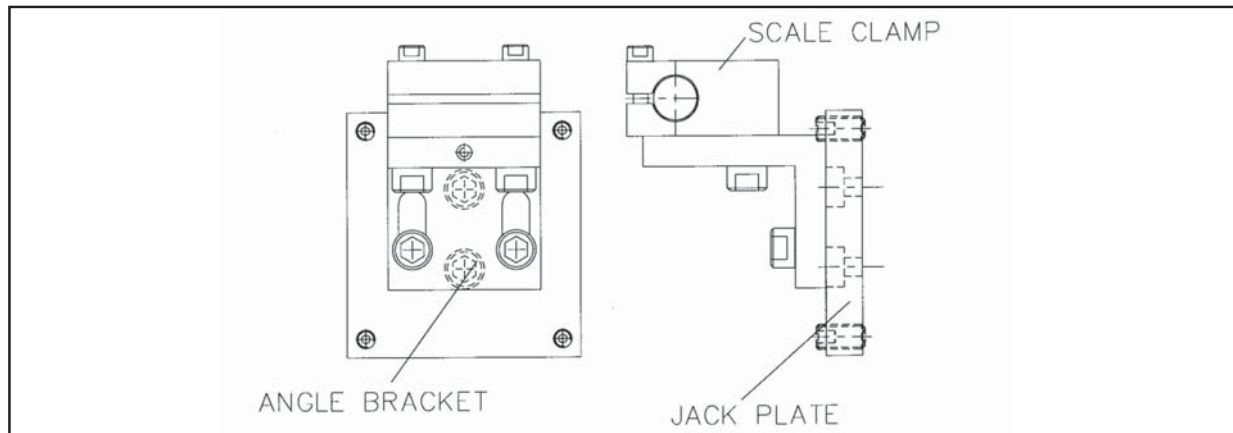


Figure 6.5 - Long Scale Support Bracket Assembly

6.1.4 Center Supports for Scales in Excess of 2.5 Metres (100”) Travel

See data sheet supplied with center supports kit 600-84605

6.2 MHG Scale

The fixed end of the scale has an M3 tapped hole, which will be fitted to the anchor pin when installed.

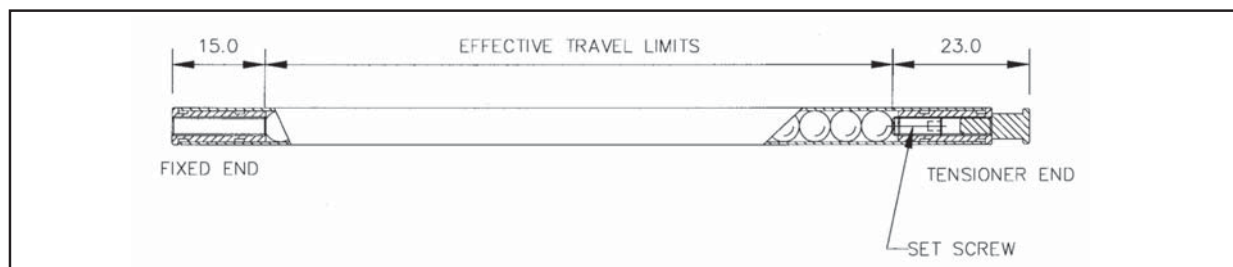


Figure 6.7 - The MHG Scale

NOTES:

- (A) Erroneous readings will occur if the MHG Reader Head is allowed to travel beyond Effective Travel Limits. (Refer to Figure 6.7)
- (B) The pre-load on the balls are factory set via the set screw at the tensioner end. Do not tamper with or adjust the set screw as this will alter the calibration and accuracy specification of the scale and void the warranty.

The scale support brackets kit consists of the Anchor Pin, Support Pin, Support Link, and Pillar(s). (Refer to Figure 6.8) In order to avoid the risk of damage to the scale during installation all MHG encoders include a set up bar. The set up bar is of the same diameter as the MHG Scale and will be used to align the brackets to the Reader Head.

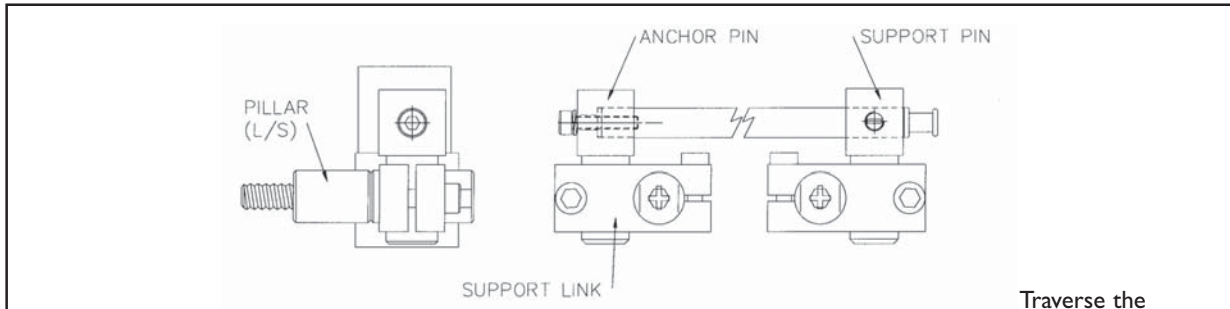


Figure 6.8 - MHG Scale Support Bracket

machine to its maximum position toward the non-cable entry side of the Reader Head. Maximum position means all available travel, including hand winding past any electrical limits or trip dogs.

Carefully slide the MHG Scale set-up bar through the Reader Head, allowing for sufficient scale to project from the Reader Head in order to fit the scale support brackets.

Assemble the support link to the anchor pin leaving approximately 3mm (1/8") gap between the bottom of the anchor shoulder and the top of the link.

Slide the link/anchor assembly onto the scale set-up bar to approximately 5mm (0.2") away from the end of the Reader Head.

Transfer punch through the support link and into the machine casting. It is important that the support link be kept square to its mounting surface at all times.

Remove the link/anchor assembly and the scale set-up bar from the Reader Head. Drill and tap M6 x 12mm deep hole into the machine casting as marked by the transfer punch. Fit the pillar(s) to the machine casting by using one of the methods shown in Figure 6.3. The pillar shoulder fits square and flush to the machine surface.

A maximum of two support pillars may be screwed together to allow for sufficient adjustment of the scale. If two pillars are insufficient to enable the scale to be mounted, then additional brackets will be necessary. These brackets must be sufficiently rigid to eliminate any axial movement of the scale.

Loosely fit the support link/anchor assembly onto the pillar and pass the scale set-up bar through the Reader Head and into the anchor pin. While gently sliding the scale set-up bar in and out of the anchor pin, carefully tighten the cap screws on the support link, ensuring that the scale set-up bar slides smoothly through the Reader Head and into the anchor pin. If any interference is detected then fully loosen the cap screws on the support link and repeat this step.

Remove the scale set-up bar from the Reader Head and traverse the machine to its full extent in the opposite direction. Full extent means hand winding past electrical limits.

Assemble the scale support link to the support pin leaving approximately 3mm (1/8") gap between the bottom of the mounting shoulder and the top of the link. (Refer to Figure 6.8)

Mounting the Scale

Slide the link/pin assembly onto the scale set-up bar making certain that there is sufficient clearance between the Reader Head and the support link to prevent damage to the Reader Head cable. Do not secure the support pin to the scale at this time.

Transfer punch through the support link and into the machine casting. It is important that the support link be kept square to its mounting surface at all times.

Remove the link/pin assembly and the scale from the Reader Head. Drill and tap M6 x 12mm deep into the machine casting as marked by the transfer punch. Fit the pillar(s) to the machine casting by using one of the methods shown in Figure 6.3. The pillar shoulder fit square and flush to the machine surface.

Loosely fit the support link/pin assembly onto the pillar and pass the scale set-up bar through the Reader Head and into the support pin. While gently sliding the set-up bar forward and back 25 - 50mm (1" - 2") through the support mounting, carefully tighten the screws on the support link, ensuring that the scale set-up bar slides smoothly through the Reader Head and into the support pin. If any interference is detected then fully loosen the screws on the support link and repeat this step.

IMPORTANT WARNING

THE CENTRE LINE BORE OF THE READER HEAD MUST BE IN DIRECT ALIGNMENT WITH THE CENTRE LINE BORE OF THE SUPPORT PIN. PERMANENT DAMAGE TO SCALE AND/OR ERRONEOUS READER WILL OCCUR IF THIS WARNING IS NOT FOLLOWED. REFER TO FIGURE 6.9

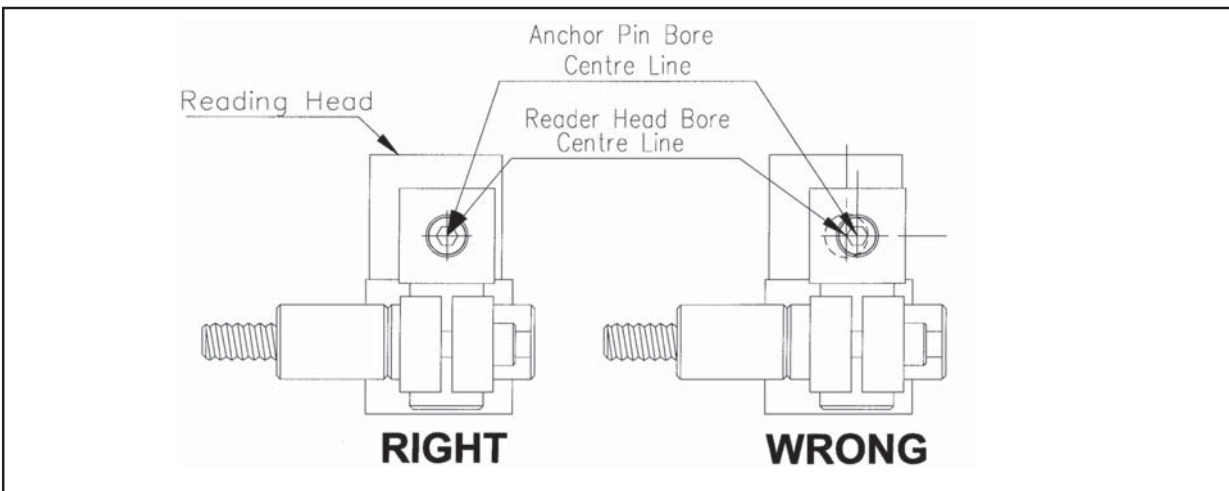


Figure 6.9 - Reader Head and Bracket Alignment

Carefully slide the MHG Scale through the support pin, ensuring the fixed end is inserted first, through the Reader Head and into the anchor pin.

Using the M3 x 16 skt cap screw and spring washer, secure the scale to the anchor pin. It is **important** that the nylon set screw on the support pin be only "pinched" to the scale at the tensioner end. **DO NOT OVER TIGHTEN THE NYLON SET SCREW ON THE SUPPORT PIN.**

6.2.1 Single End Mounting

For installations requiring a lower profile assembly, there is an alternative method for fixing the scale at one end only by way of the single end mounting block assembly (Refer to Figure 6.10). The MHG single end mounting kit is sold separately, part number **600-65340**.

Note: The maximum total length of scale should not exceed 450mm (18") when using the single end mounting block.

Once the Reader Head has been installed slide the scale through the head and insert the fixed end of the scale into the single end mounting block. (Refer to Figure 6.10)

Once the position for the single end mounting block has been determined mark the machine casting with the slot in the block. Drill and tap a M5 x 12mm deep hole. Fit the bracket using the M5 skt head cap screw and washer. Check the alignment by gently sliding the scale through the head and in and out of the mounting block, adjustments may be carried out by altering the M3 jacking screws. When the alignment is complete secure the scale by inserting the M3 screw and spring washer through the mounting block and into the fixed end of the scale.

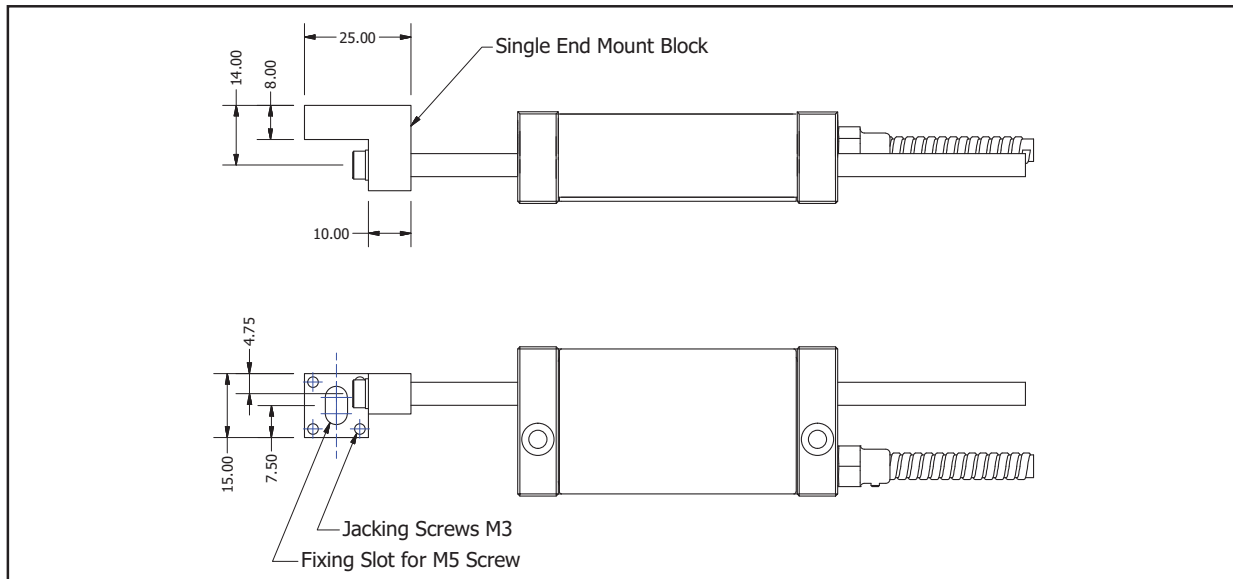


Figure 6.10 - MHG Single End Mounting

7.0 FITTING THE SCALE GUARD

Each Encoder includes a protective guard. This aluminium guard is intended to protect the scale from impact damage. The guard can be attached to the machine casting or by means of the scale support pillars. (Refer to Figure 7.1)

To fit the guard to the support pillars, measure and mark off the distance between the centre of each pillar. For SHG drill two 8.5mm, for MHG 7mm holes at either end of the guard. The guard can be attached to the pillars by using the button head screws provided. After the guard is attached, move the machine axis to both extents of its travel ensuring that the guard does not interfere with or rub against the Reader Head.

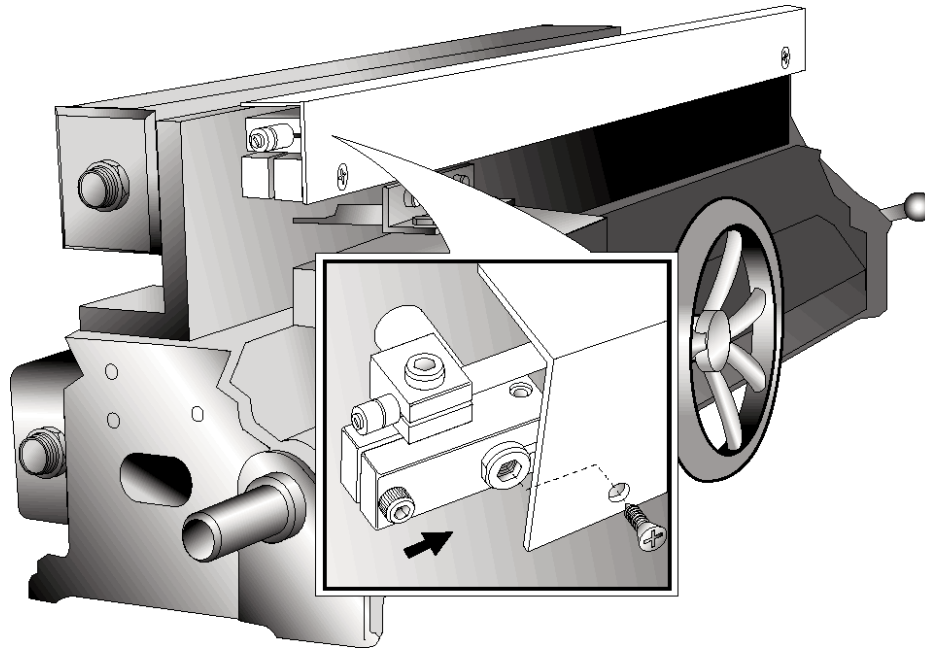


Figure 7.1 - Fitting the Scale Guard (example shown using a SHG Scale)

8.0 CABLE ROUTING

The most important and the most over looked aspect of fitting the Encoder is proper cable routing. Dangling and loose cables can be snagged or broken causing irreparable damage. Care should be taken in order to ensure that the cables are secured to the machine and that cable loops do not interfere with any part of the machine or the Encoder movements. "P" clips and thread forming screws are provided to route the cables.

Note: The armoured cable is an integral part of the Reader Head. If the cable becomes damaged, then it would have to be replaced complete with the Reader Head.

If extension cables are used, do not allow the plug and socket junction to lie in the swarf tray or in the direct flow of coolant or oil.

In order to avoid problems associated with electrical noise and interference, do not allow the cables to lie across electrical motors, fuse boxes or electrical pumps.

9.0 FINAL CHECK

Prior to putting the Encoder into operation, slowly traverse the machine axis to both extents of its travel checking at all times that the cables are secure and that machine over travel cannot occur. Newall will not accept responsibility for Encoder malfunction caused by over travel or damaged cables.

10.0 SHG-TS/VS REFERENCE MARK

SHG-TS AND SHG-VS SERIES LINEAR ENCODERS WITH SINGLE REFERENCE MARK

Introduction

The SHG-TS and SHG-VS scales have a series of selectable reference markers, to a maximum of 4, within the end section of the scale. Which reference is selected for output is dependent on the rotational alignment of the scale relative to the reader-head and will be discussed in more detail below. Only one reference mark can be active at one time.

Mode of Operation

The standard internal scale periodic reference mark is 'gated' using a logical 'AND' type operation with the signal from the head sensor triggered by the scale insert. The result is that only the internal periodic reference mark is allowed to propagate from the reader-head when both it and the magnet insert signal are both in the 'high/true' state.

In order to facilitate installation a head mounted LED has been included. The head LED is illuminated Green when the sensor has detected the magnet insert. It then changes to Red once the internal incremental reference mark, within the window defined by the scale insert, is detected. The LED then turns off once the external magnet is no longer detected. Thus the repeatability of the reference mark is within a single resolution count. See Figure 10.1.

Note: Under normal operation (other than at the index position) the LED is OFF.

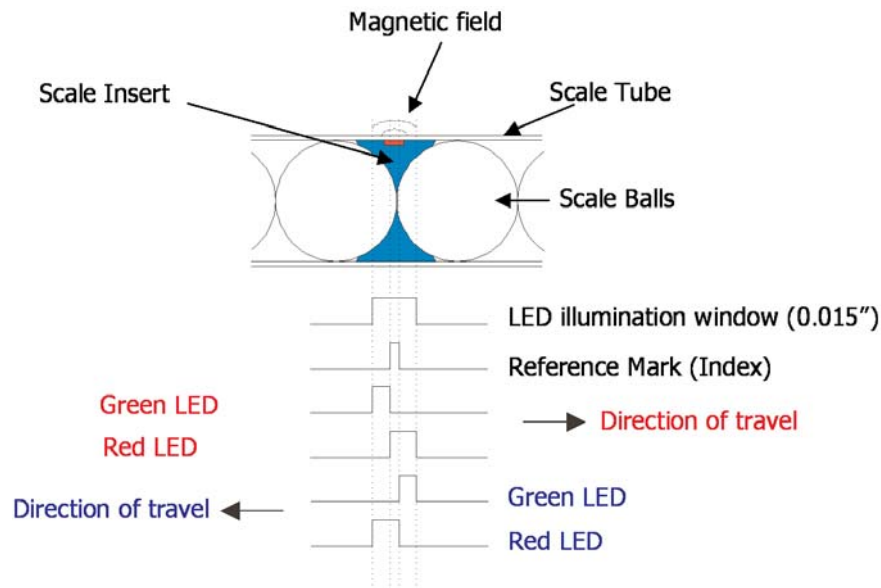


Figure 10.1 Operation of the head-mounted LED.

Scale Construction

The scale is constructed with 4 inserts located at the non-adjusting end of the scale. The non-adjusting end of the scale has a white nylon snap rivet. The adjusting end of the scale will have a red cap. The sequence commences 5 balls in from the end of the scale (78.5mm/3.1") with the inserts then loaded 2 balls (25.4mm/1.00") apart and at 90° incremental angles to each other (See Figure 10.2a,b). Thus, from the non-adjusting end of the scale, the last insert will appear at approximately 256.3mm/10.1" from the external extreme of the scale. For short scales the number of inserts is reduced accordingly.

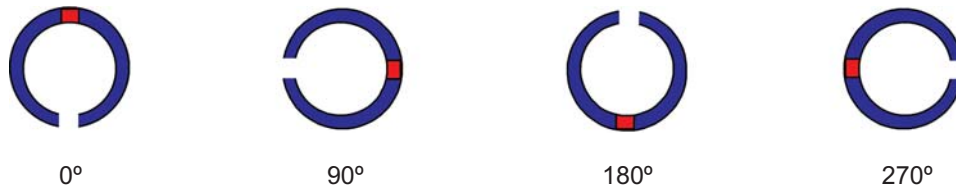


Figure 10.2a. Orientation of inserts within a scale

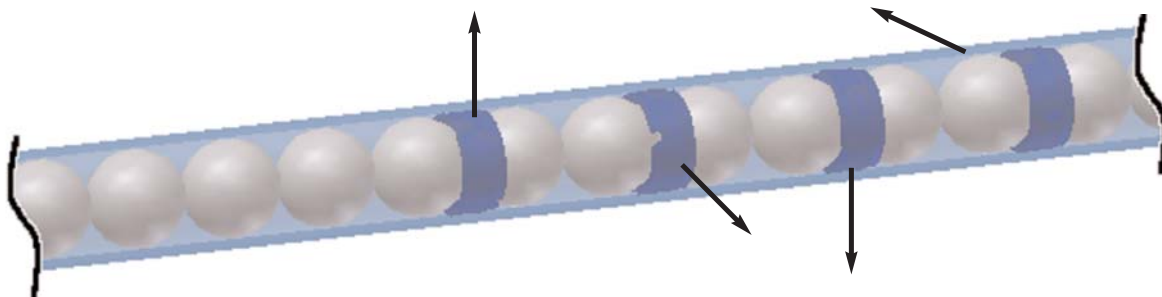


Figure 10.2b. Image showing rotation of inserts within a scale

Installation

- The position of the desired reference marker location should be identified prior to installation to ensure the scale can be mounted to meet this requirement. The index position is usually related to machine mechanical switches. The scale and reader-head should then be mounted mechanically in the standard way.
- Locate the reader head mechanically at the position where the reference marker is required ensuring again that this is within the coverage of the scale selectable reference marker positions.
- Rotate the scale until the head LED turns Green. If after one revolution this has not occurred move the scale longitudinally through the reader-head in either direction by approximately 2mm and repeat the procedure.
- Repeat the above procedure until the reference marker window is found.
- If the LED has turned Red or Green, rotate the scale about this point, backwards and forwards, until the rotation of the scale coincides with the mid point of the LED on/off cycle. The scale is now axially aligned with the reader-head.
- If the LED is Green then the index position longitudinally is within approximately $\pm 2\text{mm}$ of the current head position. In most circumstances this will be sufficient. If fine placement is required then the scale should be moved longitudinally until the LED turns Red. It is at this transition point that the index output will occur. (See Figure 10.1) If the LED turns off and not to Red then move the scale in the opposite direction as you have moved away from the index position.
- The installation alignment is now complete and the scale should be secured at the mounting points to prevent any future movement.
- As the reader-head passes over the reference marker (in either direction – see Figure 10.1) the LED will flash Green then Red.

The scale is reversible within the reader-head and as such can be swapped end for end. As the sensor within the reader-head is not centrally located with respect to its body length, this can have an effect on which index marker is selected or the preferred orientation (end-for-end) of the scale. If the reader head cable is closest to the non-adjusting end of the scale, 4 reference markers can be obtained. If the reader head cable is closest to the adjusting end of the scale, 2 reference markers can be obtained. See Figure 10.3 for position of sensor within the reader-head envelope.

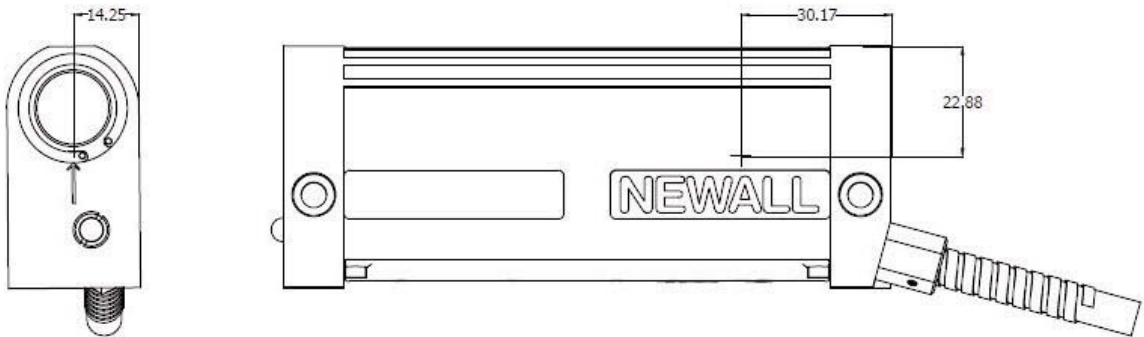


Figure 10.3. Position of reference sensor

Magnetic Fields

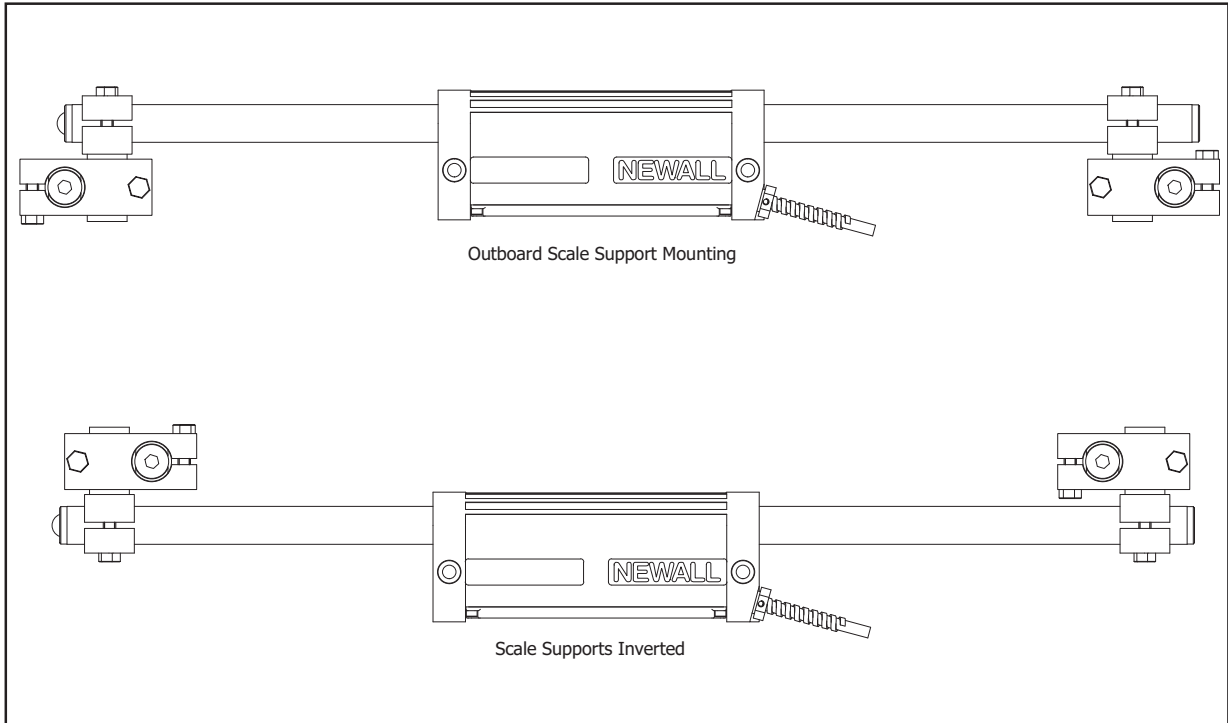
The magnetic field generated by the scale inserts is in the order of 100 Gauss (at the scale surface) and as such will not attract swarf or anything but the finest ferrous dust particles.

However, if the reader-head is subjected to strong magnetic fields this may 'enable' the head sensor and as such allow the incremental index marks to propagate from the encoder. Consequently, it is important to ensure during installation that any stray magnetic fields are minimised in order to prevent false operation. In the worst case, a field of 30 Gauss at the encoder surface could result in false operation.

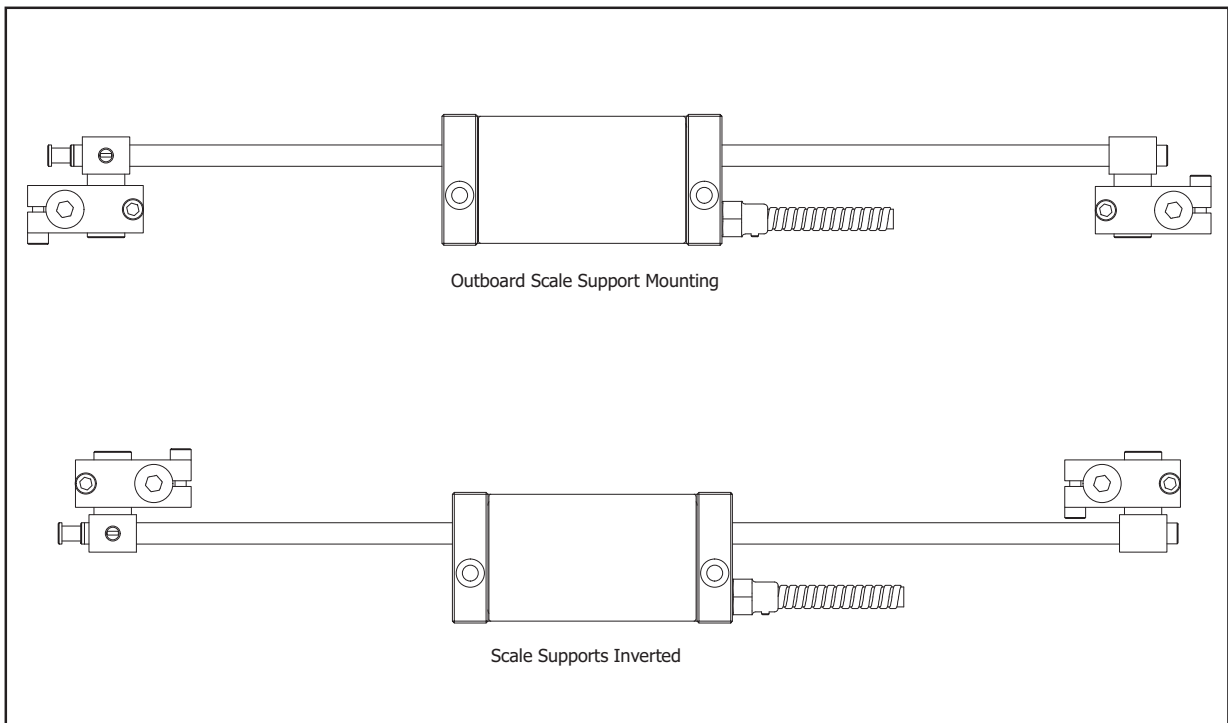
Providing magnetic shielding by mounting on a steel plate would greatly improve the encoder's robustness to stray magnetic fields.

11.0 SCALE BRACKET ORIENTATION OPTIONS

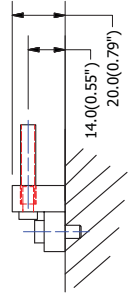
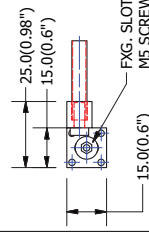
11.1 SHG



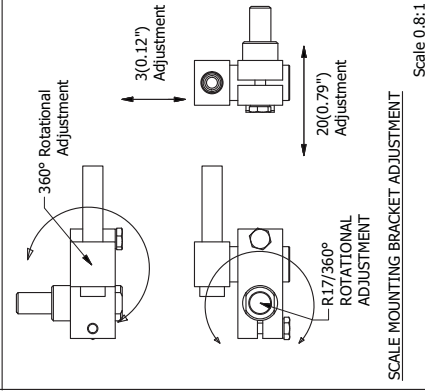
11.2 MHG



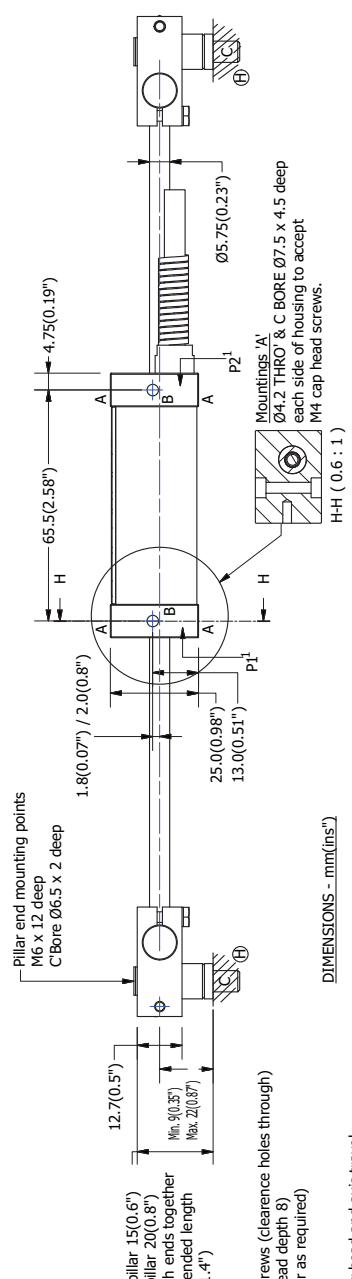
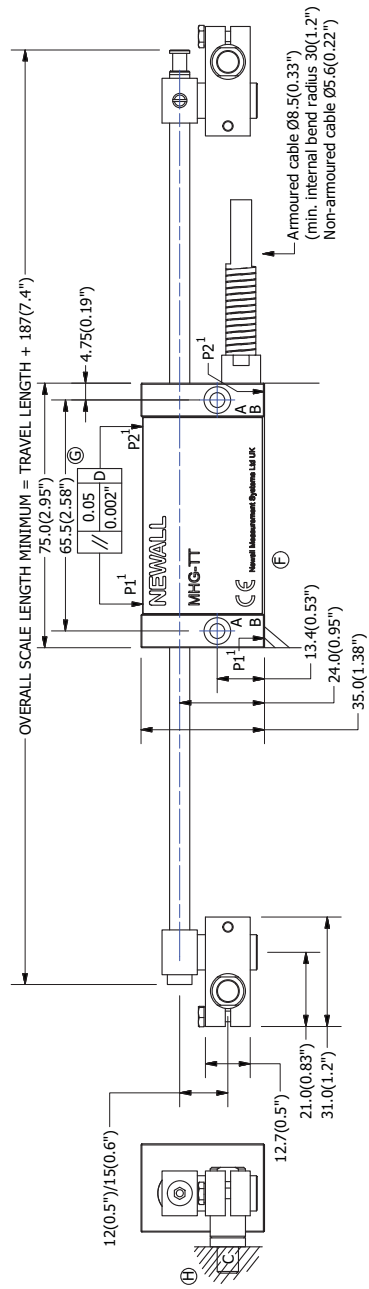
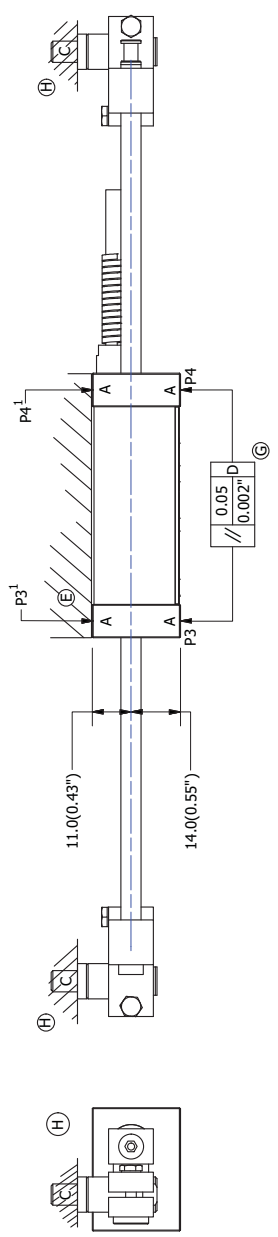
SIZE DRAWING NUMBER **316-85620** REV/ISS **1**



Optional Single End Scale Mounting Kit. Left and right hand versions available. Scale 0.6:1



DO NOT SCALE THIRD ANGLE PROJECTION IF IN DOUBT ASK

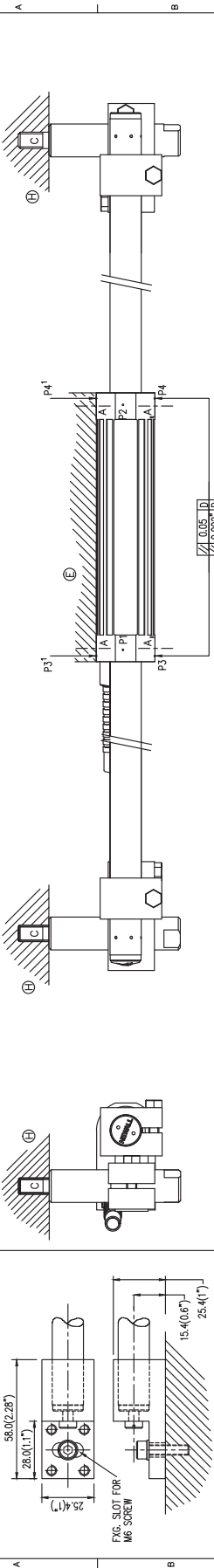


DIMENSIONS - mm.(ins.)

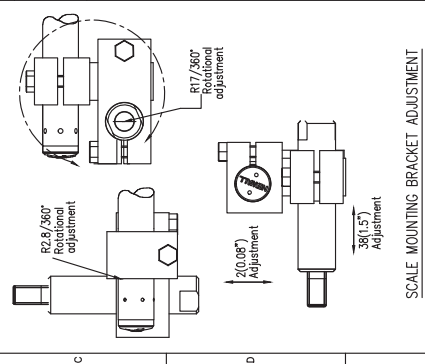
FOR FURTHER INFORMATION REFER TO INSTALLATION MANUAL

- A - Encoder head mounting points 2off for M4 cap head screws (clearance holes through)
- B - Encoder head mounting points 2off for M4 screws (thread depth 8)
- C - Scale pillar mounting studs M6 x 10 (use spacer washer as required)
- D - Machine Guideway
- E/F - Encoder head mounting faces
- G - Indicating parallel alignment required between encoder head and axis travel
- H - Scale end mounting points to machine bed
- P - Installation alignment points

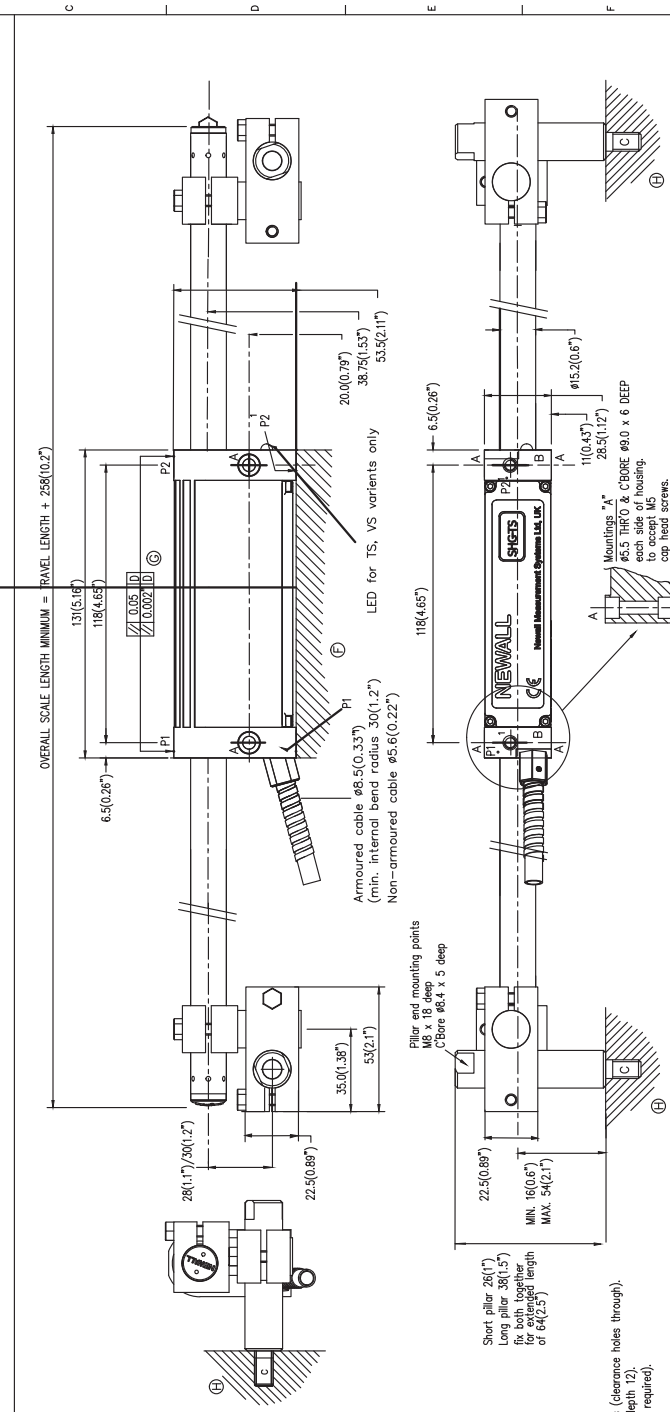
TITLE		MATERIAL/FINISH	
MHG Series Linear Encoders			
DRAWN/T: Hetherley	DATE: 09/03/2009	LEICESTER	ENGLAND
REVIS: DATE	CHG: ALTERATION		
1	27/11/15 (E03030) IMPROVED FORMS REMOVED, NOW METRIC ONLY		
SCALE: UNLESS OTHERWISE STATED: 1:1		TOLERANCES: -0 DECIMAL PLACES ±0.1	
SHEET: DRAWING NUMBER: 316-85620		1 DECIMAL PLACES ±0.1	
1 OF 1		REV: 1	
		ISS: 1	



Optional End Scale Mounting Kit



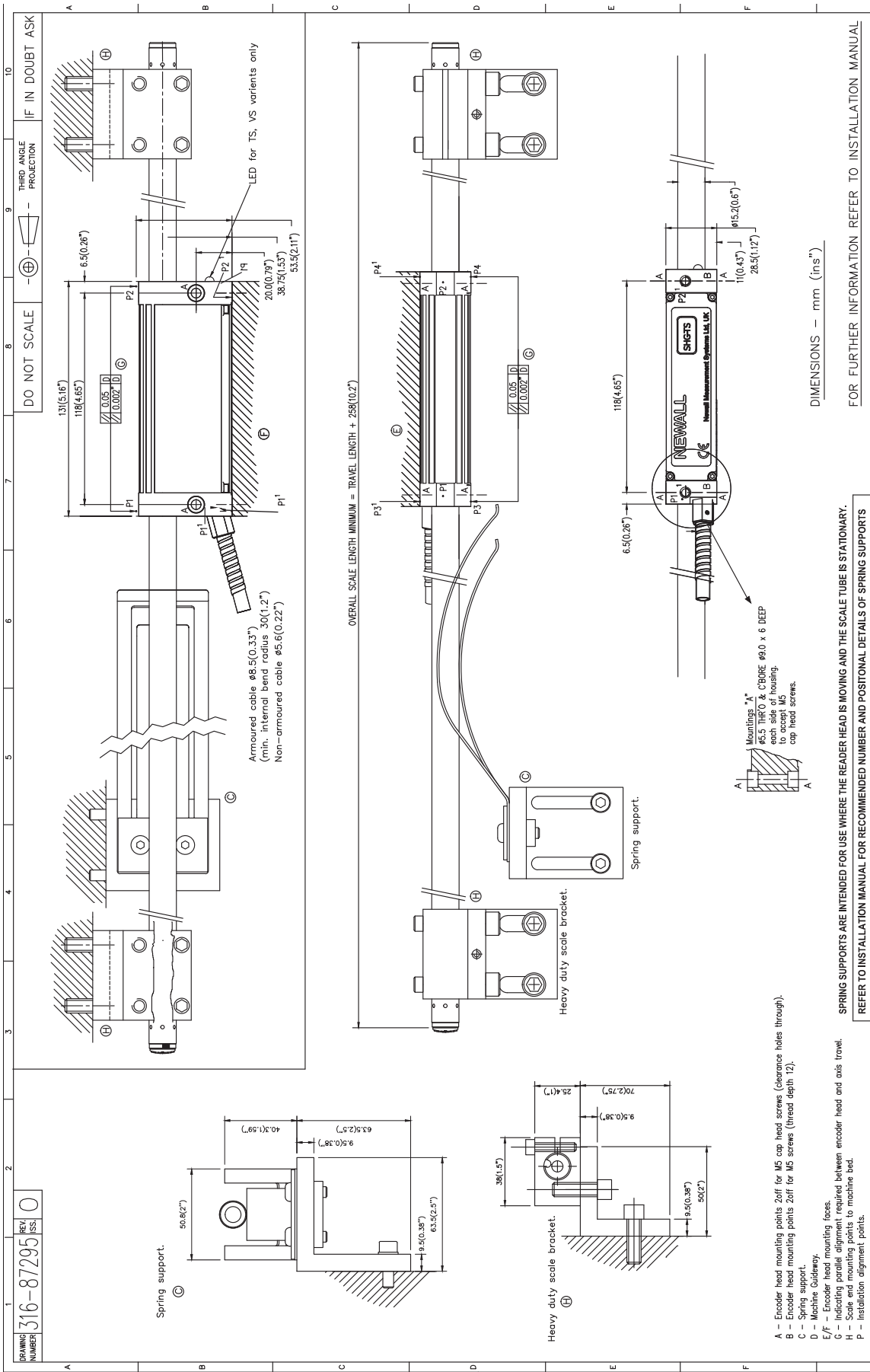
SCALE MOUNTING BRACKET ADJUSTMENT



DIMENSIONS - mm (ins'')

FOR FURTHER INFORMATION REFER TO INSTALLATION MANUAL

REVISIONS	DATE	CAUSE	ALTERATION	1	2	3	4	5	6	7	8	9	10
TITLE: 316-11, 316-14, 316-15, 316-16 and 316-15 Encoders (400°) DRAWN: C. WHITMORE 25-11-14 CHECKED: APPROVED: MATERIAL / FINISH: SCALE: 1=1 DIMENSIONS: ARE IN MM. UNLESS OTHERWISE TOLERANCES - 0 DIMENSIONS ARE IN MM. DIMENSIONS: ARE IN MM. SHEET: 1 OF 1 NUMBER: 316-87290 (REV. 0)										DIMENSIONAL DETAILS FOR 316-11, 316-14, 316-15, 316-16 and 316-15 Encoders (400°) DRAWN: C. WHITMORE 25-11-14 CHECKED: APPROVED: MATERIAL / FINISH: SCALE: 1=1 DIMENSIONS: ARE IN MM. UNLESS OTHERWISE TOLERANCES - 0 DIMENSIONS ARE IN MM. DIMENSIONS: ARE IN MM. SHEET: 1 OF 1 NUMBER: 316-87290 (REV. 0)			



SPRING SUPPORTS ARE INTENDED FOR USE WHERE THE READER HEAD IS MOVING AND THE SCALE TUBE IS STATIONARY.
REFER TO INSTALLATION MANUAL FOR RECOMMENDED NUMBER AND POSITIONAL DETAILS OF SPRING SUPPORTS

REVISION DATE	ALTERATION	2	REVISION DATE	ALTERATION	3	REVISION DATE	ALTERATION	4	REVISION DATE	ALTERATION	5	REVISION DATE	ALTERATION	6	REVISION DATE	ALTERATION	7	REVISION DATE	ALTERATION	8	REVISION DATE	ALTERATION	9	REVISION DATE	ALTERATION	10

DRAWING NUMBER		316-87295		REV. ISS.		O	
DRAWING NUMBER		316-87295		REV. ISS.		O	
DRAWING NUMBER		316-87295		REV. ISS.		O	

TITLE		DIMENSIONAL DETAILS FOR 506-T1, 506-PI, 506-F, 506-IP and 506-M series encoders (507)		MATERIAL/ FINISH		SCALE (ON A1)		UNLESS OTHERWISE STATED: - DIMENSIONS ARE IN MM		TOLERANCES: - DIM. PLACES AND DIMENSIONS ARE IN MM		SHEET NUMBER		DRAWING NUMBER		1 OF 1		ISS.		REV.	
DRAWN		C.W.H.		CHECKED		APPROVED		25-11-14		1		1		1		1		1		1	
DRAWN		C.W.H.		CHECKED		APPROVED		25-11-14		1		1		1		1		1		1	
DRAWN		C.W.H.		CHECKED		APPROVED		25-11-14		1		1		1		1		1		1	

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316-87295

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