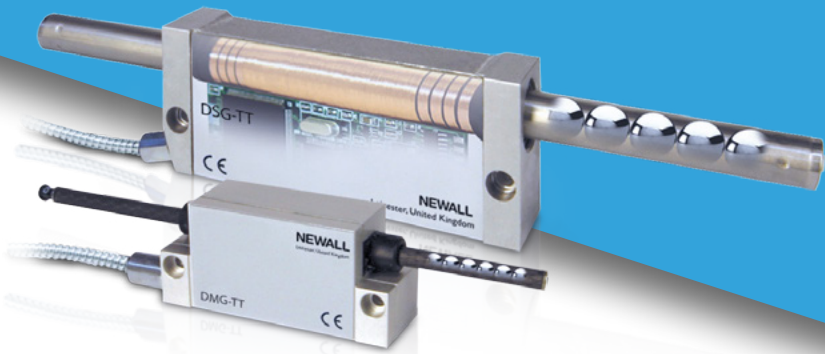


NEWALL

DSG & DMG Series Incremental Linear Encoders



Installation Guide

For Models:
DSG-TT, DSG-EV, DSG-EM DMG-TT,
DMG-EV, DMG-EM

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1.0 INTRODUCTION

This manual will provide mounting instructions for Newall's DSG and DMG 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 may be necessary to design, make and fit custom brackets for the encoder assembly. If brackets are needed, make certain they are rigid enough to prevent 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.

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

DMG: 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 10.0)

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.

DSG and DMG encoders are designed to operate with Digital Readout Systems and therefore may not operate correctly with automated or closed loop motion control systems. For closed loop motion control applications please refer to SHG & MHG encoders

2.0 TECHNICAL SPECIFICATIONS

	TT	EV	EM
Operating Voltage	5 VDC \pm 5%	5 VDC \pm 5%	5 VDC \pm 5%
Maximum Power Consumption	<80mA + line receiver requirement	<80mA + line receiver requirement	<80mA + line receiver requirement
Outputs	5v TTL differential quadrature line driver	~ 1Vpp differential (Via SVV Module)	~ 11 μ A _{pp} differential (Via SVM Module)

Construction:

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

Dimensions (reader head):

DMG

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)

DSG

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: 1,000,000 counts/sec (1Mhz)
(DSG-TT & DMG-TT)

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

Required Moving Force:

DMG	10N
DSG	20N

Scale Type:

DMG	Carbon fibre	5.64mm OD	(0.222")
DSG	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 pin out details apply to DSG-TT/EV/EM, DMG-TT/EV/EM

9D Pin #	Core	Function	Colour
1	26AWG	Reserved / N/C	Orange
2	26AWG	Channel A	Green
3	Twisted Pair	Channel /A	Yellow
4	26AWG	Channel B	Blue
5	Twisted Pair	Channel /B	Red
6	18AWG	0V	White
7	18AWG	+V	Black
8	26AWG	Reserved / N/C	Violet
9	Twisted Pair	Reserved / N/C	Grey
Shell	Overall Braid	Gnd	- - -

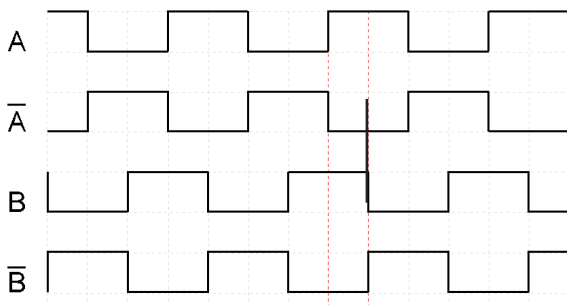
Note: Pin 1 (Orange wire) is used during manufacture and should either not be connected or tied to 0V.

2.2 Output Signals

2.2.1 DSG-TT and DMG-TT

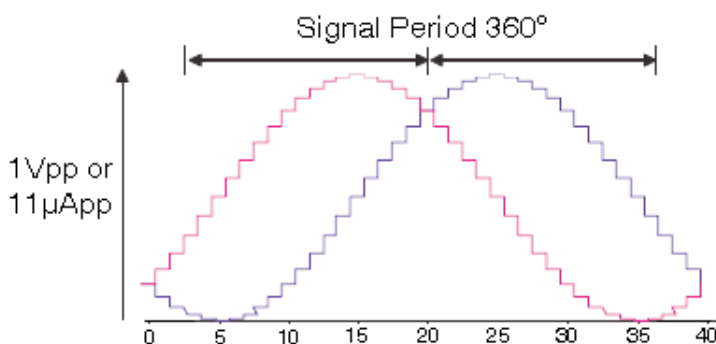
Newall TT series linear encoders provide a differential quadrature output at RS422 TTL levels.

The distance between successive edges of the combined pulse train A and B is one measuring step (resolution)



2.2.2 DSG-EV/EM and DMG-EV/EM

Newall EV & EM series linear encoders provide differential sinusoidal output signals, (via an external module), that are phase shifted by 90°, and can provide 1Vpp or 11µApp signal levels depending on which model is selected.



No reference mark is provided with the DSG or DMG range of encoders.

2.3 Resolution Options

The DSG-TT and DMG-TT are available with a range of pre-programmed resolutions as shown below.

Resolution	DSG-TT	DMG-TT	Counts/Inch Post Quadrature
1µm	√*	√	25,400
2µm	√*	√	12,700
5µm	√	√	5,080
10µm	√	√	2,540

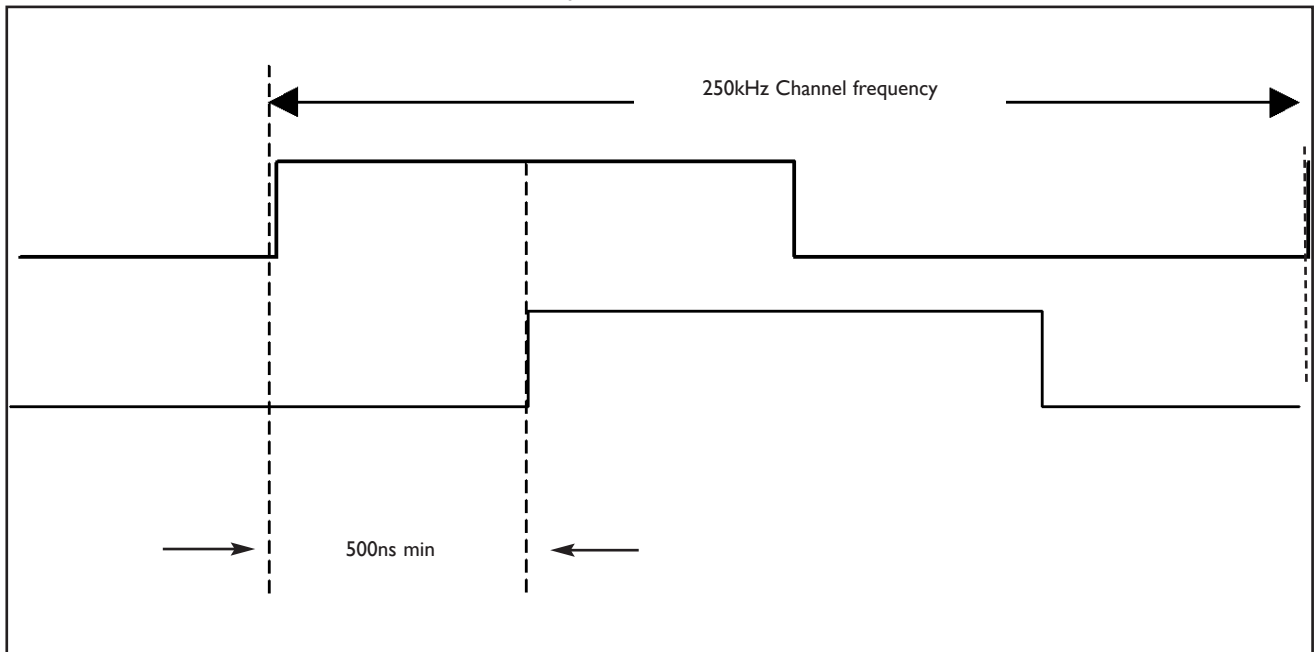
* Not available in all areas

The DSG-EM/EV and DMG-EM/EV are available to order with the signal periods shown below

Signal Period	DSG-EV	DSG-EM	DMG-EV	DMG-EM
20µm	√	√	√	√
40µm		√		√

2.4 Maximum Traverse Rates

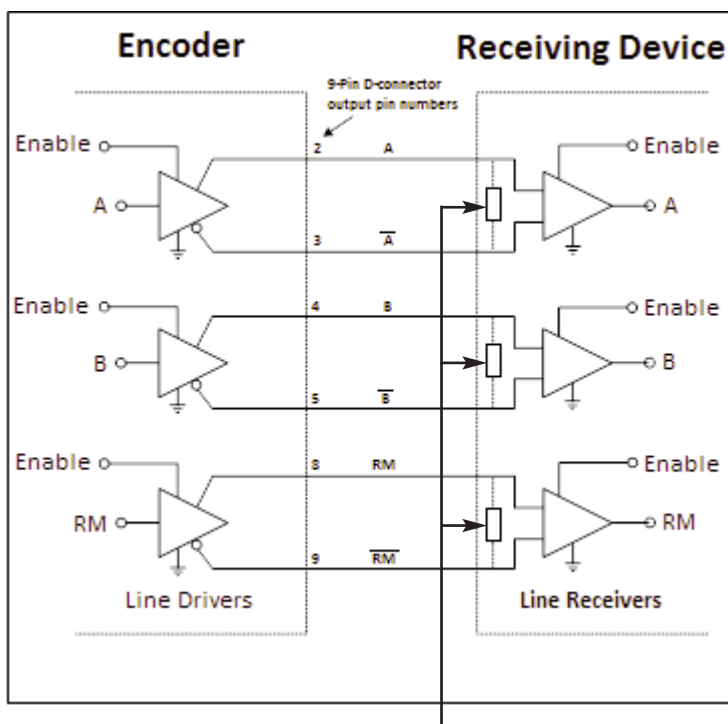
The DSG and DMG encoders have a maximum output rate of 1MHz.



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)	
	DSG	DMG
1µm	1.0	1.0
2µm	2.0	2.0
5µm	5.0	5.0
10µm	10.0	10.0

2.5 Recommended Encoder Connections



Newall DSG-TT and DMG-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)

2.6 DSG-EM/EV & DMG-EM/EV Interface Module

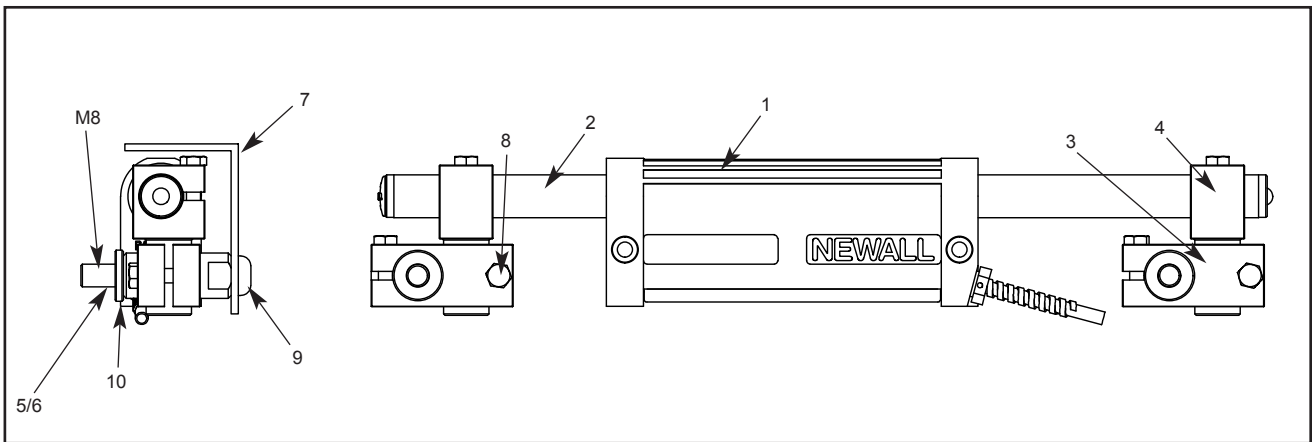
When DSG-EM, DSG-EV, DMG-EM or DMG-EV linear encoders are supplied an interface module is included that provides 1Vpp or 11µApp signals.



1Vpp SVV Interface Module (Part No: 600-83640)

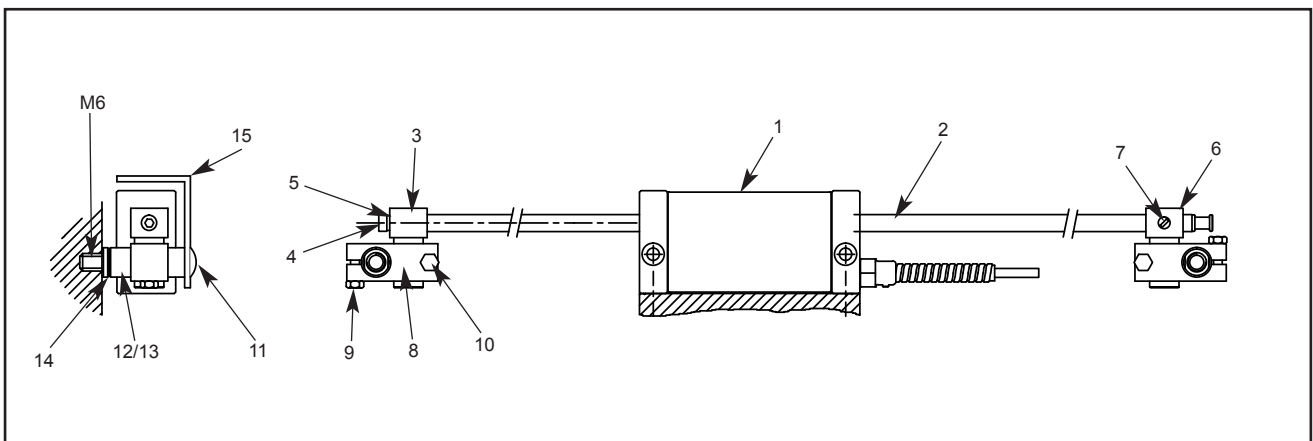
11µApp SVM Interface Module (Part no: 600-83650)

3.0 DSG ENCODER ASSEMBLY (<2.5m/100")



Item	Description	Qty	Item	Description	Qty
1	DSG reader head	1	6	Support pillar long	2
2	DSG 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 DMG ENCODER ASSEMBLY



Item	Description	Qty	Item	Description	Qty
1	DMG reader head	1	8	Support link	2
2	DMG 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 DSG

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)

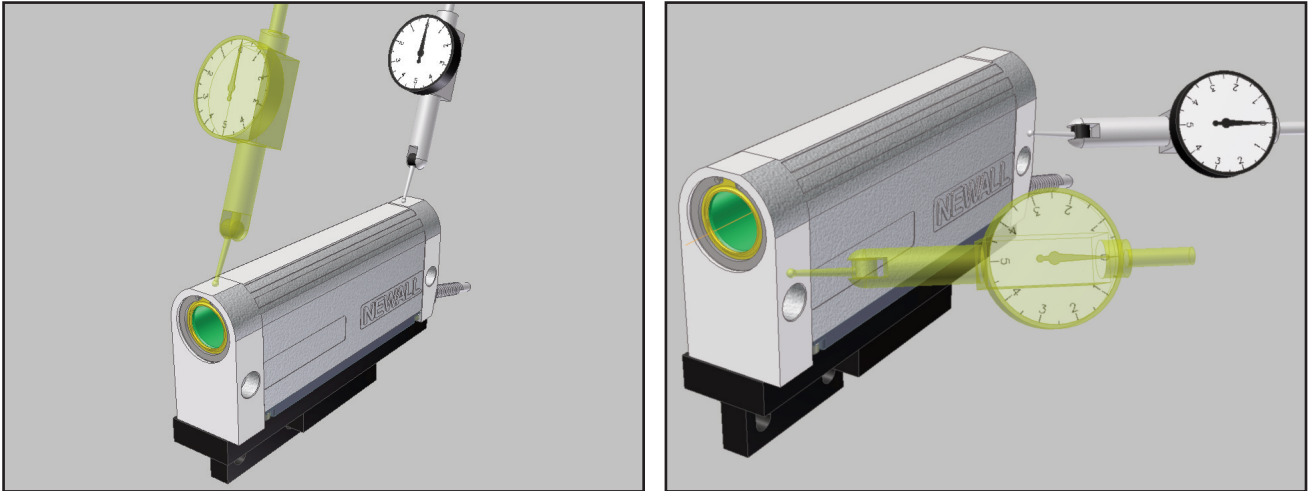


Figure 5.1 - Alignment of the DSG Reader Head

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 DMG

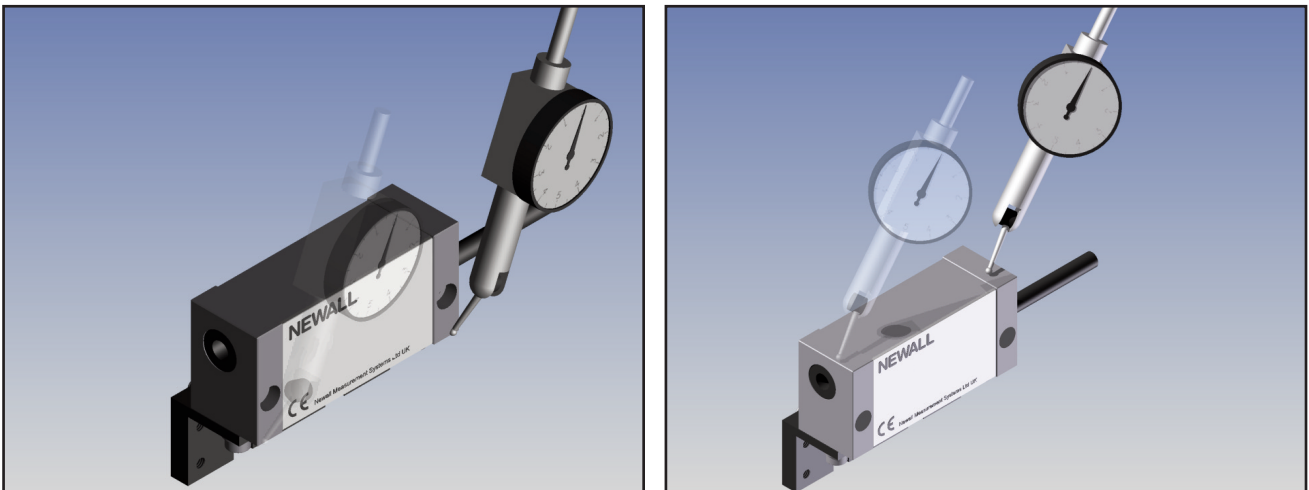


Figure 5.2 - Alignment of the DMG Reader Head

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 DSG

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 DSG 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'.

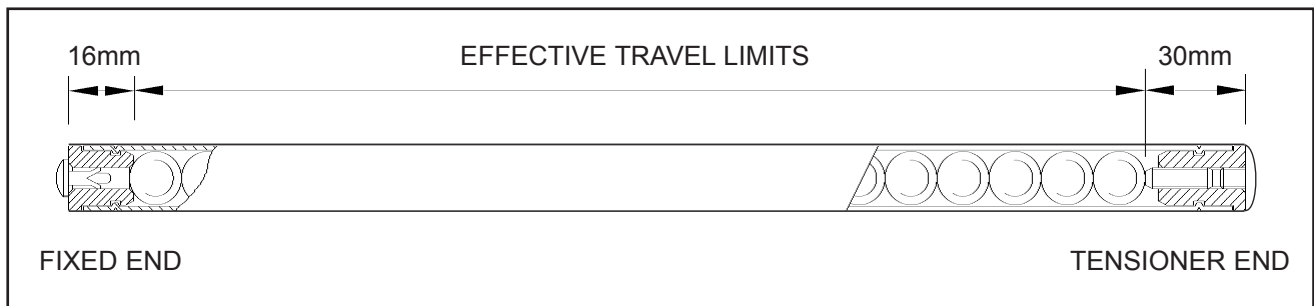


Figure 6.1 - DSG Scale

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 DSG 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 prevent 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 READINGS WILL OCCUR IF THIS WARNING IS NOT FOLLOWED. REFER TO FIGURE 5.2

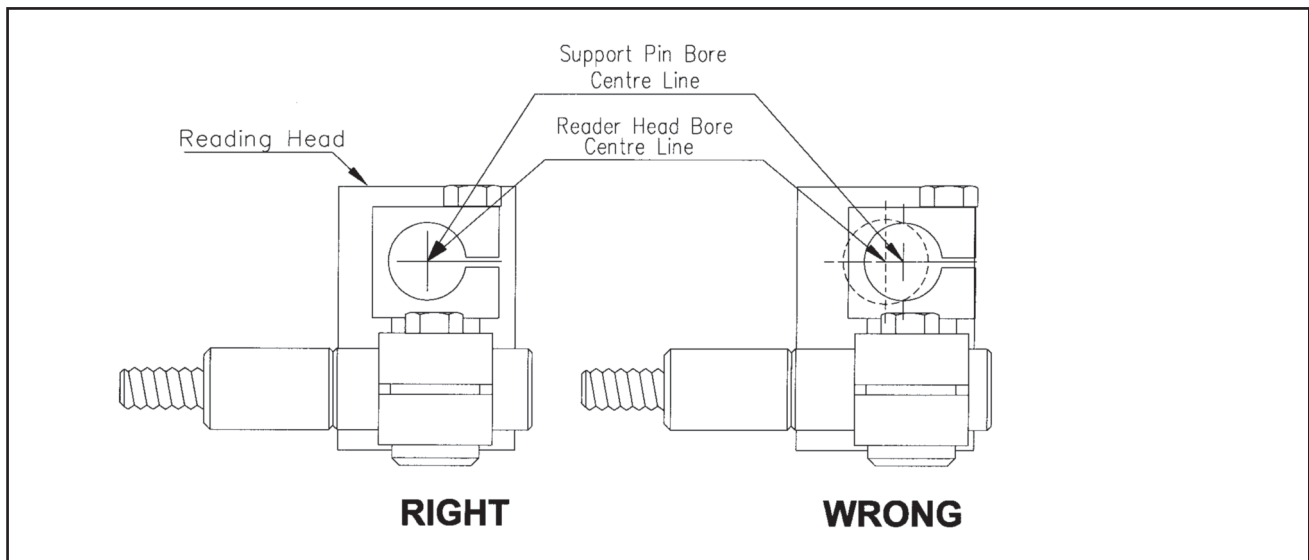


Figure 6.2 - Reader Head and Bracket Alignment

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.

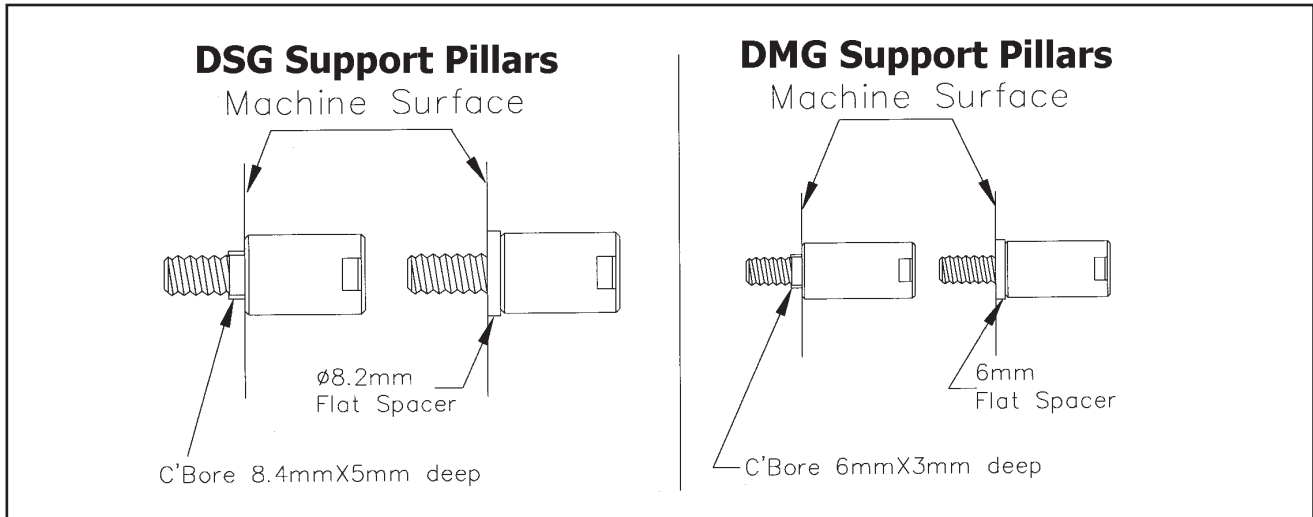


Figure 6.3 - Support Pillars

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 prevent 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 DSG 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.

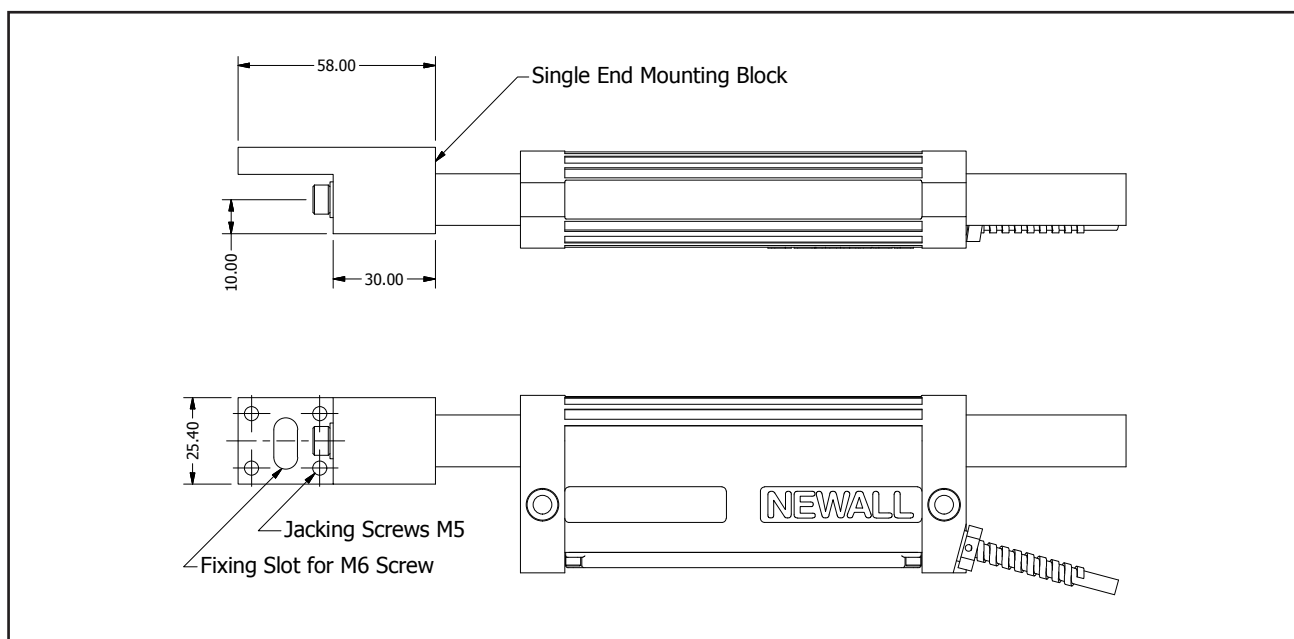


Figure 6.4 - DSG Single End Mounting

6.1.3 Scales in Excess of 2.5 Meters (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 DSG 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 DSG 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 DSG Scale and mark the fixing position for the bracket assembly.

Mounting the Scale

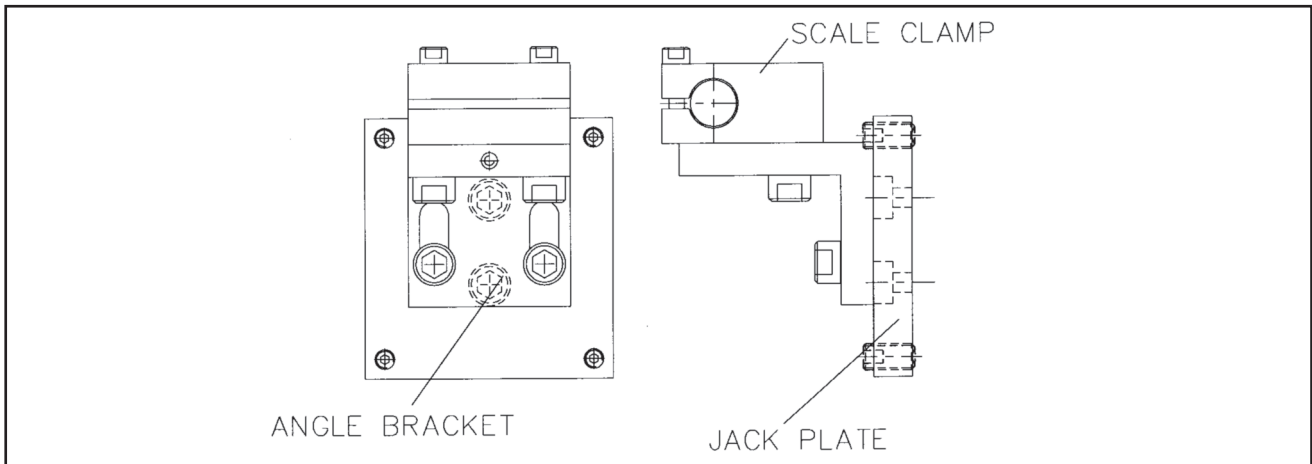


Figure 6.5 - Long Scale Support Bracket Assembly

6.1.4 Center Supports for Scales in Excess of 2.5 Meters (100") Travel

See data sheet supplied with center supports kit 600-84605

6.2 DMG Scale

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

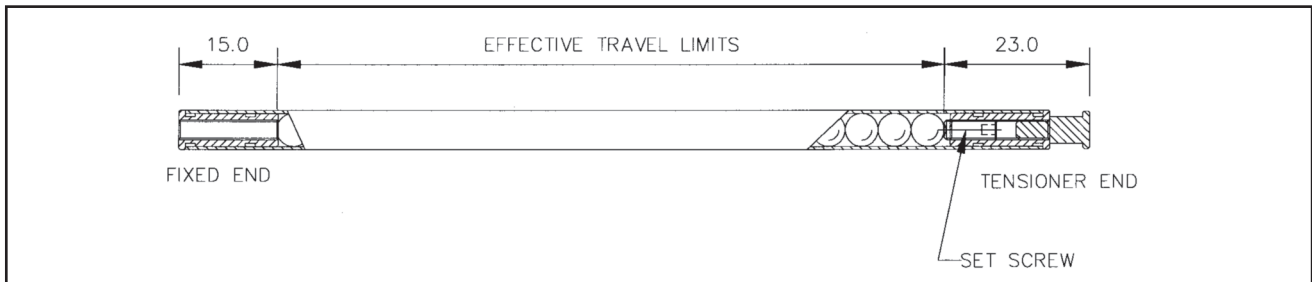


Figure 6.7 - The DMG Scale

NOTES:

- (A) Erroneous readings will occur if the DMG 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 DMG encoders include a set up bar. The set up bar is of the same diameter as the DMG Scale and will be used to align the brackets to the reader head.

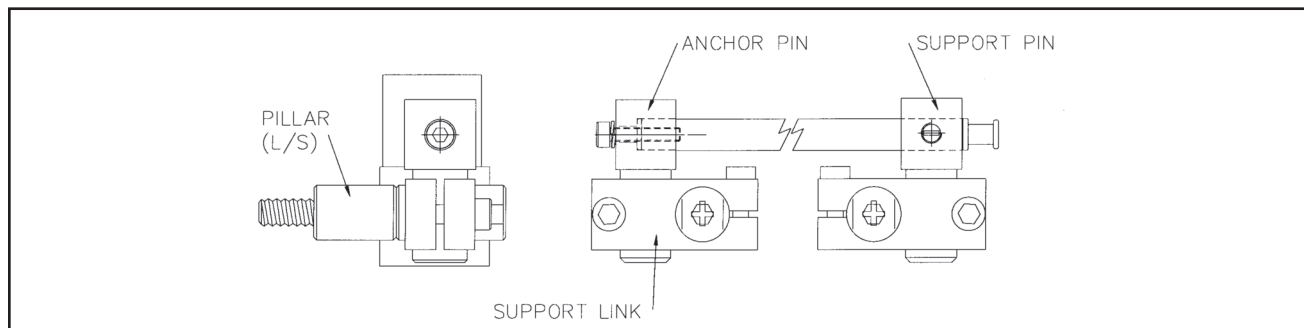


Figure 6.8 - DMG Scale Support Bracket

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 DMG 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 prevent 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 READINGS WILL OCCUR IF THIS WARNING IS NOT FOLLOWED. REFER TO FIGURE 6.9

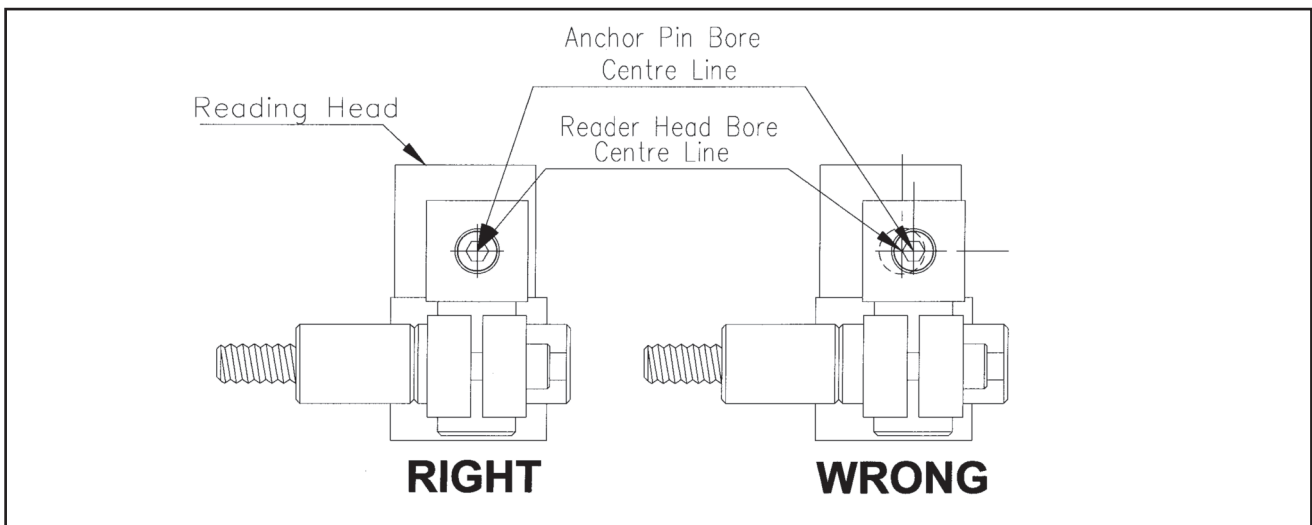


Figure 6.9 - Reader Head and Bracket Alignment

Carefully slide the DMG 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 DMG 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.

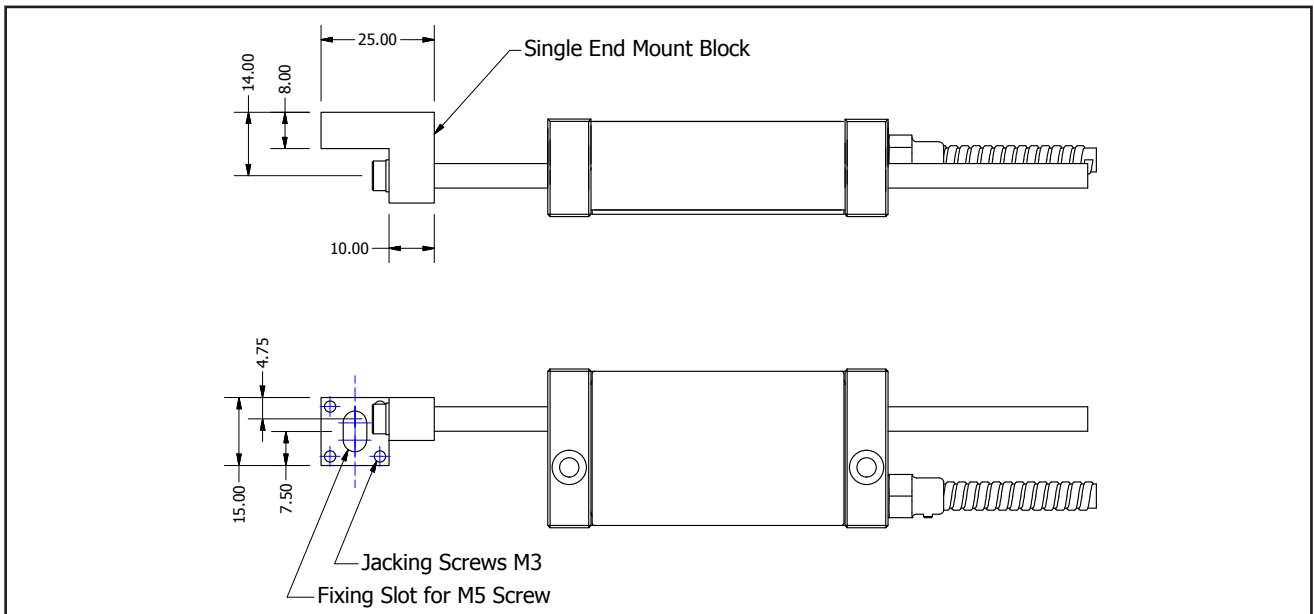


Figure 6.10 - DMG Single End Mounting

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 DSG drill two 8.5mm, for DMG 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.

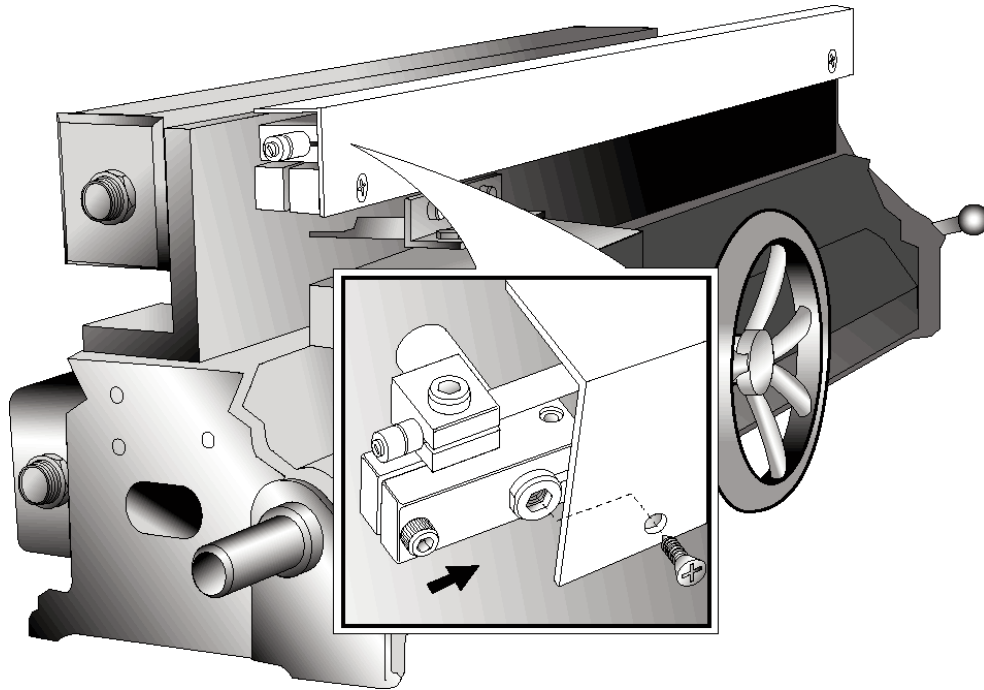


Figure 7.1 - Fitting the Scale Guard (example shown using a DSG Scale)

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.

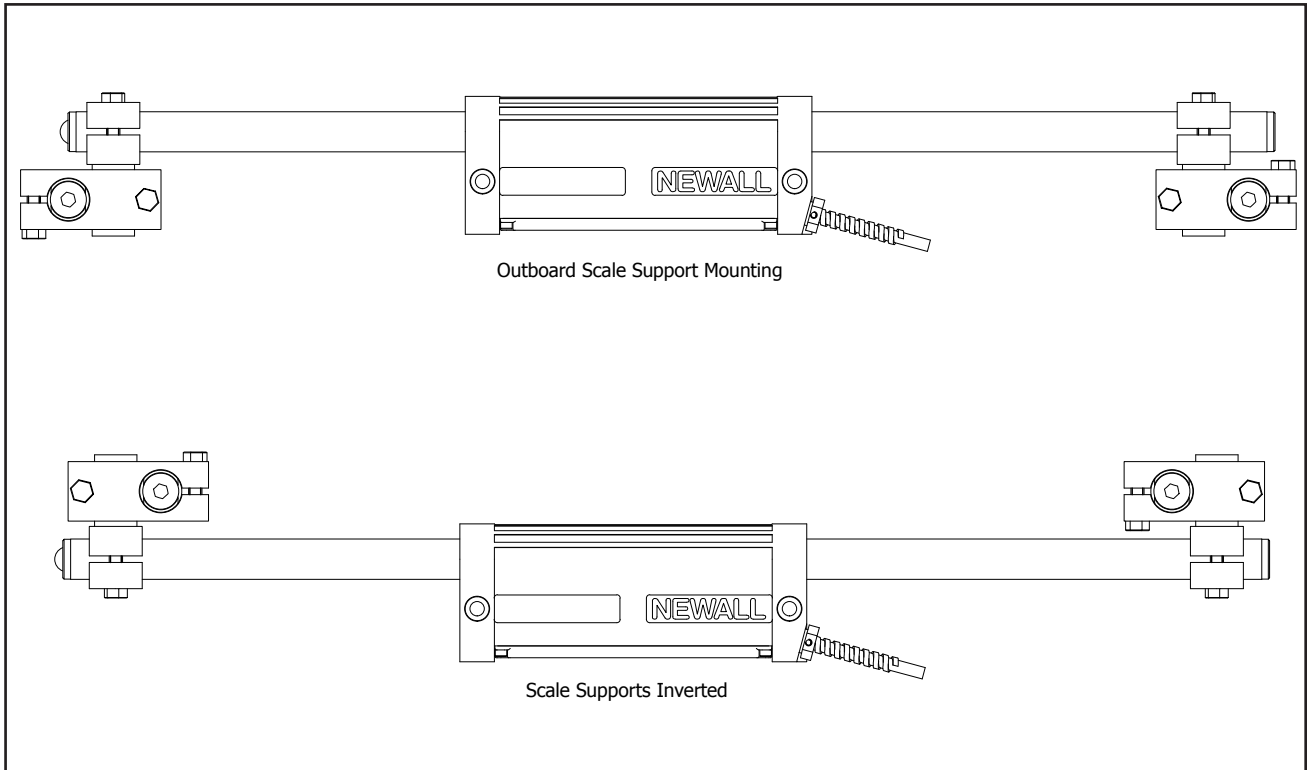
In order to avoid problems associated with electrical noise and interference, do not allow the cables to lie across electrical motors, fuse boxes or electrical pumps.

9.0 FINAL CHECK

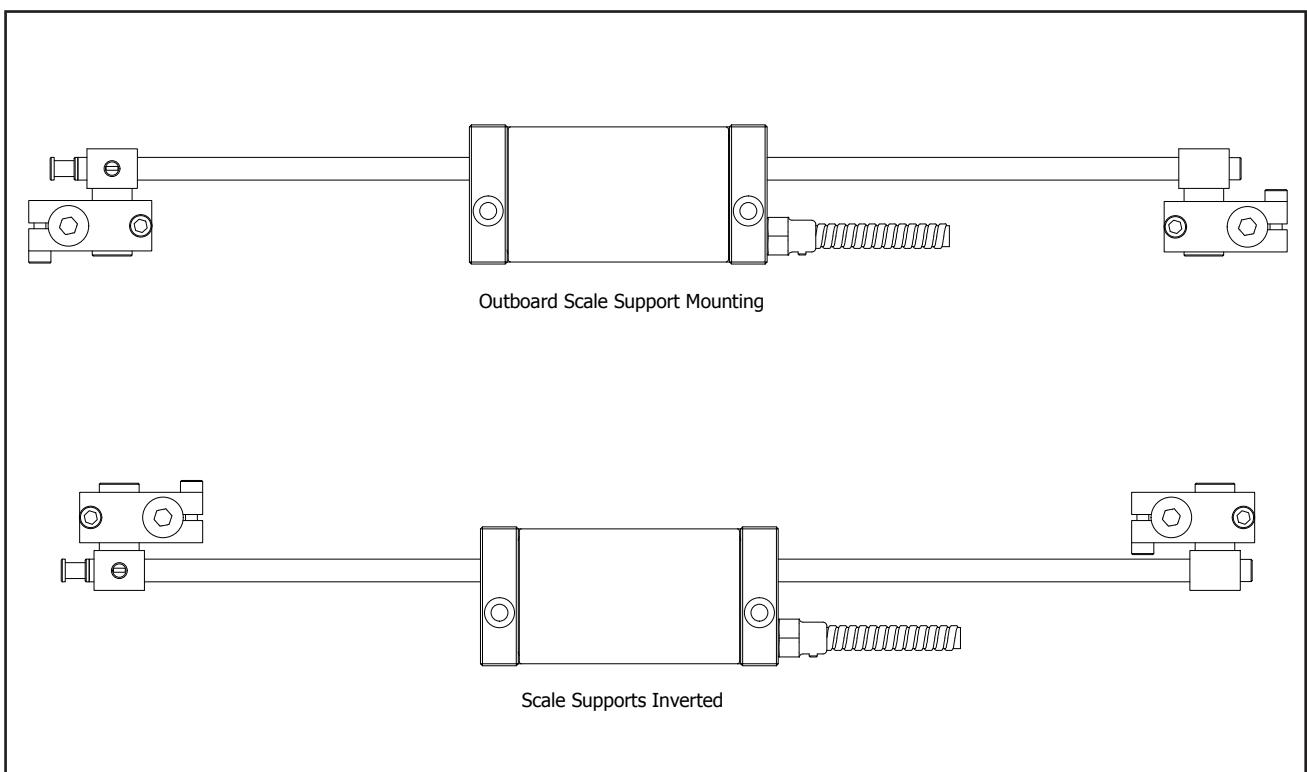
Prior to putting the encoder into operation, slowly traverse the machine axis to both extents of its travel checking at all times that the cables are secure and that machine over travel cannot occur. Newall will not accept responsibility for encoder malfunction caused by over travel or damaged cables.

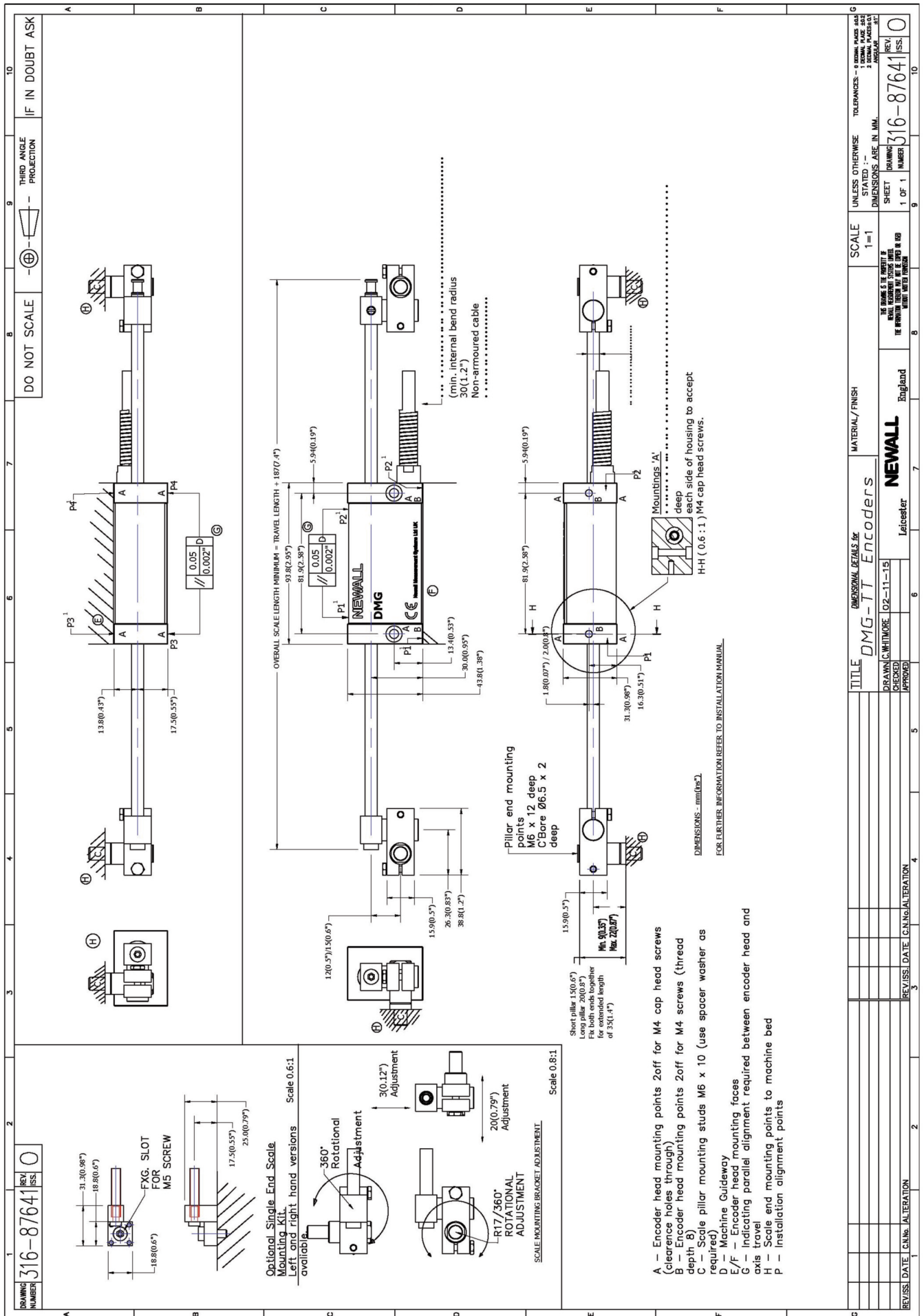
10.0 SCALE BRACKET ORIENTATION OPTIONS

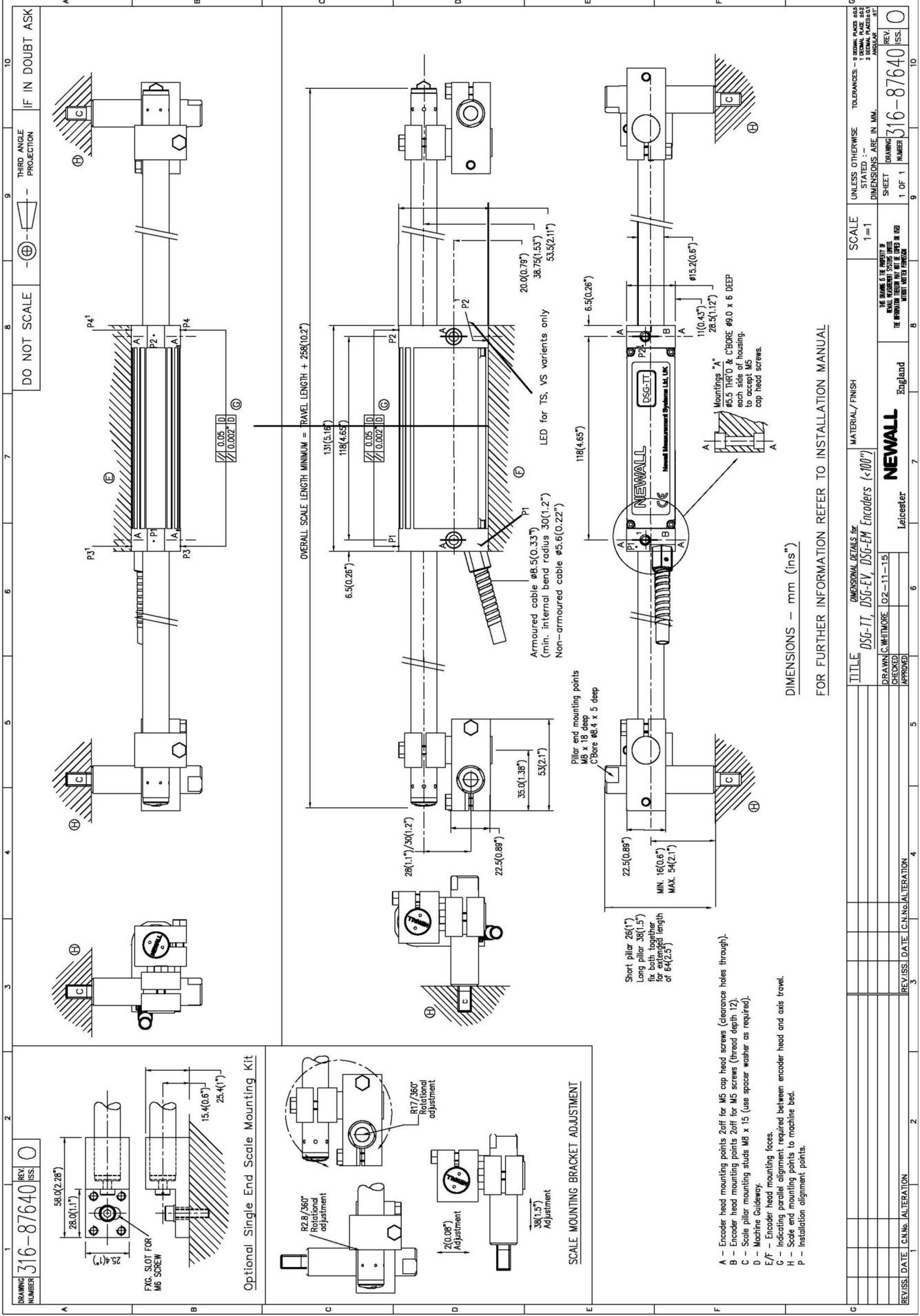
10.1 DSG



10.2 DMG







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