Guide Pulley & Tension Gauge

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Introduction

The fibre tension gauge is located directly above the capstan and enables draw tension measurements to be measured on a sampling basis before coating has been applied or to measure the coated fibre tension on a continuous basis.

(Drawings 286039A & 380186A, refer).

Description

The Fibre Tension Gauge comprises a 70mm root diameter pulley attached to a load cell. Both being supported by a mounting frame. This assembly is mounted between the Bottom Centering Pulley and the Capstan which act as the outer surfaces allowing a fibre wrap to be created.

The tension pulley is fitted to a pneumatic actuator so it can be moved into and out of line as required to either take spot measurements or to be left permanently engaged. To allow wrap angles to be reproducibly set, the slide mechanism is moved until it reaches an adjustable stop. The stop has a vernier scale to allow it to be reproducibly set.

Commissioning

Sensor & Amplifier Set-up.

Caution - The strain gauge is a delicate instrument. Excessive force applied beyond its maximum force rating can irreversibly damage it.

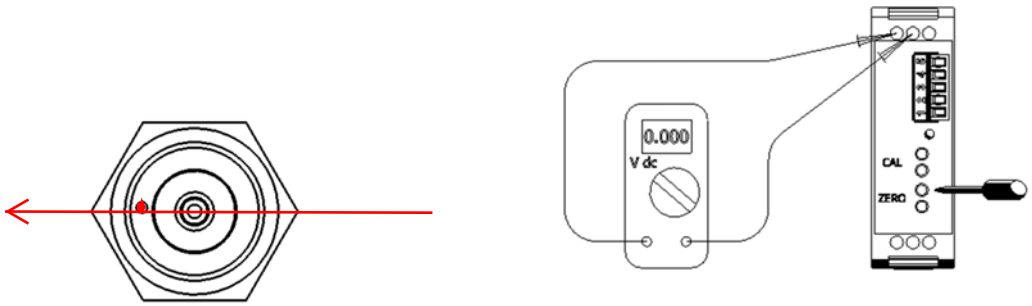
The unit is factory Set and ordinarily, the Sensor and Amplifier set up stage is only required if the strain gauge sensor or signal amplifier are replaced.

This manual is written based on a system rated for a maximum fibre tension of 700gm (6.87 Newtons) using a strain gauge rated for a maximum of 5 Newtons.

Due to the geometry of the tension monitoring system the strain gauge maximum is not identical to the maximum fibre tension. The principles and method of calibration are applicable to systems rated to different maximum fibre tension and strain gauge ratings.

The single axis strain gauge sensor is a delicate instrument, rated to a maximum of 5 Newtons and is connected through a signal amplifier to a voltage analogue input on the tower PLC control system.

The initial step is to adjust the signal amplifier to give zero volts output with zero force applied to the sensor. To achieve this, the tension pulley is removed from the sensor and the sensor is orientated with the measure plane horizontal (measure force sensed from pulley axel towards RED dot), so with the RED dot at the 9 o’clock position for a ‘right handed’ tower or 3 o’clock for a ‘left handed’ tower. Take care not to overload the sensor when removing or replacing the pulley. Whilst monitoring the analogue output (PLC input on SCADA Test page or hand held multi meter) of the amplifier, adjust the **ZERO** pots for a signal of 0.000 volts.



Direction of force is towards the red dot (from centre of axle)

FIGURE 1

To obtain full scale deflection, orientate the measure plane vertically, so with the RED dot at the 6 o'clock position and load the pulley axel with a total mass of 510 grams (5N), with a combination of the pulley itself (c/w fastening screw & spacer) with additional mass suspended on a thread from the center of the pulley groove. Whilst monitoring the analogue output (PLC input on SCADA Test page or hand held multimeter) of the amplifier, adjust the **CAL** pots for a signal of 10.000 volts.

Remove the added mass from the pulley and rotate the sensor so it is orientated with the measure plane horizontal, so with the RED dot at the 9 o'clock position, for a 'right handed' tower ,whilst also aligning the center of the pulley groove to the fibre line. The analogue output should ideally be 0.000 volts and if necessary, the rotational orientation of the sensor should be carefully tuned to get to as close as practically possible.

Furthermore, a zero offset can be entered on the SCADA Test page for final correction. See Fig.2.

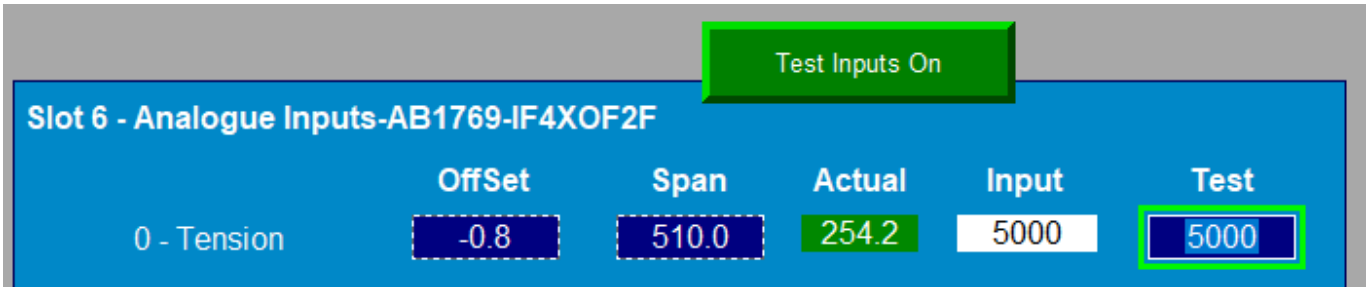


FIGURE 2

Description of Test Screen Data Entry and Display Fields

Offset Enter a positive or negative number in here until the [actual] display reads zero grams when no fibre is present in the gauge but the load cell pulley is in its measurement position.

Span Enter the rating of the load cell in grams in this field (not the maximum fibre tension that can be measured (e.g. for a 5N load cell enter 510gm).

Actual Displays the force exerted on the load cell (in grams) based on the Span Offset.

Note : This force may differ from the actual fibre tension.

Input Displays the number of millivolts being output by the load cell for information purposes only.

Test This data entry field is only active if the toggle button [Test Inputs] is in the [on] position and is used to provide a convenient way of seeing how a given output from the load cell will be interpreted as a force on the load cell. The field is in millivolts. For a load cell of 0-10V then entering, for example, 5000 will simulate the effect of the load cell seeing a force 50% of the full range of the load cell. The value shown in the [Actual] field shown then is 2.5N (255g) less the offset value i.e. 254.2 in the example figure shown.

Note : Do not forget to disengage this function for normal operation.

Tension Pulley Set-up – Setting the Wrap Angle for maximum sensitivity.

The force applied to the strain gauge sensor is dependent on fibre tension and the wrap angle around the sensor pulley. The gravitational force acting on the mass of the pulley is perpendicular to the measure axis, thereby leaving the full range of the gauge for sensing tension. Although the resultant force from the tensile load is not in line with the measure axis of the sensor, this is compensated for by increasing the wrap angle. The advantage of this set-up is that it simply requires only the tension pulley stop position and therefore the angle of wrap, to be adjusted to change the sensitivity and maximum range of tension measurement.

For a maximum range of 0 to 700-gram tension measurement, thread a test line from the dancer intake pulley, over the capstan intake pulley and through the capstan. Attach a 700-gram test weight to the dancer end of the test line, such that it is free to move, unimpeded, up & down as the tension pulley engages/disengages, displacing the test line. See Fig.3. For calibrations applying to 125micron fibre it is OK to use fishing line but for thicker fibres where resistance to bending is more significant we recommend using a sample of the fibre itself.

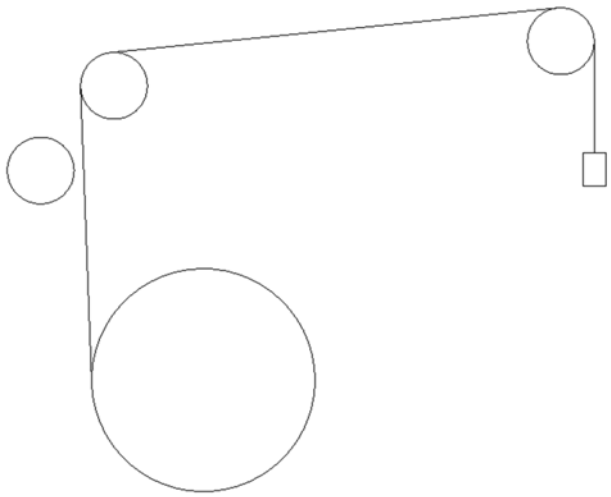


FIGURE 3

Release the tension pulley assembly pneumatic pressure by adjusting it's regulator to zero. Open the [Calibrate Coated Tension Gauge] pop-up screen. See Fig.4. Cell Output mV is display at the top of this screen. Slide the sensor into the fibre line whilst monitoring the gauge signal, until 10.000 millivolts is reached and note the pulley's position (there is a moving red pointer & ruled scale on the front of the assembly). Ease the tension in the test line. Adjust the position of the pulley stop to limit the pulley's

travel to the position noted. Slide the pulley back to it's retracted position. Adjust the pneumatic regulator to standard working pressure. Re-establish test line tension. Engage the tension pulley by operating the control switch in the normal manner. Check that the gauge signal shows 10.000 mV and no more. Disengage the tension pulley.

The Wrap Angle has now been set for maximum sensitivity at the rated fibre tension of the system.

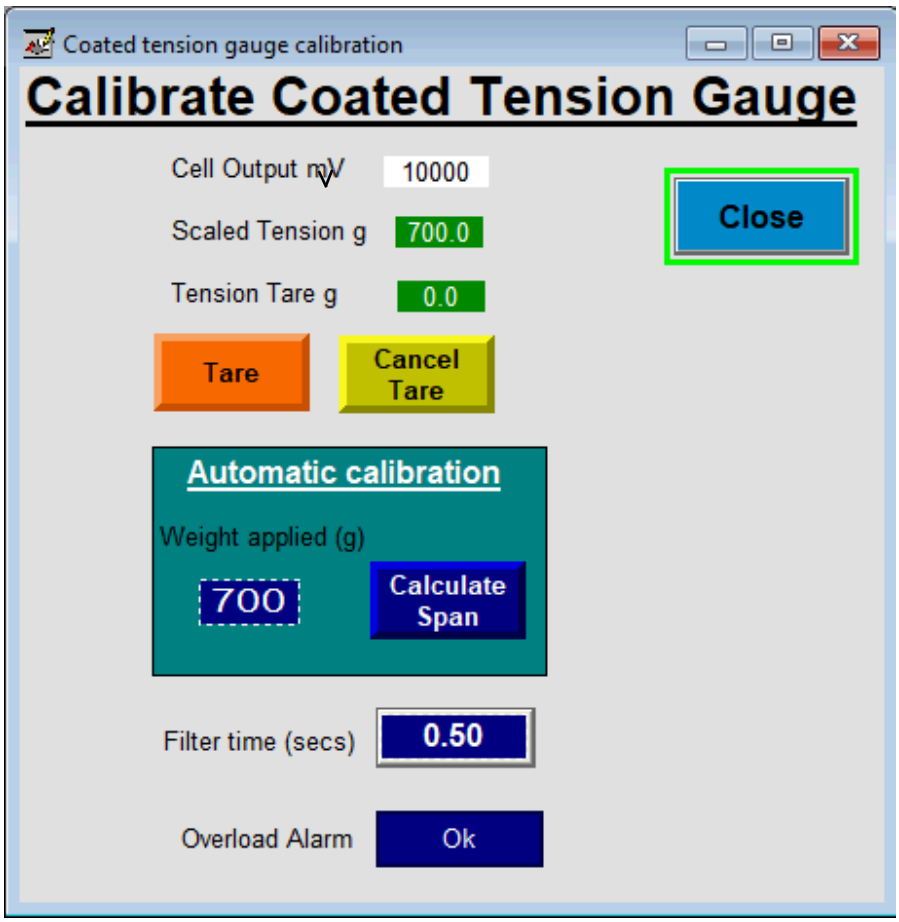


FIGURE 4

Calibration.

On the [Calibrate Coated Tension Gauge] pop-up screen. See Fig.4. Press the [Tare] button. Suspend the test weight as per Fig.3. Engage the tension pulley. In the [Automatic calibration] box enter the test weight, i.e. 700 (assuming a 700g suspended weight), and press the [Calculate Span] button.

Process Adjustment.

This procedure should be considered for inclusion in your standard set-up routine if you intend to utilize the tension gauge during the forthcoming draw. This will correct for any sensor drift & non-linearity.

Thread a test line, as described above, with a test weight equal, or close to the process target tension. Best accuracy is required at a tension close to those used for production. Open the [Calibrate Coated Tension Gauge] pop-up screen. Press the [Tare] button. Engage the tension pulley. In the [Automatic calibration] box enter the test weight and press the [Calculate Span] button.

Maintenance

Warning ***The correct Personal Protective Equipment (PPE) is to be worn at all times.***

Warning ***Working at height and related safety.***

- ***Personnel are to remain behind guard rails at all times and/or wear an appropriate safety harness.***
- ***Personnel are to practice good housekeeping and methodical working practices to prevent items falling from the tower.***

Warning ***Methanol.***

- ***Methanol is toxic if ingested and can be absorbed through the skin on prolonged exposure.***
- ***Impermeable gloves are to be worn.***

General

There are no serviceable parts in the load cell. If the unit will not calibrate or is giving erratic readings, it will need to be returned to the manufacturer for attention.

Routine

The following inspection and servicing procedure is to be carried out. The frequency of the inspection and servicing may vary dependant on tower usage and the working environment.

Weekly

Check that the pulley rotates freely, the bearing has no significant play and that the root of the pulley's "V" is free from dirt.

Warning ***Take care not to overload the load cell if cleaning the pulley***

Monthly or as required

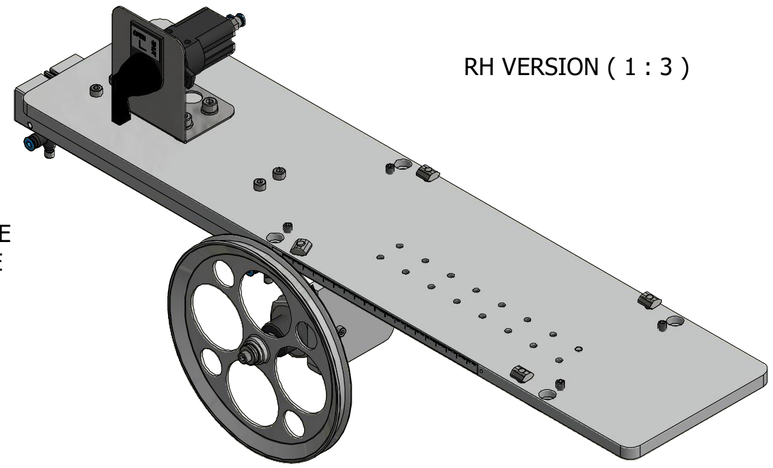
Check tension gauge calibration.

REVISION HISTORY				
REV	DESCRIPTION	DCR No.	DATE	APPROVED
1	FIRST ISSUE		07.2.18	ck

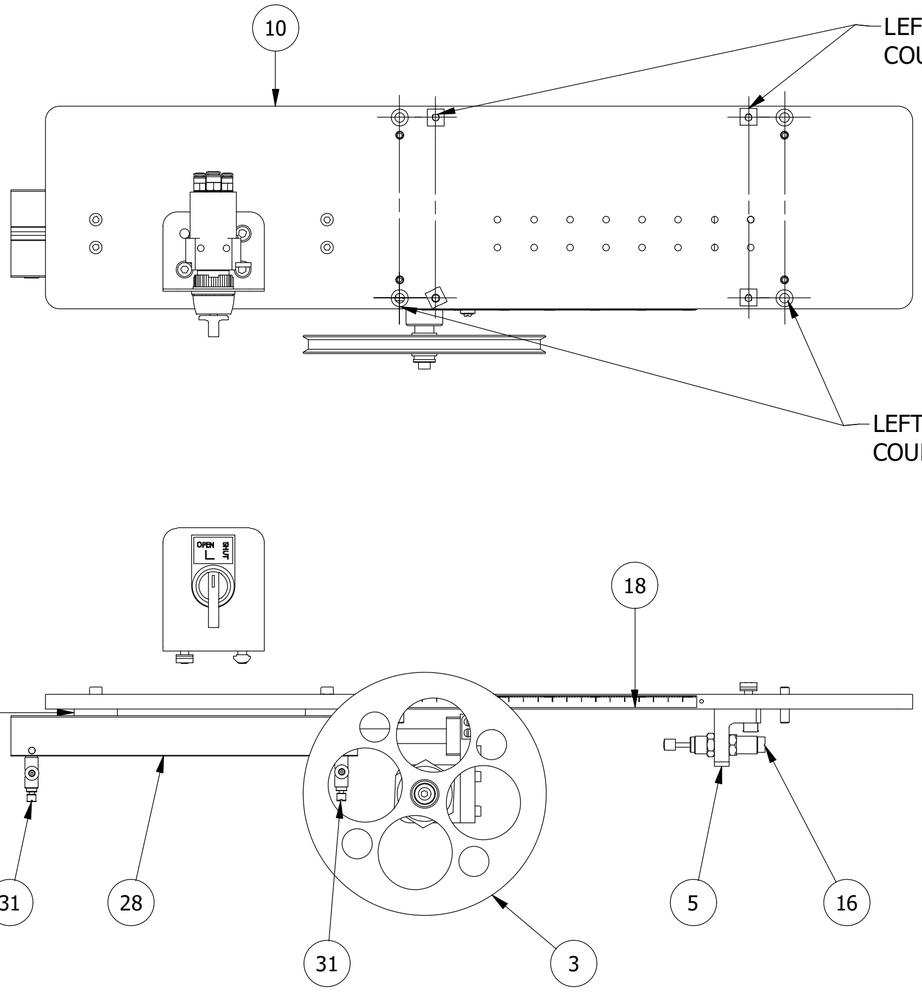
NOTE

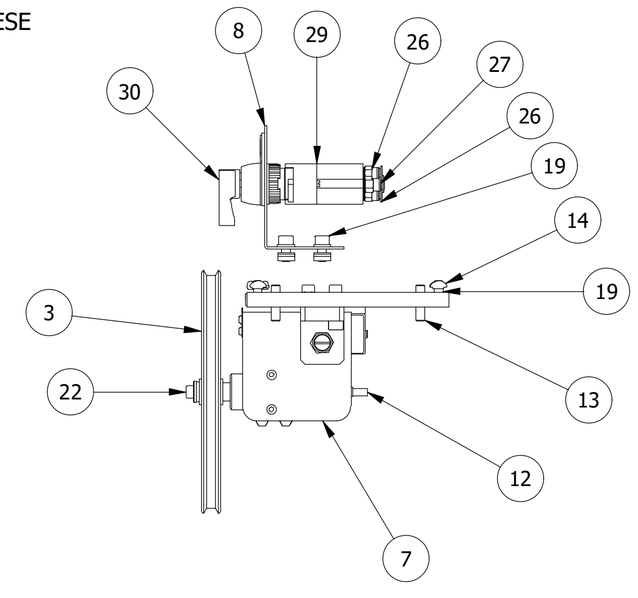
RIGHT HAND ORIENTATION

REFER TO SHEET 2 FOR SECTIONS OF PULLEY AND OTHER DETAIL.
ALL ARE BUILT THE SAME, LEFT HAND VERSION IS POSITIONED DIFFERENTLY ON THE MAIN PLATE.



RH VERSION (1 : 3)





SG Controls Limited

DRAWN	DATE
ckerby	07/02/2018

DO NOT SCALE
IF IN DOUBT ASK
UNLESS OTHERWISE STATED DIMENSIONS ARE IN mm
DIM TOL' 0 ± 0.3
0.0 ± 0.1
ANGULAR TOL ± 0.5
SURFACE FINISH: 1.6 µm
REMOVE ALL SHARP EDGES

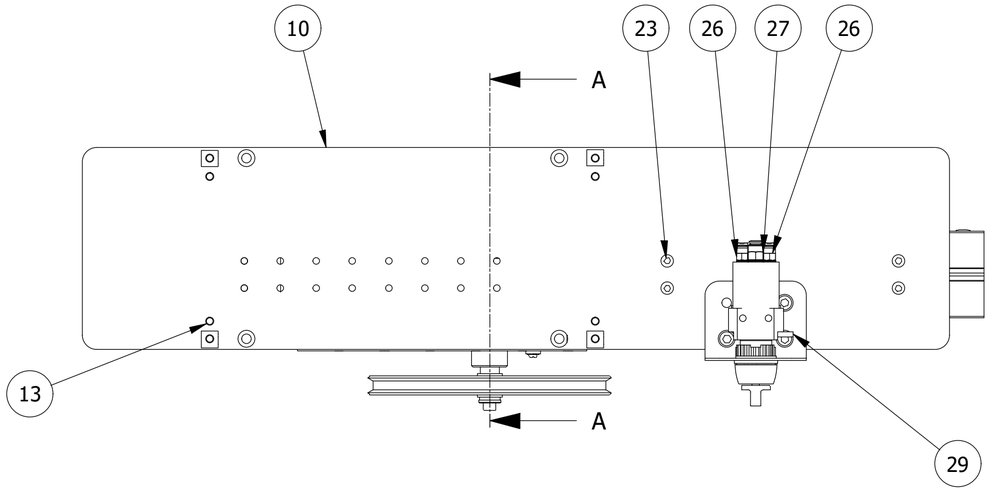
TITLE: TENSION MONITOR RH

USED ON	DRG No.	SHEET	REV
380000A	286039A	1 OF 3	1
	MATERIAL: -	ORIG SCALE	1:3
	FINISH:	ORIG SHEET	A2

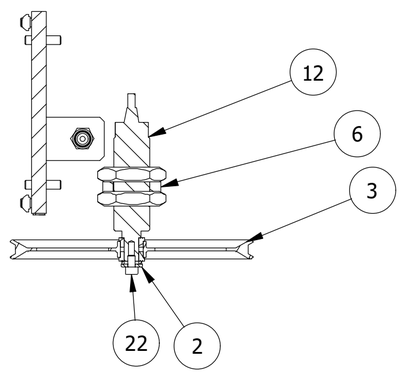
NOTE

LEFT HAND ORIENTATION SHOW ON THIS SHEET

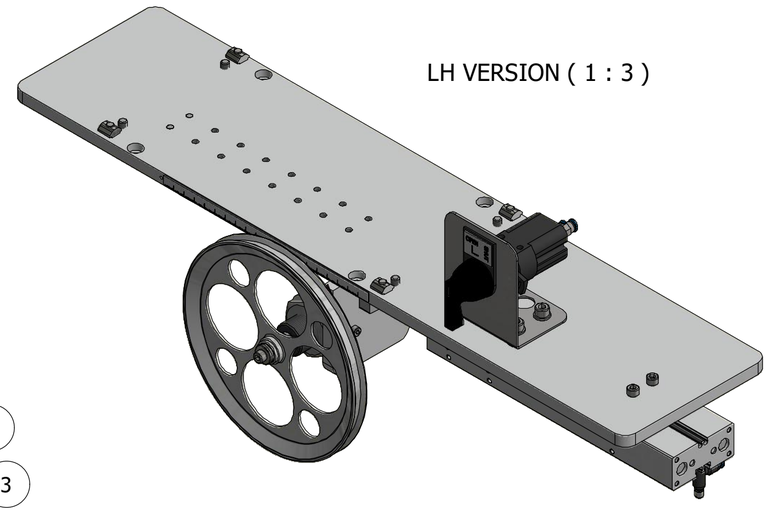
SEE SHEET 1 FOR RIGHT HAND ORIENTATION

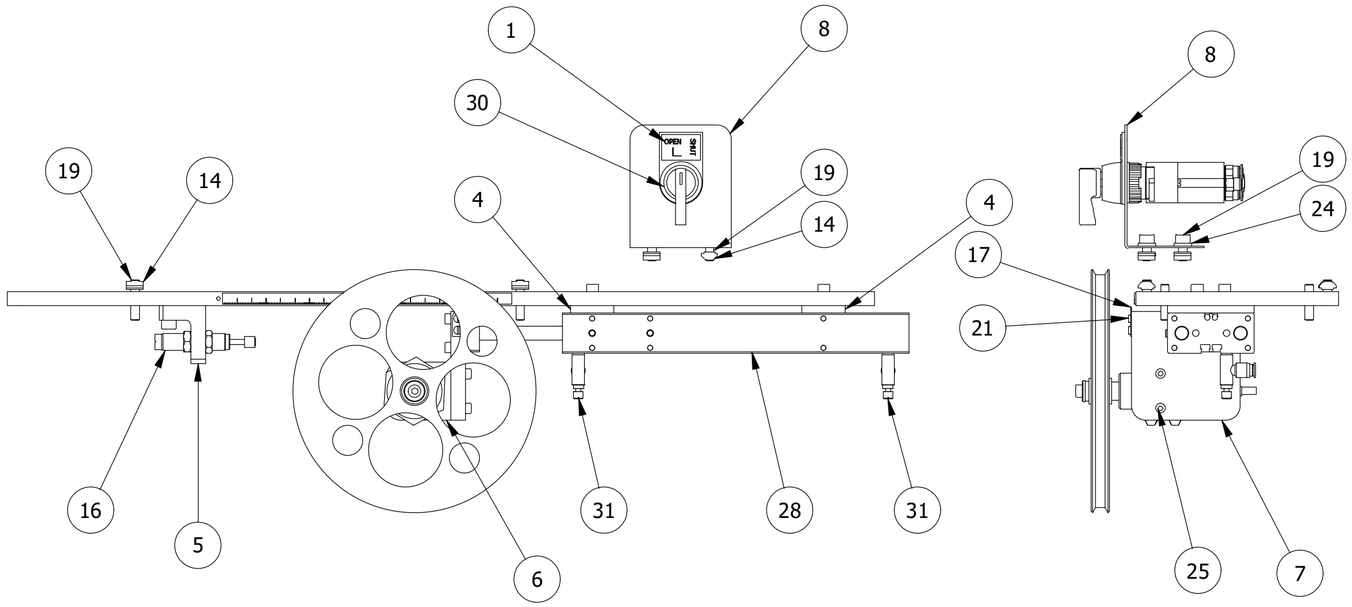


A-A (1 : 3)



LH VERSION (1 : 3)





ASSEMBLY NOTES:

1. SEE 284897A FOR GUIDE PULLEY SUPPORT FRAME.
2. BLUE 4mm OD TUBE IS TO BE FITTED BETWEEN THE SELECTOR VALVE AND FLOW CONTROL VALVES AS PER THE DIAGRAM.
3. CUSTOMER WILL NEED TO PROVIDE PNEUMATIC SUPPLY. 8 BARG MAX. A 6mm PUSH-FIT FITTING IS PROVIDED.
4. K00482 - 4 OFF ARE PROVIDED TO ALLOW ADJUSTMENT OF THE BASE-PLATE'S ATTITUDE TO ENSURE THAT THE PULLEY IS PERPENDICULAR.
5. THE STOP BLOCK CAN BE MOVED TO THE APPROXIMATE STOP LOCATION AND FINE TUNING IS CARRIED OUT USING ADJUSTMENT OF THE SHOCK ABSORBER POSITION.

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	283830-8	LABEL - OPEN/SHUT
2	1	284565	CLAMP WASHER
3	1	284665	150mm DIA FLAT BOTTOM PULLEY
4	2	284890	SPACER
5	1	284892	STOP BLOCK
6	1	284893	MOUNTING PLATE
7	1	284894	END PLATE
8	1	284895	BRACKET - SEL SWITCH
9	1	284995	M10 SPECIAL WASHER
10	1	286040	BASEPLATE
11	1	EE048248	LEGEND PLATE
12	1	EL82617	5N TENSION SENSOR
13	4	H04380	StScr-M6x25 S/S
14	7	H04445	T-NUT M6 8MM
15	1	H04517	DAMPER NUT M12X1
16	1	H04519	ACE SHOCK ABSORBER
17	1	H04520	POINTING PLATE
18	1	H04521	SCALE PLATE 200MM
19	7	K00067	HxCpHd M6x12 S/S
20	2	K00086	HxCpHd M6x20 S/S
21	2	K00096	PnHd M3 x 8 S/S
22	1	K00162	HxCpHd M5x8 S/S
23	4	K00293	HxCpHd M5x20 S/S
24	3	K00313	Washer 6mm Std S/S
25	6	K00482	HxCpHd M4x16 S/S
26	2	P03736	M5 TO 4MM PUSH IN
27	1	P03752	PUSH IN FITTING 6mm TUBE TO M5
28	1	R00125	DMF12 GUIDED DRIVE
29	1	V01486	5/2 VALVE PANEL MOUNT
30	1	V01487	ACTUATOR - SELECT SW
31	2	V01535	ONE WAY FLOW CTRL VALVE

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DRAWN ckerby DATE 07/02/2018

DO NOT SCALE

IF IN DOUBT ASK

UNLESS OTHERWISE STATED DIMENSIONS ARE IN mm

DIM TOL' 0 ± 0.3
0.0 ± 0.1
ANGULAR TOL ± 0.5
SURFACE FINISH: 1.6 µm

REMOVE ALL SHARP EDGES

TITLE: TENSION MONITOR LH

USED ON 380186A

DRG No. 286039A

SHEET 2 OF 3

REV 1

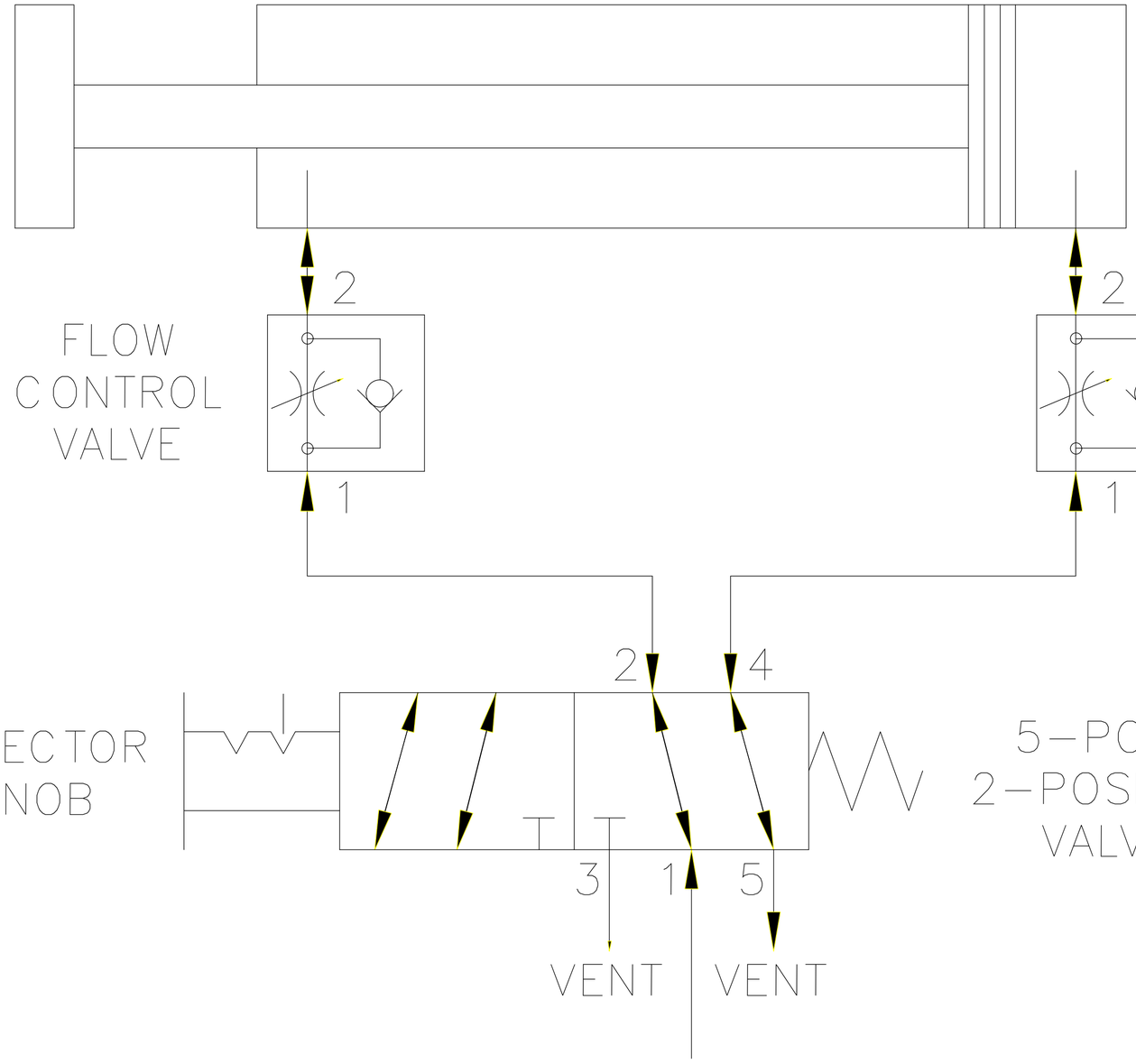
MATERIAL: -

ORIG SCALE 1:3

FINISH:

ORIG SHEET A2

DFM GUIDED DRIVE



PNEUMATIC CIRCUIT

SG Controls Limited

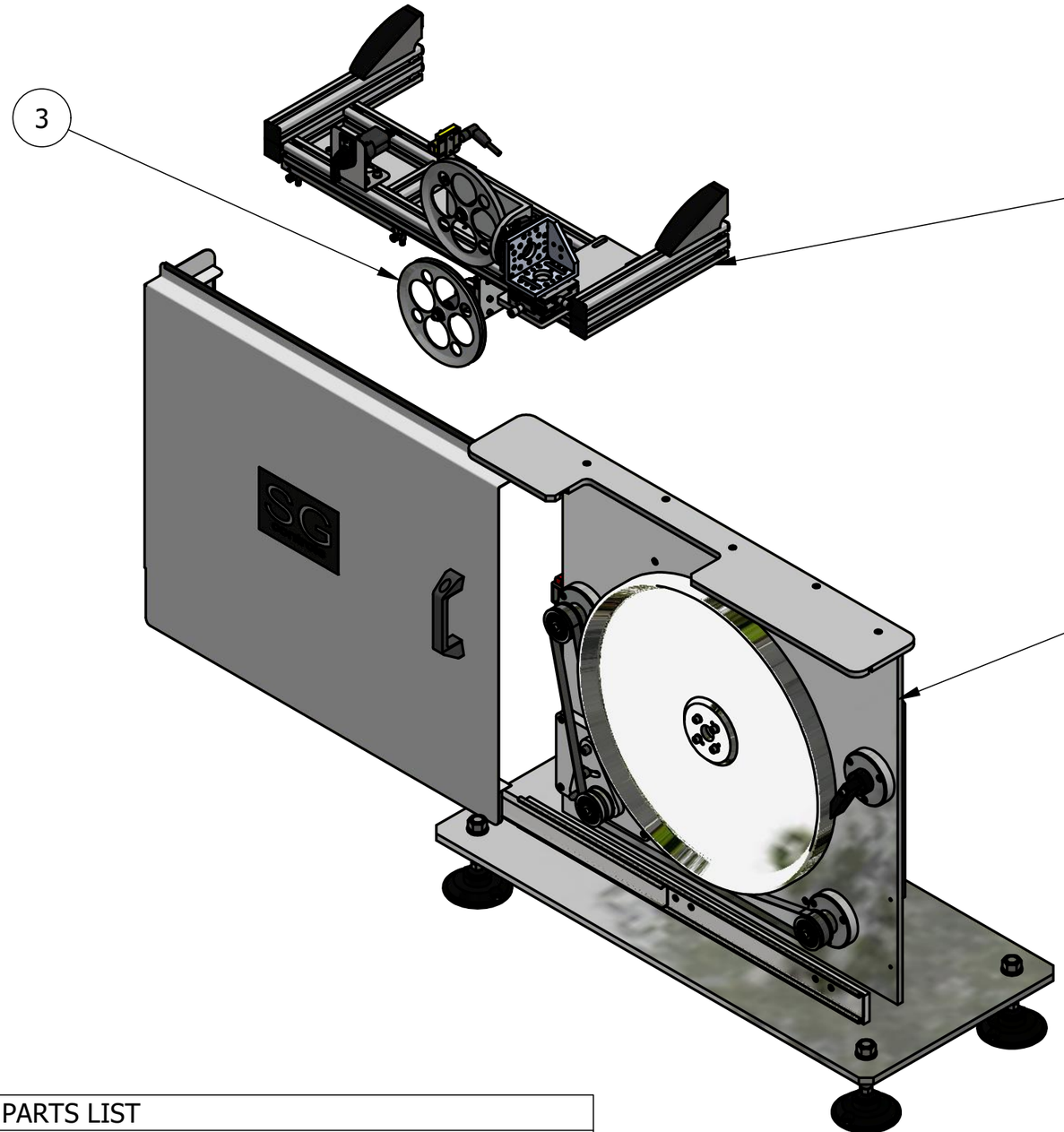
DRAWN: ckerby | DATE: 07/02/2018

DO NOT SCALE
IF IN DOUBT ASK
UNLESS OTHERWISE STATED
DIMENSIONS ARE IN mm
DIM TOL' 0 ± 0.3
0.0 ± 0.1
ANGULAR TOL ± 0.5
SURFACE FINISH: 1.6 µm
REMOVE ALL SHARP EDGES

TITLE: TENSION MONITOR RH

USED ON	DRG No.	SHEET	REV
380000A	286039A	3 OF 3	1
	MATERIAL: -	ORIG SCALE	1:3
	FINISH:	ORIG SHEET	A2

REVISION HISTORY				
REV	DESCRIPTION	DCR No.	DATE	APPROVED
1	FIRST ISSUE		22.6.20	AJW



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	380111A	GUIDE PULLEY & BREAK DETECTOR
2	1	287756A	500mm CAPSTAN SLIDING DOOR
3	1	381550A RH	TENSION MONITOR RH

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DRAWN aweise | DATE 22/06/2020

DO NOT SCALE

IF IN DOUBT ASK

UNLESS OTHERWISE STATED
DIMENSIONS ARE IN mm
DIM TOL' 0 ± 0.3
0.0 ± 0.1
ANGULAR TOL ± 0.5
SURFACE FINISH: 1.6 µm

REMOVE ALL SHARP EDGES

TITLE

CAPSTAN SYSTEM - SOREQ TOWER

USED ON	DRG No.	SHEET	REV
	380186A	1 OF 1	1
	MATERIAL:	ORIG SCALE	1 :8
	FINISH:	ORIG SHEET	A3