


Document Title		RHGSE Capstan Check using Zephyr Capstan Measuring Tool ZT-029-00				
Document #	Rev	Type	Reason	Recommendation	Original Release Date	
ZSB-021	Original	Service Bulletin	Improved Maintenance	Optional	2017-04-04	

Zephyr RHGSE Capstan Check and Upgrade Using Zephyr Capstan Measuring Tool ZT-029-00



Zephyr International LLC

5015 Enoch Rd, Conway SC 29526 USA


Phone 843-365-2675 * Fax 843-365-2677

Email: info@zephyrintl.com

Web: www.zephyrintl.com

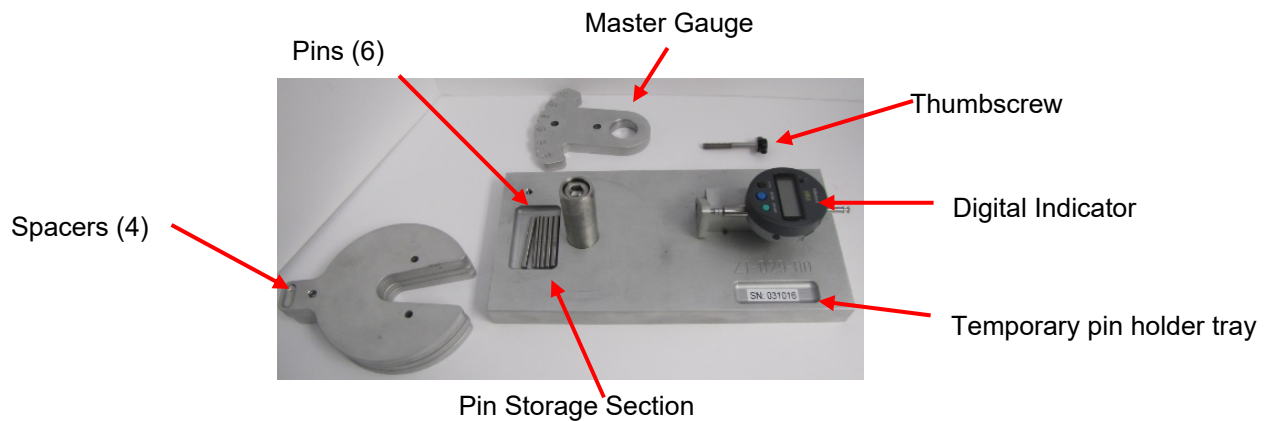
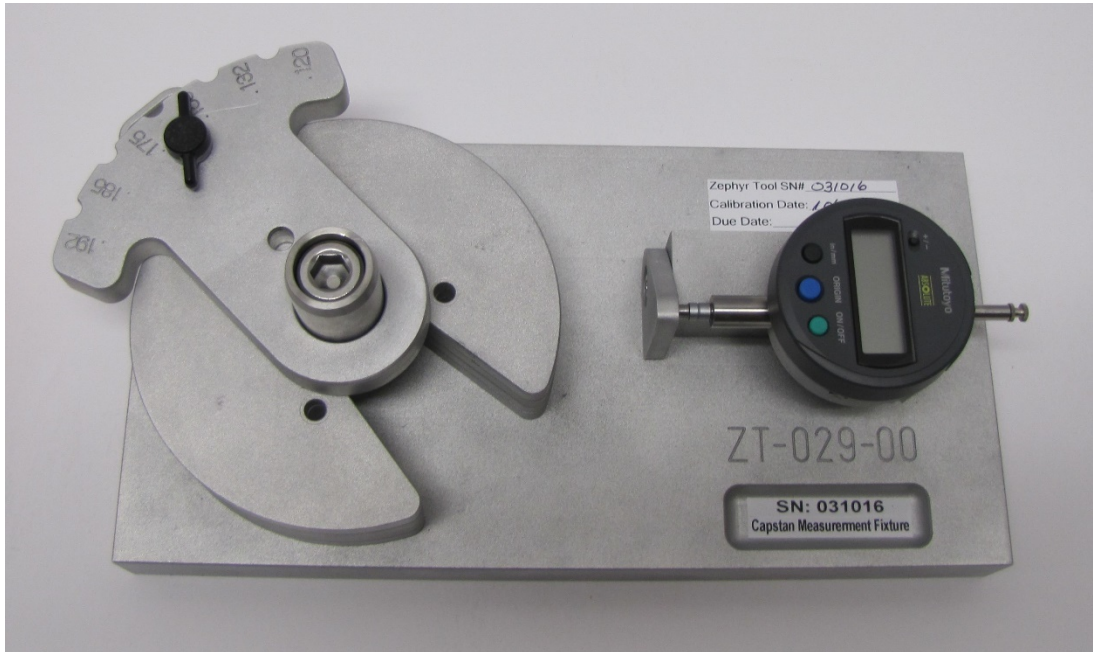
Serving Helicopter Rescue Hoist Users Worldwide


Prepared by	Jim Brown	jbrown@zephyrintl.com
Checked by	Elizabeth Bielsa-Mitchell	zephyradmin@zephyrintl.com
Approved by	Michael R Mitchell	mmitchell@zephyrintl.com

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Purpose: To advise Zephyr Rescue Hoist Ground Support Equipment (RHGSE) users of:

- 1) Effects of worn capstans and cable diameter.
- 2) The procedure to check the capstans.
- 3) To advise the various part number capstans available for the various size cables.
- 4) To advise on the replacement procedures.
- 5) To advise the availability to measure the capstans with the new Zephyr capstan measuring tool instead of using calipers.



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Capstan Measuring

Used for measuring the 3, 4 or 5 Groove capstans.

3 Groove Capstan



4 Groove Capstan



5 Groove Capstan



Measuring the pitch diameter of the capstans is **essential** for the proper operation of your Zephyr RHGSE.

Effect of rescue hoist cable diameter

The rescue hoist cable diameter is an important variable that affects the way the cable is collected in the rotating tub of the Zephyr RHGSE. The cable diameter does vary according to the way the wire rope manufacturer produces the cable. There are also several different cable diameters being used worldwide today. The table below correlates the cable diameters to the correct capstans that should be used with the cable.

Upper Capstans: Note: ZGS-12474-2 can be used for 3/16 and 4.5 mm cables.

Cable Diameter	Upper Capstan Part Number	Measurement Pin diameter	Minimum dimension over gage pin
3/16 inch	ZGS-10113-20	.185	(- .012 in)
4.5 mm	ZGS-12474-2	.175	(- .012 in)
5/32 inch	ZGS-10113-30	.156	(- .010 in)
3.5 mm	ZGS-10340-1	.132	(- .008 in)
1/8 inch	ZGS-10113-40	.120	(- .007 in)

Lower Capstans: Note: ZGS-12474-1 can be used for 3/16 and 4.5 mm cables.


Cable Diameter	Lower Capstan Part Number	Measurement Pin diameter	Minimum dimension over gage pin
3/16 inch	ZGS-10113-20-1	.185	(- .012 in)
4.5 mm	ZGS-12474-1	.175	(- .012 in)
5/32 inch	ZGS-10113-30	.156	(- .010 in)
3.5 mm	ZGS-10340-1	.132	(- .008 in)
1/8 inch	ZGS-10113-40	.120	(- .007 in)

Capstans with a first steel groove can be used for 3/16 and 4.5 mm cables.

Cable Diameter	Part Numbers	Measurement Pin diameter	Minimum dimension over pin
4.5 mm	ZGS-10276-1 ZGS-10506-1, ZGS-12971-1	.192 gage pin	(- .004 in.)

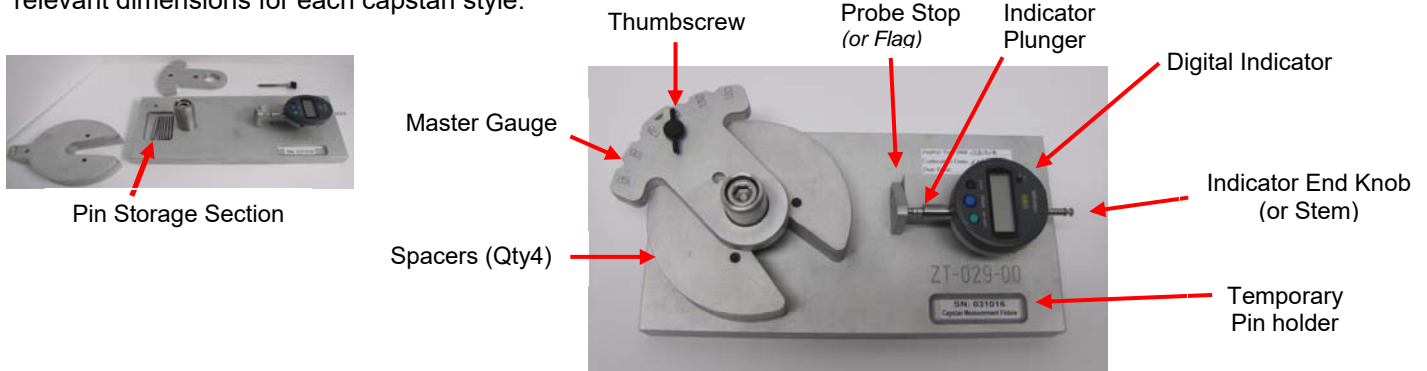
Effect of worn capstans

The capstans will wear as a result of slipping and heavy loading over time. The first groove on the lower capstan will wear first because it has the heaviest load applied to it. For RHGSE's that are being used with a 600 lbs. capable hoist, the lower capstan is black and a harder material than the upper capstan. When the wear of the capstans becomes significant, the cable will slip excessively on the capstans. The results may be seen as the cable starting to ride to the top of the spooler or twisting of the cable between the top of the RHGSE and the rescue hoist.

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ZT-029-00 Zephyr Capstan Measurement Fixture

To check the pitch diameter using the Zephyr Capstan Measuring Tool ZT-029-00, a pin of the correct diameter is required. There are several capstans available for the different size cables in use. It is important to use the correct part number capstans for the type of cable being serviced. The table list on the previous page has the relevant dimensions for each capstan style.



The master gauge is used for zeroing the digital indicator. The blue button on the digital indicator zeroes the indicator value.

It is recommended that measurements are taken at four locations of each groove of the capstan, since capstans do not always wear evenly.



- (1) At the keyway
- (2) 90 degrees from the keyway
- (3) 180 degrees from the keyway
- (4) 270 degrees from the keyway

Ensure that the capstan to be measured is **free from any particles** to allow for an accurate reading. Once the capstan has worn down beyond the minimum dimension referenced on table page 3, the capstans must be replaced.

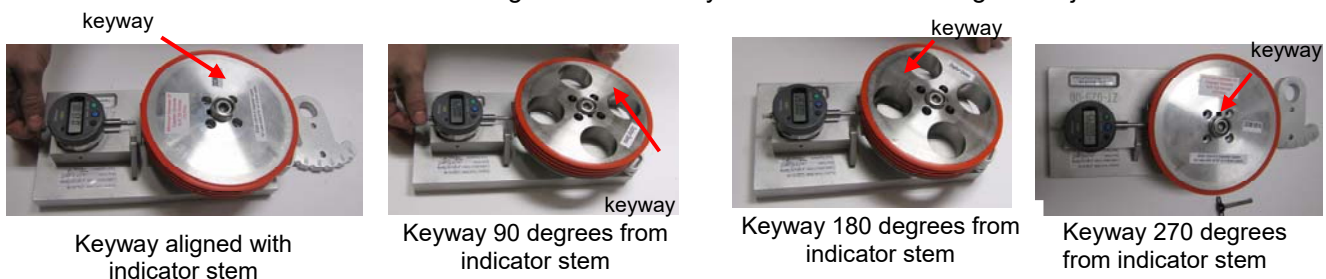
(Beyond minimum = negative number greater than referenced minimum values on table page 3). Values on indicator at zero or (+.002) indicate a non-worn capstan.


Spacers under the capstan to be measured allow each groove to align with the height of the indicator tip to measure all of the grooves individually.

Note: All capstans have the same pitch diameter. The master gauge size and gauge pin size will change for varying size capstans based on the cable diameter. See the table on page 3.

Keyway Illustration

A dimension on either end of the capstan can be used to check for wear and ensure accuracy. Note: 1 dimension of the 4 taken at each groove that is beyond minimum is enough for rejection.



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Flag Illustration

Probe stop or flag is raised to hold indicator plunger while rotating the capstan. Lower the flag when you are ready to measure the capstan
(Note: Illustrations are shown using 3 or 4 groove capstans. Procedures apply to all capstans 3, 4 and 5 groove.)



Process for Measuring Capstans



The 3 Groove Capstans have all 3 molded grooves and no steel grooves. It is the standard capstan to be used with all the Zephyr RHGSE.



The 4 Groove Capstans have a steel first groove and 3 molded grooves. It is used only on the Zephyr Hydraulic RHGSE, for running at high loads.
Note: It is not recommended to run at high loads all the time.



The 5 Groove Capstans have a steel first groove and 4 molded grooves. It is only used on the Zephyr Depot Test Facilities.

Setting up the capstan measurement fixture.

Follow the steps for setting up the capstan measurement fixture for measuring all capstans.

Step 1) Unwind the thumbscrew.




Step 2) Remove the Master Gauge.



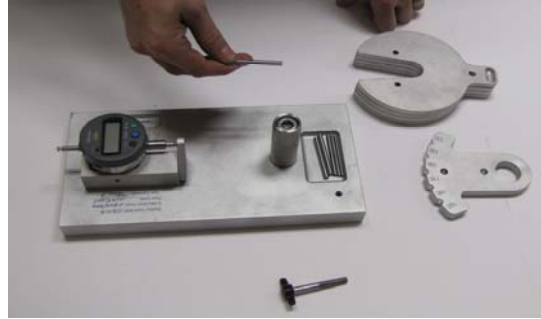
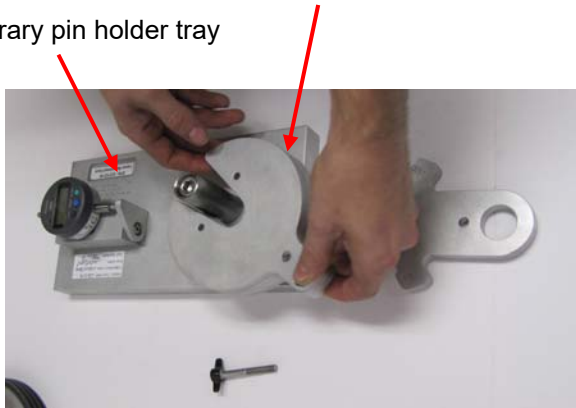
Step 3) Remove all four spacers from fixture.

Step 4) Take the correct gauge pin(s) from the pin storage, and place the pin(s) in the temporary pin holder.

Note: If you are measuring the 3 groove capstans, you will need only one size pin. For the 4 and 5 groove capstans, you will need two different size pins. See capstan chart table on page 3 for pin sizes.

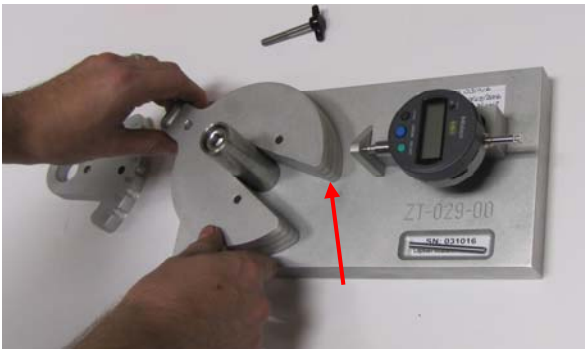
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Temporary pin holder tray

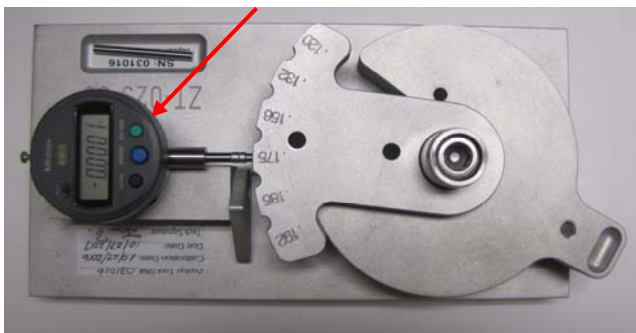


Step 5) Place all 4 spacers back onto the fixture.


Step 6) Place the Master Gauge back on the fixture with numbers facing towards the digital indicator.



Step 7) Press the green button to turn the digital indicator on.



- On/Off Power button
- Origin button for zeroing and indication reading.
- All capstan measurements are to be done in English/Imperial values.

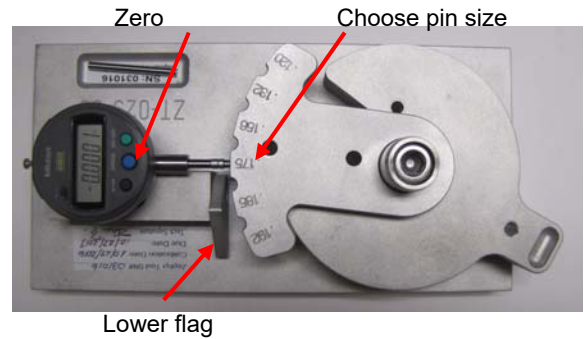
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Measuring three (3) groove Capstan.

Step 1)

- Zero the indicator by pressing the blue button while indicator plunger is resting on correct master gage size for molded grooves.

Reminder when zeroing the value on the indicator and/or taking a reading, remember to pull and release stem back and let it go until it touches the master gauge, repeat a couple of times to make sure the zero reading or value is consistent.



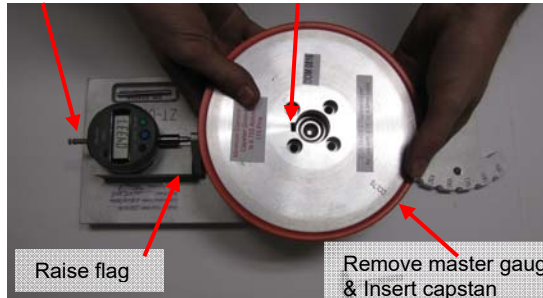
Step 2)

- Pull the stem back and raise the flag.
- Remove the master gauge.
- Leave in all (4) spacers if measuring the 3 groove capstans.
- Insert the capstan to be measured on top of the spacers with keyway facing the digital indicator



Pull stem back

Keyway facing indicator



Raise flag

Remove master gauge & Insert capstan

Step 3)

- Place the correct size pin in the first molded groove of the capstan. Keyway pointing to the indicator.

Step 4)

- Hold the stem and lower the flag.




Step 5)

- Ensure indicator plunger tip, pin and groove have solid contact. "View value" and record.

Step 6)

- Raise the flag, remove the pin, and place in the temporary pin holder.

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Step 7) Complete the following for each molded groove, note the “value” for each on indicator.

- Rotate the Capstan approximately 90 degrees from the keyway, and repeat steps 3-6.
- Rotate the Capstan approximately 180 degrees from the keyway, and repeat steps 3-6.
- Rotate the Capstan approximately 270 degrees from the keyway, and repeat steps 3-6.



- (1) At the keyway
- (2) 90 degrees from the keyway
- (3) 180 degrees from the keyway
- (4) 270 degrees from the keyway


Step 8)

- Remove one of the spacers. Repeat steps 3-7 for measuring the **second molded groove**.

Step 9)

- Remove one more of the spacers. Repeat steps 3-7 for measuring the **third molded groove**.



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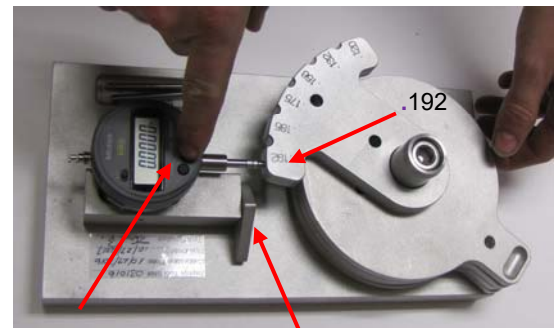
Measuring steel first groove.

The following steps are only applicable when measuring the first steel groove on the 4 and 5 groove capstans.

To measure the **4 and 5 Groove Capstans**, two pins are used. The .192 pin is used for the steel groove and the appropriate pin for the molded grooves; as referenced on capstan chart page 3 for molded groove pin size.

Step 1)

- Position the master gauge on the .192 pin
- Lower the flag. A flip flag is used to hold the plunger of the indicator back prior to any measuring.
- Zero the value on the indicator by pressing the blue button.

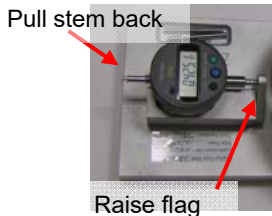


Zero the value out

Lower flag

Step 2)

- Pull the stem back and raise the flag.
- Remove the Master Gauge, and leave in all 4 spacers.
- Insert the capstan to be measured on top of the spacers with keyway facing the digital indicator



Raise flag



Remove master gauge



Leave all (4) spacers under capstan




Insert capstan with keyway facing the indicator (shown is a 4-groove capstan)

Step 3)

- Place the .192 size pin in the steel groove of the capstan. Keyway pointing to the indicator.



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Step 4)

- Hold the stem back.
- Lower the flag.
- Allow indicator plunger tip to make contact with .192 pin; ensure good contact “view value” and record.



Step 5)


- Pull the stem.
- Raise the flag
- Remove the pin from the Capstan.
- Place the .192 pin in the temporary pin holder.



- **Step 6)** Rotate the capstan as below and repeat steps 3-5.
- **Note:** Any one (1) dimension of the four (4) beyond minimum is cause for rejection.



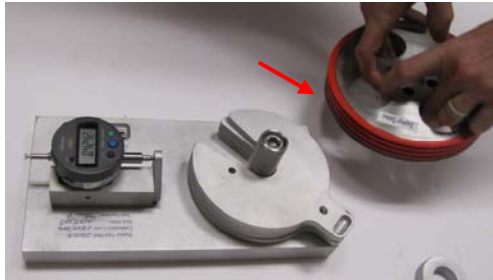
- Rotate the Capstan approximately 90 degrees from the keyway, and repeat steps
- Rotate the Capstan approximately 180 degrees from the keyway, and repeat steps
- Rotate the Capstan approximately 270 degrees from the keyway, and repeat steps

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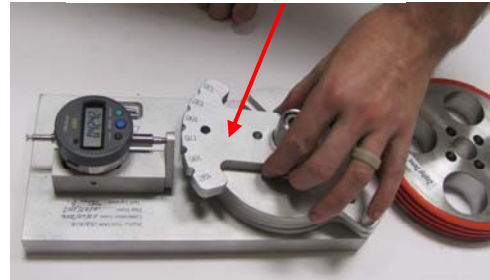
Measuring molded grooves for the 4 and 5 groove capstans.

Step 1)

- Remove the Capstan
 - Replace master gauge onto the fixture.
 - Reposition the master gauge and zero out value at the correct size pin for the molded grooves.
- See reference capstan chart on page 3.



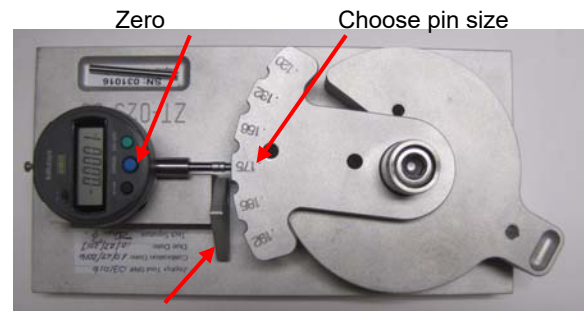
Position to correct pin size.



Step 2)

- Zero indicator by pressing the blue button while indicator plunger is resting on correct master gage size for molded grooves.

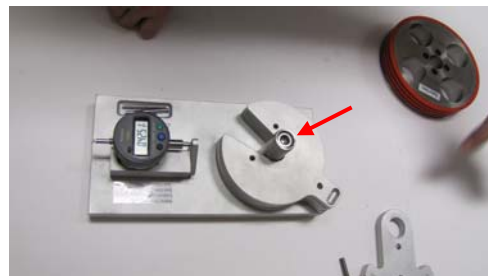
Reminder when zeroing the value on the indicator and/or taking a reading remember to pull and release stem back and let it go until it touches the master gauge, repeat a couple of times to make sure the zero reading or value is consistent.




Lower flag

Step 3)

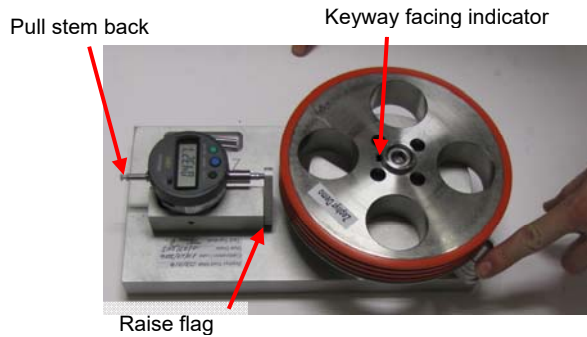
- Remove master gauge.
- Remove one spacer from the fixture in order to measure molded groove of 4 and 5 groove capstans.



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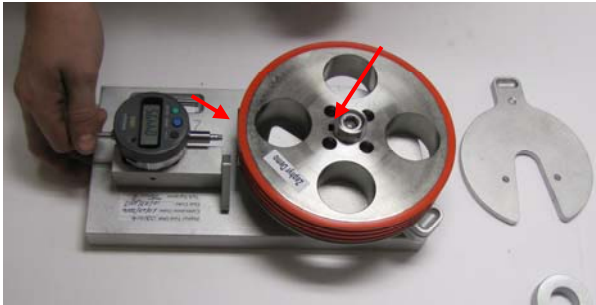
Step 4)

- Pull the stem back and raise the flag.
- Insert the capstan to be measured on top of the spacers with keyway facing the digital indicator



Step 5)

- Place the correct size pin in the first molded groove from the bottom of the capstan. Keyway pointing to the indicator.



Step 6)

- Hold the stem and lower the flag.



Step 7)


- Ensure indicator plunger tip, pin and groove have solid contact. "View value" and record.



Step 8)

- Raise the flag, remove the pin, and place in the temporary pin holder.



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Step 9) Complete the following for each molded groove, note the “value” for each on indicator.

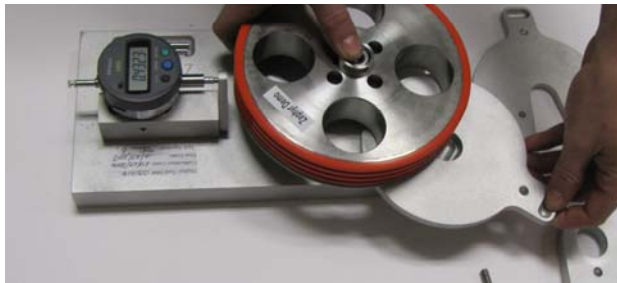
- Rotate the Capstan approximately 90 degrees from the keyway, and repeat steps
- Rotate the Capstan approximately 180 degrees from the keyway, and repeat steps
- Rotate the Capstan approximately 270 degrees from the keyway, and repeat steps



- (1) At the keyway
- (2) 90 degrees from the keyway
- (3) 180 degrees from the keyway
- (4) 270 degrees from the keyway

Step 10)

- Remove one of the spacers. Repeat steps 18-23 for measuring the **second molded groove**.




Step 11)

- Remove one more of the spacers. Repeat steps for measuring the **third molded groove**.



Reminder: Any one (1) dimension of four (4) taken around circumference of capstan grooves beyond minimum is cause for rejection. Minimum dimensions are found on the capstan table on page 4.

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Storing capstan measurement fixture after measuring capstans.

Step 1)

When you are done measuring all the molded grooves, retract indicator plunger and raise indicator flag then remove the capstan from the fixture, and remove any remaining spacers.

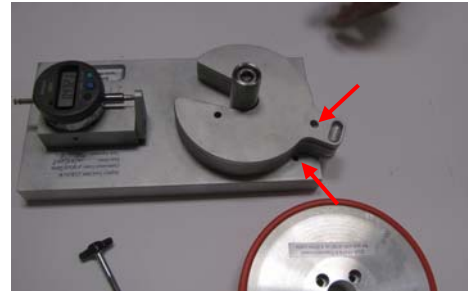
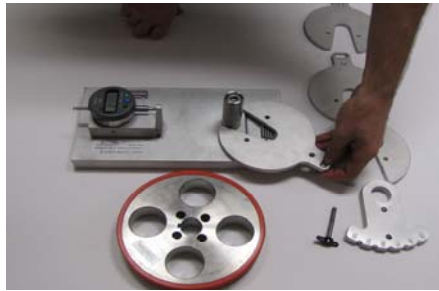


Step 2)

- Place the pin(s) back into the storage section.

Step 3)

- Place all spacers back on the fixture. Match the hole in the spacers to the threaded hole on fixture.

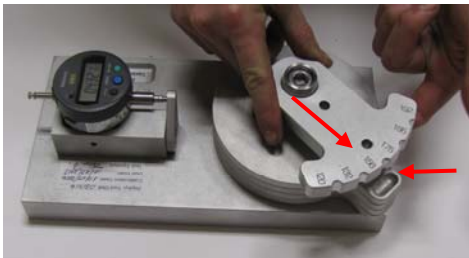



Step 4)

- Place the master gauge with the numbers facing away from indicator.

Step 5)






- Thread the thumbscrew back into the fixture. Press the green button to turn the digital



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Capstan Replacement

The capstans can be easily replaced when required. Also, if different size wire rope is to be serviced then the capstans will have to be changed to accommodate the different wire rope diameters.

Replacing Capstans					
	Open the cover and remove the (4) 10-32 x 1-1/2 screws from the upper capstan. Remove old capstan <i>(Note: that the upper capstan uses longer screws than the lower capstan.)</i>		Verify the .7 Key has remained in its location		Install new upper Capstan (Orange) and attach using the (4) 10-32 x 1-1/2 screws
	Remove (4) 10-32 x 1-1/4 screws from the Lower Capstan (Black) And remove old Capstan		Verify the .8 Key has remained in its location		Install new lower capstan (Black) and attach using the (4) 10-32 x 1-1/4 screws

Price / Availability:

Contact Zephyr International info@zephyrintl.com for information.