

Heat Flow Module
Instructions for
Cryostat Installation

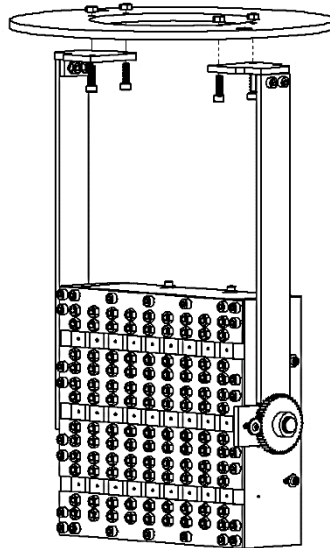
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1. Removing module from shipping crate:
 - A. See additional materials emailed for step by step instructions for removal of module from crate.
 - a. Module weighs approximately 45kg.
 - b. Two people moving the module is highly recommended. One to lift the module, the second to prevent the module from rotating.
 - c. Due to the posts and nuts on the bottom of the module and the wires coming from the temperature probes and heaters, only support the module on the ends perpendicular to the hanger arms.

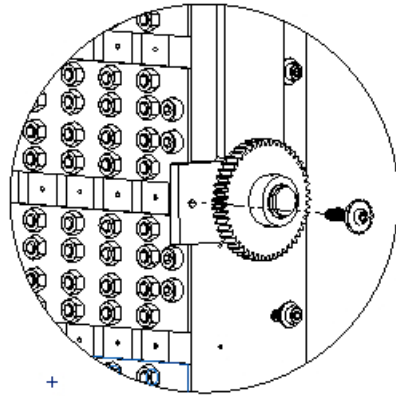
2. Module mounting:
 - A. Attach the module to the mounting ring. 8mm nuts and bolts provided.
 - a. The position of the module shown below is considered “neutral” position.



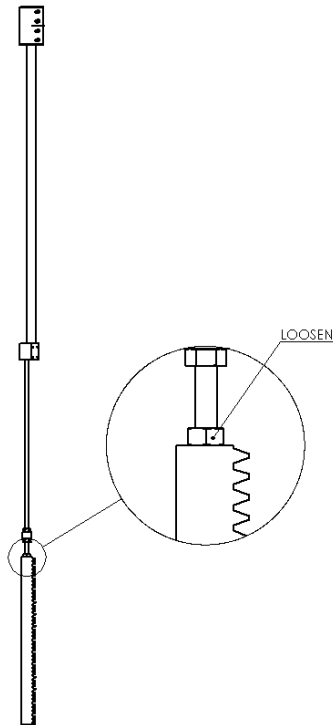
B. Pull arm assembly

a. Installing lower pull arm.

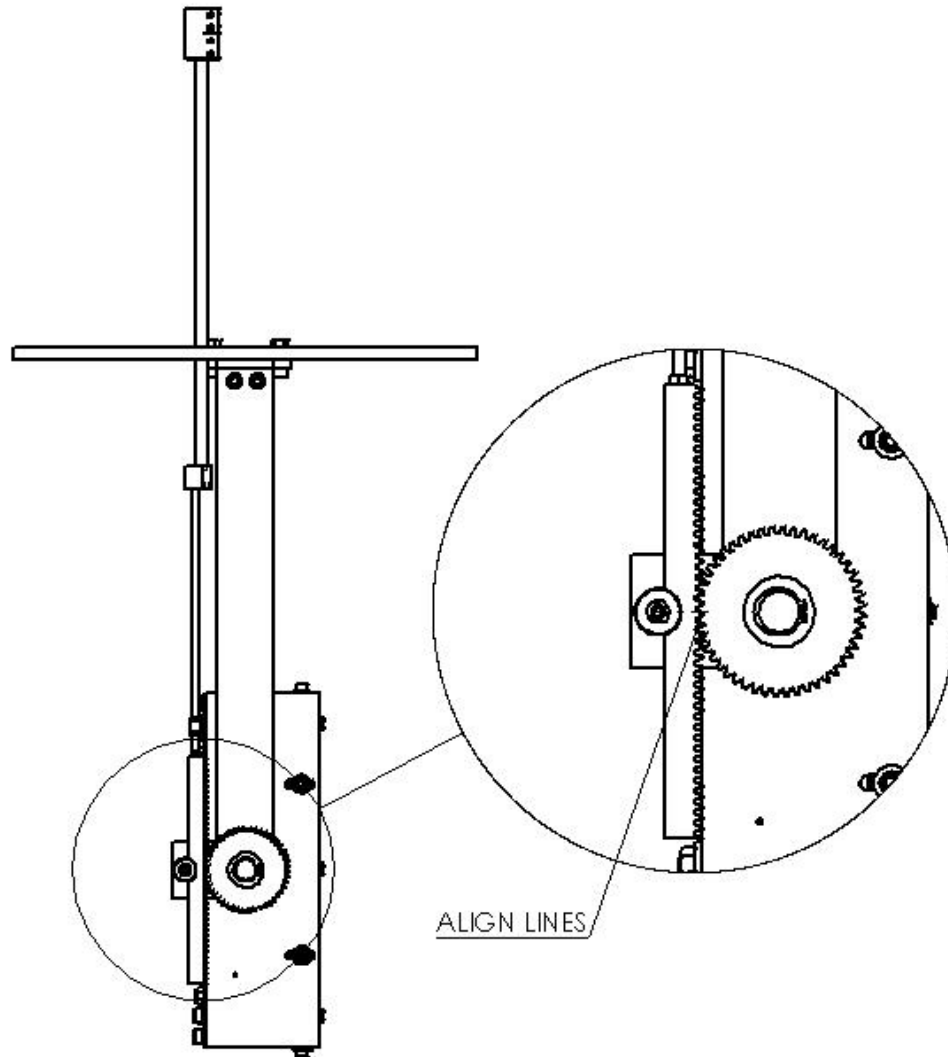
- i. Remove the rack guide bolt from hanger.



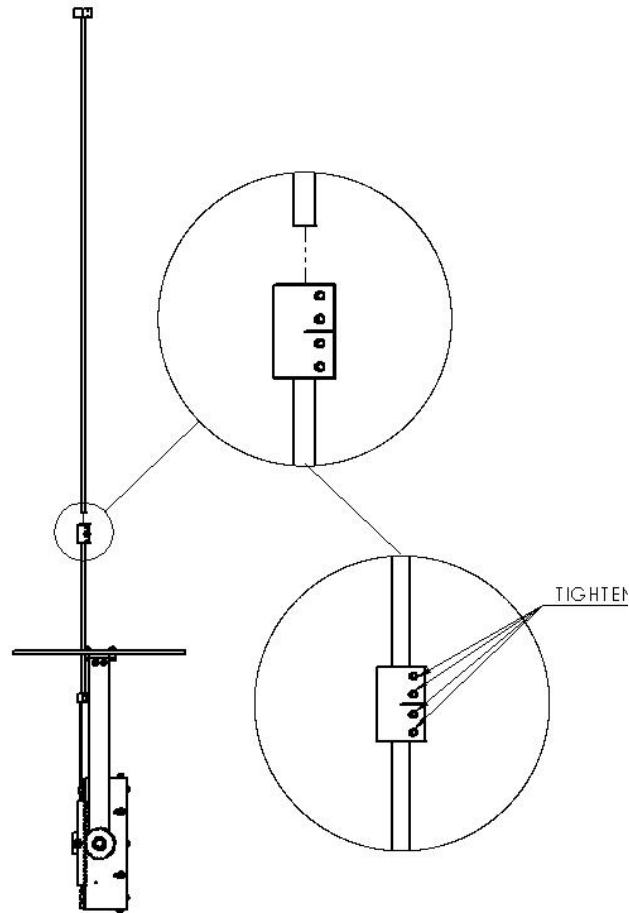
- b. Loosen nut above rack gear to allow rotation of 5mm threaded rod and rod offset assembly.



- c. Install rack gear so that the centerline aligns with the line on the pinion gear (Note: rack gear line can be placed either above or below the pinion gear tooth with the line.)
 - i. Rotate rod offset assembly so the 10mm rod fits through the pull rod hole on mounting ring.
 - ii. Remove the coupling, on the end of the 10mm rod, to fit through the mounting ring hole if needed.
- d. Reinstall the rack guide screw until the shrink wrapped threads are touching the hanger. The rack gear will not be held tightly against the hanger.

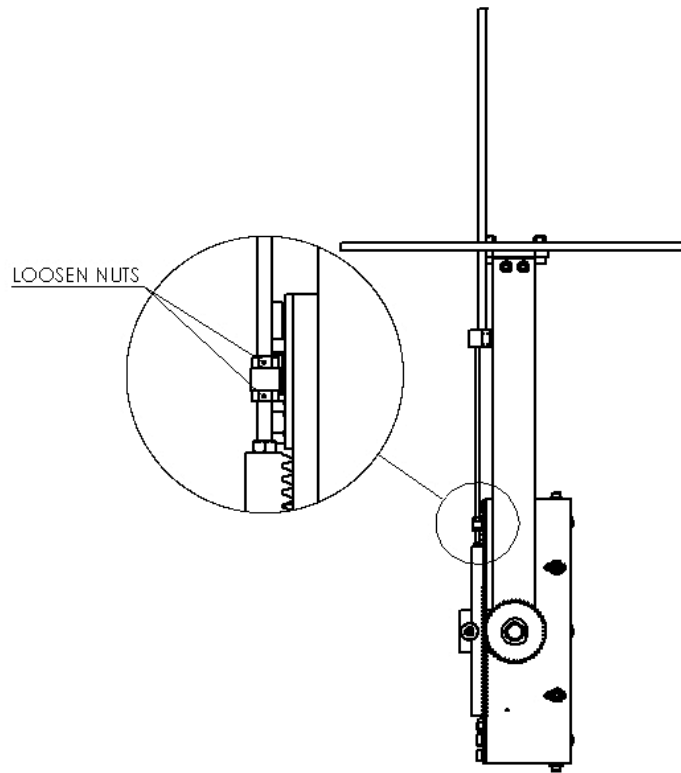


- e. Feed upper 10mm rod through cryostat feed thru and connect to coupling.
 - i. Align lower 10mm rod with upper 10mm rod and coupling by rotating the rod offset assembly as needed
 - ii. Tighten coupling screws on the 10mm rods.
 - iii. Tighten lock nut at the top of the rack gear (loosened in step 2.B.b) to lock rack gear and pull rod in place.

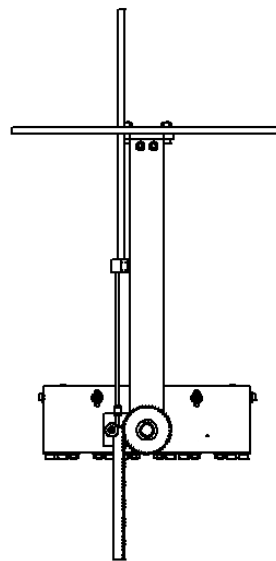


- C. Mount pull rod lock:
 - a. Lock is located on the upper 10mm rod below the pull handle.
 - b. Loosen setscrew holding rod lock in place on the rod.
 - c. Slide down to cover the rod cryostat feed thru.
 - d. Tighten the 3 lower setscrews on the rod lock so that they firmly hold to the feed thru.

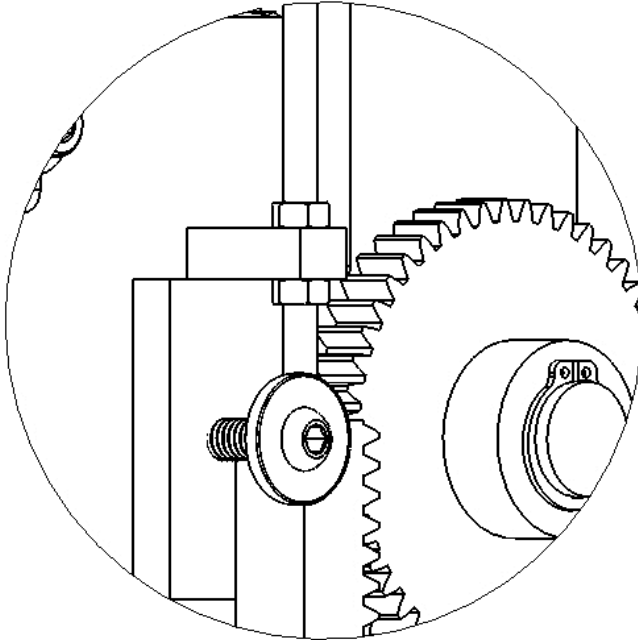
- D. Adjust lower push rod stop.
- a. Loosen the nuts on the top and bottom of the lower stop.
 - i. Lower stop is located just above rack gear.



- b. Slowly rotate module to the horizontal position so the copper HEC rows are positioned on the bottom.
 - i. Pushrod and rack gear will move as module is rotated.
 - ii. Once in horizontal position lock into place using the setscrew on the pull rod lock.



- c. Adjust stop so that it sits flush on the horizontal part of the hanger bar.
 - i. Tighten nuts so that the stop is locked in place.



- ii. Note: if the final desired rotation position of the module is horizontal, there may be more travel available on the rack gear than shown in the picture above. If maximum rotation available from the rack gear is desired, adjust the stop to a position shown in the drawing above (module will be rotated beyond horizontal).
- iii. Upper stop is provided by the pull rod offset. It should contact the support ring before the rack gear is pulled from the pinion gear and guide screw.

E. Key Numbers:

- A. Rack gear length: 200mm
- Pinion gear nominal diameter: 72mm
- Linear movement to rotation angle ratio: 0.628mm/deg

3. Check liquid argon gap size.

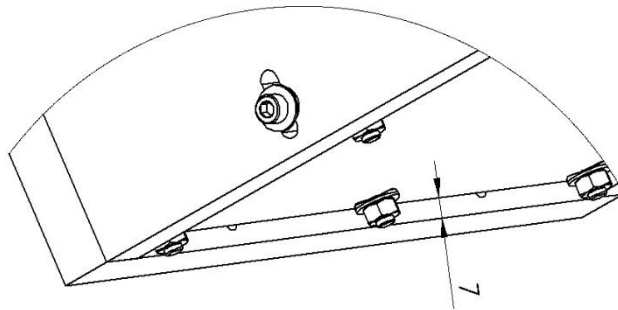
Key numbers:

Bottom of HEC plates to bottom of G-10 sides: 60mm

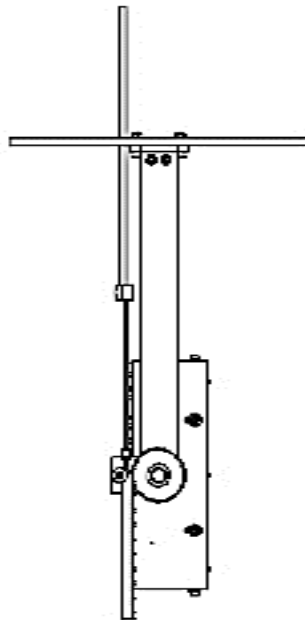
Heater plate thickness: 41.4mm

Nominal gap size: 12mm

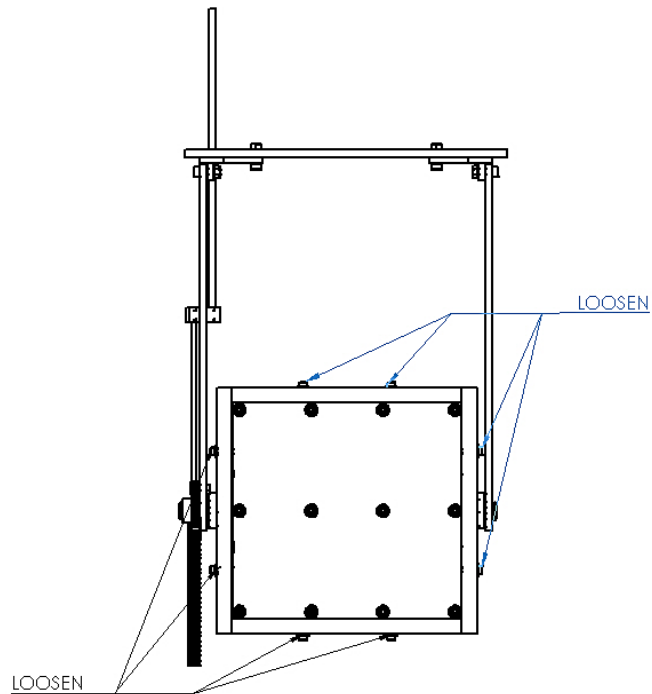
- A. To check the gap between the HEC plates and Aluminum "FCal" plate:
- Measure the distance from the bottom of the G-10 "FCal" sandwich, to the bottom of the G-10 walls.
 - 12mm gap should yield a measurement of ~7mm



- B. To adjust the liquid argon gap, rotate the module to the vertical position and lock in place.



- a. Loosen, but don't remove the 8 bolts holding the FCal sandwich in place.



- b. Slide the sandwich in or out depending on what liquid argon gap size is desired.
- Gap size can be calculated by summing the sandwich thickness (41.4mm) and the distance the bottom G-10 plate of the sandwich is from the bottom of the G-10 sides and subtracting that value from 60mm (HEC plate distance to bottom of the G-10 sides).
 - Maximum gap size: ~20mm
Minimum gap size: ~0mm