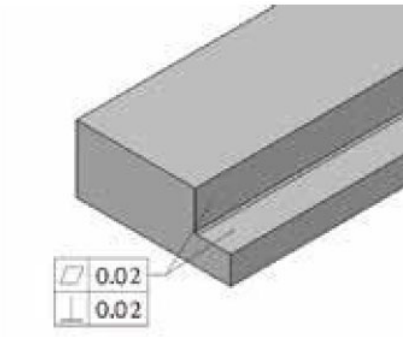
GAM HELICAL RACK INSTALLATION INSTRUCTIONS

1. INSTALLATION PREPARATION



1.1. Inspect packaging to ensure the rack was not damaged in transit.

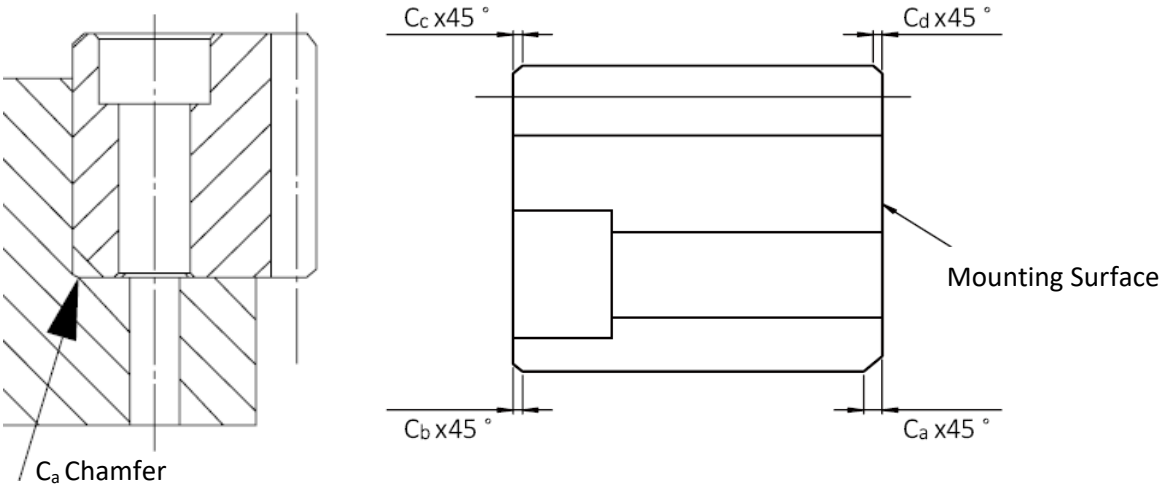
1.2. Check specifications of all necessary assembly tools.

1.3. Before assembly check mounting surface of installation is within tolerance:

- Perpendicularity ≤ 0.02mm
- Flatness ≤ 0.02mm

1.4. Check that surface is clean and free of chips.

1.5. Ensure the chamfer of the rack will fit the mounting surface (see table).



Rack Chamfers

Module of Rack	C_a	C_b	C_c	C_d
M2	2.0 mm	1.0 mm	1.0 mm	1.0 mm
M3	2.0 mm	1.0 mm	1.0 mm	1.0 mm
M4	2.0 mm	1.5 mm	1.5 mm	1.5 mm

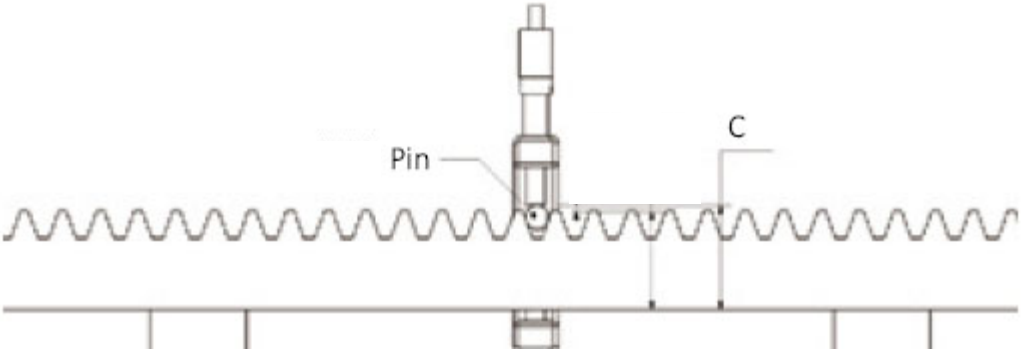
2. INSTALL RACK

2.1. Align rack on mounting surface and slightly tighten bolts.

2.2. Using C-clamps and soft pads fix the rack to the mounting surface.

3.

3.1. Use inspection pins in table to measure the location of the rack teeth. Ensure the values are the same across the rack (Height “C”). Tighten the C-clamps as necessary.



Module of Rack	C: Height to Pin (mm)	Inspection Pin Dia (mm)
M2	1.532	4
M3	2.298	6
M4	3.064	8

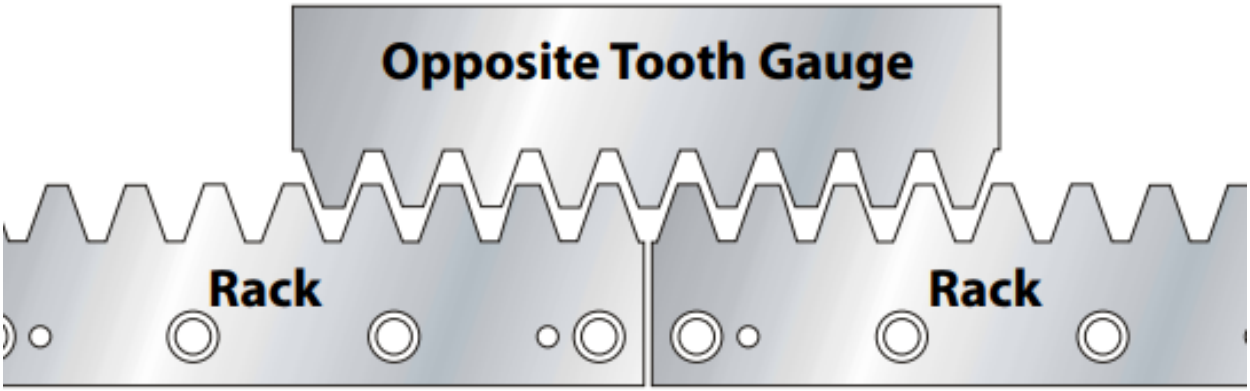
3.2. Tighten the bolts to secure the rack. Then remove the c-clamps and pads.

3.3. If the rack is to be removed and replaced (e.g. for shipping purposes) without re-alignment or if the lengths are less than 1m, GAM recommends pinning the sections to the mounting structure.

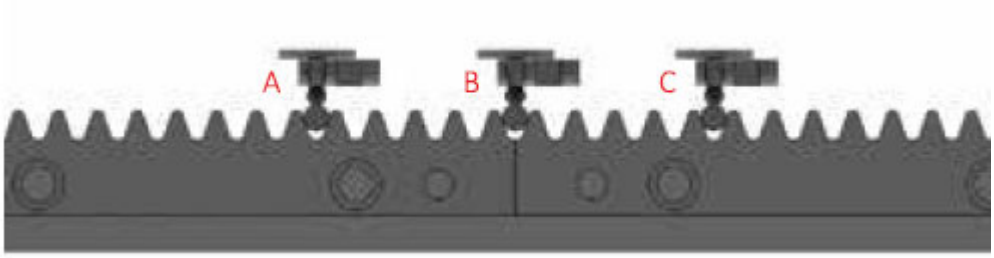
Pre-drill the pin hole locations in the mounting structure. After aligning the rack sections and installing the bolts as detailed above, ream the pre-drilled holes in the rack and the mounting structure as assembled. Install a dowel pin through the rack into the mounting structure.

4. MULTIPLE RACK INSTALLATION

4.1. When joining the opposite tooth gauge is used to align the racks.



4.2. With the racks secured with C-clamps and soft pads, place inspection pins on each rack and the tooth valley between the racks (A, B, C below). These values should be the same, adjust the racks as necessary.



4.3. Measure each rack and secure bolts as in steps 2.3-2.4.

4.4. Repeat for each added rack.

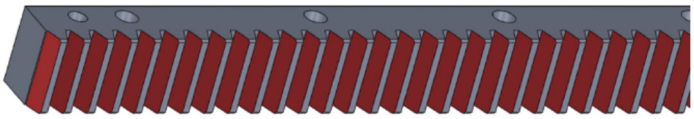
4.5. Install dowel pins.

5. CHECK THE ALIGNMENT OF THE PINION ON THE RACK.

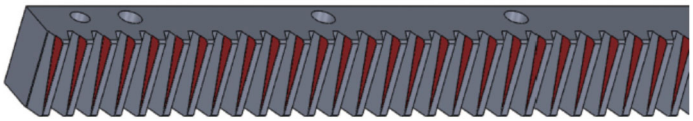
5.1. For best performance, the rack and pinion must be installed with proper tooth engagement. To check this, we recommend using a red compound and check the gear mesh contact pattern under load conditions.

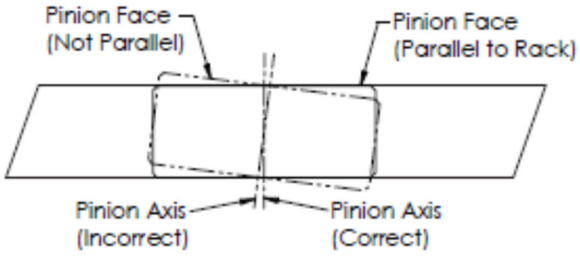
5.2. Compare results to the images and adjust as necessary

Correct Contact is even across the face of the tooth.



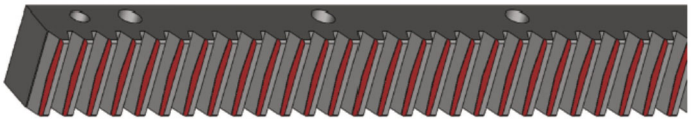
Not Parallel The pinion and rack are not parallel. Adjust the pinion so the face of the pinion and the side of the rack are parallel. The axis of the pinion should be perpendicular to the rack.

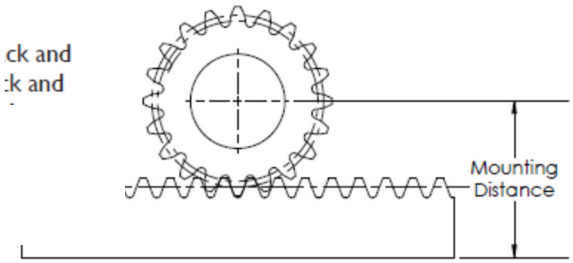




Incorrect Mounting Distance

There is insufficient tooth contact between the rack and pinion. Adjust the mounting distance between the rack and the pinion. Reference the table below for mounting distance.





Pinion Mounting Distance

Pinion	Type	Mod	No. of Teeth	Mounting Distance (mm)
PHGH-20-15-S16-06	Spline	2	15	39.1
PHGH-20-18-S22-06	Spline	2	18	42.1
PHGH-20-23-S32-06	Spline	2	23	47.4
PHGH-30-20-S40-06	Spline	3	20	59.2
PHGH-40-20-S55-06	Spline	4	20	79.04
PHGH-20-18-K16-06	Keyed	2	18	41.1
PHGH-20-20-K22-06	Keyed	2	20	43.22
PHGH-20-30-K32-06	Keyed	2	30	53.83
PHGH-30-22-K40-06	Keyed	3	22	61.01
PHGH-20-26-B31.5-06	Bolt-through	2	26	50.4
PHGH-20-33-B50-06	Bolt-through	2	33	57.8
PHGH-20-40-B63-06	Bolt-through	2	40	65.2

Pinion	Type	Mod	No. of Teeth	Mounting Distance (mm)
PHGH-20-16-W50-06	Flange	2	16	38.98
PHGH-20-19-W63-06	Flange	2	19	42.16
PHGH-30-16-W80-06	Flange	3	16	51.46
PHGH-30-19-W80-06	Flange	3	19	56.24
PHGH-40-20-W125-06	Flange	4	20	77.44
PHGH-20-15-D20-06	Shaft	2	15	39.1
PHGH-20-18-D25-06	Shaft	2	18	42.1
PHGH-20-23-D30-06	Shaft	2	23	47.4
PHGH-30-20-D40-06	Shaft	3	20	59.2
PHGH-40-20-D55-06	Shaft	4	20	79.04
PHGH-40-20-D70-06	Shaft	4	20	79.04

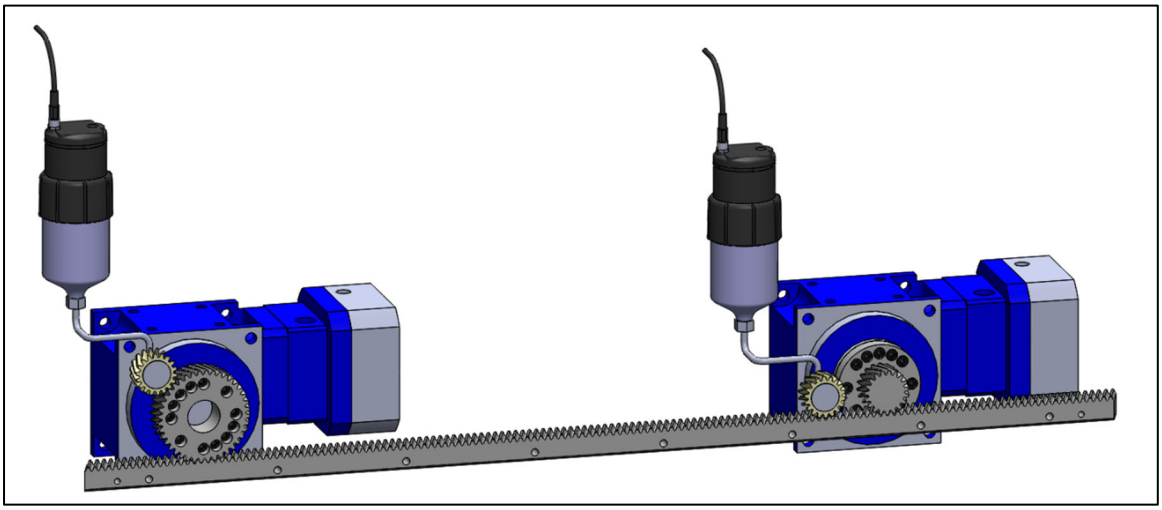
6. MAINTENANCE

6.1. Rack and Pinion requires lubrication. Please select a suitable lubricant and lubrication process.

6.1.1. Rack and pinion should be clean and free of particulates and debris

6.1.2. Use lubrication with EP additives. Lower speeds can use a grease such as Mobilux EP2 or Shell Gladus greases. At higher speeds (over 5 m/s), oil with EP additives is recommended.

6.1.3. Lubrication systems using a felt pinion can be used to keep the rack and pinon lubricated. Lubrication can be applied to the pinion or the rack.



LUBRICATION APPLIED TO PINION **LUBRICATION APPLIED TO RACK**

6.1.4. Lubrication Supply Volume (mL/day) by Velocity and Module

Velocity (m/s)		Supply Volume (mL/day)			
Over	Up to & Incl.	Mod 1.5	Mod 2	Mod 3	Mod 4
-	0.25	0.25	0.25	0.25	0.25
0.25	0.50				
0.50	0.75				0.33
0.75	1.00			0.32	0.42
1.00	1.25		0.32	0.38	0.50
1.25	1.50		0.38	0.44	0.63
1.50	1.75	0.32	0.44	0.50	0.75
1.75	2.00	0.38	0.50	0.63	0.88
2.00	2.50	0.44	0.63	0.75	1.00
2.50	3.00	0.50	0.75	0.88	1.13
3.00	3.50	0.58	0.88	1.00	1.25
3.50	4.00	0.67	1.00	1.13	1.50
4.00	4.50	0.75	1.13	1.25	1.75
4.50	5.00	1.00	1.25	1.50	2.00

6.2. Worn or damaged racks should be replaced