

# Bolt Torque Information

## Supplement to Fisher™ 249 Sensor Instruction Manuals

### Recommended Bolt Tightening Procedure

1. Start with all fasteners hand-tight.
2. Progressively tighten all fasteners in a standard criss-cross pattern. Use multiple passes of increasing torque increments until the maximum desired torque has been reached.
3. Make the final passes in a circular pattern until there is no bolt movement at the maximum torque for one complete pass.
4. For steam service and other high temperature applications, it is beneficial if the unit(s) can be heated up and then cooled down after step 3, and then step 3 repeated.

### Lubrication Requirements

NCF2 coated fasteners can be used either with or without additional lubrication:

- If the fasteners are used without additional lubricant, use the torque values for NCF2 coated.
- If additional lubricant is applied to the NCF2 coated fasteners, use the torque values for the lubricant that is being used.

### Recommended Pipe Plug Installation Procedure

Torque values are not used when tightening NPT pipe threaded connections. Rather, we follow American National Standard ANSI / ASME B1.20.1, where thread engagement is used to determine how much to tighten the connection. Refer to Fig. 3 and Table 2 of the standard. Thread the pipe plug in by hand as far as possible, and, using a wrench, tighten the additional number of turns specified in Table 2 (column 15) of the standard.

For example:

- Use a wrench to tighten a 1-1/2 - 11-1/2 NPT pipe plug or a 2 - 11-1/2 NPT pipe plug an additional three turns beyond hand tight.

Be certain to use a good grade of pipe thread sealant to ensure a leak-proof connection.

249B: CL150 - CL600

Joint Description	Size	Part Number	Standard Material	Studs & Nuts NCF2 Coated	Torque (ft•lb)			
					Lubricant			
					Molykote 321R or Equivalent	Lubriplate Mag-1 or Equivalent	Never-Seez Nickel Special or Equivalent	FFS3C3 or FFS3C6
Torque Tube Retaining Flange:	3/8 - 16	17B1392X082	SA193-B7 NCF2	42 +/- 6	25 +/- 4	31 +/- 5	30 +/- 5	16.3 +/- 2
	3/8 - 16	17B1392X092	SA193-B7M NCF2	33 +1/-5	23 +1/-3	27 +1/-4	26 +1/-4	14.4 +.7/-2
Torque Tube Arm / Head:	5/8 - 11	1A3544X0312	SA193-B7 NCF2	180 +/- 27	97 +/- 14	125 +/- 19	120 +/- 18	64 +/- 10
	5/8 - 11	1A3544X0322	SA193-B7M NCF2	160 +8/-24	97 +10/-15	125 +13/-19	120 +12/-8	64 +3/-10
Cage / Head (249B) or Blind Flange / Cage (259B):	3/4 - 10	1A3543X0222	SA193-B7 NCF2	285 +/- 42	155 +/- 23	200 +/- 28	190 +/- 29	101 +/- 15
	3/4 - 10	1A3543X0232	SA193-B7M NCF2	285 +14/-42	155 +16/-23	200 +20/-30	190 +19/-29	101 +5/-15

249C: CL150 - CL600

Joint Description	Size	Part Number	Standard Material	Studs & Nuts NCF2 Coated	Torque (ft•lb)			
					Lubricant			
					Molykote 321R or Equivalent	Lubriplate Mag-1 or Equivalent	Never-Seez Nickel Special or Equivalent	FFS3C3 or FFS3C6
Torque Tube Retaining Flange:	3/8 - 16	17B1392X082	SA193-B7 NCF2	42 +/- 6	25 +/- 4	31 +/- 5	30 +/- 5	16.3 +/- 2
	3/8 - 16	17B1392X032	SA193-B8M CL2	N/A	23 +1/-3	27 +1/-4	26 +1/-4	14.4 +.7/-2
	3/8 - 16	17B1392X092	SA193-B7M NCF2	33 +1/-5	23 +1/-3	27 +1/-4	26 +1/-4	14.4 +.7/-2
Torque Tube Arm / Head:	5/8 - 11	1A3544X0312	SA193-B7 NCF2	180 +/- 27	97 +/- 14	125 +/- 18	120 +/- 18	64 +/- 10
	5/8 - 11	1A354435222	SA193-B8M CL2	N/A	97 +10/-15	125 +13/-19	120 +12/-18	64 +3/-10
	5/8 - 11	1A3544X0322	SA193-B7M NCF2	160 +8/-24	97 +10/-15	125 +13/-19	120 +12/-18	64 +3/-10
Cage / Head:	7/16 - 14	1A8835X0242	SA193-B7 NCF2	66 +/- 10	39 +/- 5	50 +/- 7	47 +/- 7	26 +/- 4
	7/16 - 14	1A883535222	SA193-B8M CL2	N/A	37 +2/-6	43 +2/-6	42 +2/-6	23 +1/-3
	7/16 - 14	1A8835X0252	SA193-B7M NCF2	53 +2/-8	37 +2/-6	43 +2/-6	42 +2/-6	23 +1/-3

249BP: CL150 - CL600

Joint Description	Size	Part Number	Standard Material	Studs & Nuts NCF2 Coated	Torque (ft·lb)			
					Lubricant			
					Molykote 321R or Equivalent	Lubriplate Mag-1 or Equivalent	Never-Seez Nickel Special or Equivalent	FFS3C3 or FFS3C6
Torque Tube Retaining Flange:	3/8 - 16	17B1392X082	SA193-B7 NCF2	42 +/- 6	25 +/- 4	31 +/- 5	30 +/- 5	16.3 +/- 2
	3/8 - 16	17B1392X032	SA193-B8M CL2	N/A	23 +1/-3	27 +1/-4	26 +1/-4	14.4 +.7/-2
	3/8 - 16	17B1392X092	SA193-B7M NCF2	33 +1/-5	23 +1/-3	27 +1/-4	26 +1/-4	14.4 +.7/-2
Torque Tube Arm / Head:	5/8 - 11	1A3544X0312	SA193-B7 NCF2	180 +/- 27	97 +/- 14	125 +/- 18	120 +/- 18	64 +/- 10
	5/8 - 11	1A354435222	SA193-B8M CL2	N/A	97 +10/-15	125 +13/-19	120 +12/-18	64 +3/-10
	5/8 - 11	1A3544X0322	SA193-B7M NCF2	160 +8/-24	97 +10/-15	125 +13/-19	120 +12/-18	64 +3/-10
Top Flange CL150:	5/8 - 11	1J6981X0232	SA193-B7 NCF2	180 +/- 27	97 +/- 14	125 +/- 18	120 +/- 18	64 +/- 10
CL300:	5/8 - 11	1L5151X0142	SA193-B7 NCF2	180 +/- 27	97 +/- 14	120 +/- 18	120 +/- 18	64 +/- 10
CL600:	5/8 - 11	1A4875X0142	SA193-B7 NCF2	180 +/- 27	97 +/- 14	125 +/- 18	120 +/- 18	64 +/- 10

249CP: CL150 - CL600

Joint Description	Size	Part Number	Standard Material	Studs & Nuts NCF2 Coated	Torque (ft·lb)			
					Lubricant			
					Molykote 321R or Equivalent	Lubriplate Mag-1 or Equivalent	Never-Seez Nickel Special or Equivalent	FFS3C3 or FFS3C6
Torque Tube Retaining Flange:	3/8 - 16	17B1392X082	SA193-B7 NCF2	42 +/- 6	25 +/- 4	31 +/- 5	30 +/- 5	16.3 +/- 2
	3/8 - 16	17B1392X032	SA193-B8M CL2	N/A	23 +1/-3	27 +1/-4	26 +1/-4	14.4 +.7/-2
Torque Tube Arm / Head:	5/8 - 11	1A3544X0312	SA193-B7 NCF2	180 +/- 27	97 +/- 14	125 +/- 18	120 +/- 18	64 +/- 10
	5/8 - 11	1A354435222	SA193-B8M CL2	N/A	94 +10/-15	125 +13/-19	120 +12/-18	64 +3/-10

249P: CL900 - CL1500

Joint Description	Size	Part Number	Standard Material	Studs & Nuts NCF2 Coated	Torque (ft·lb)			
					Lubricant			
					Molykote 321R or Equivalent	Lubriplate Mag-1 or Equivalent	Never-Seez Nickel Special or Equivalent	FFS3C3 or FFS3C6
Torque Tube Retaining Flange:	1/2 - 13	1K6235X0152	SA193-B7 NCF2	101 +/- 15	56 +/- 8	71 +/- 10	67 +/- 10	37 +/- 6
	1/2 - 13	1K6235X0162	SA193-B7M NCF2	81 +4/-12	56 +3/-8	66 +3/-10	64 +3/-10	34 +2/-5
Torque Tube Arm / Head:	7/8 - 9	1A4212X0042	SA193-B7 NCF2	425 +63/-42	230 +35/-23	290 +44/-29	275 +41/-28	149 +22/-15
	7/8 - 9	1A4212X0032	SA193-B7M NCF2	425 +42/-63	230 +23/-35	290 +29/-44	275 +28/-41	149 +15/-22

249VS: CL125 - CL2500

Joint Description	Size	Part Number	Standard Material	Studs & Nuts NCF2 Coated	Torque (ft•lb)			
					Lubricant			
					Molykote 321R or Equivalent	Lubriplate Mag-1 or Equivalent	Never-Seez Nickel Special or Equivalent	FFS3C3 or FFS3C6
Torque Tube Retaining Flange:	1/2 - 13	1K6235X0152	SA193-B7 NCF2	101 +/-15	56 +/- 8	71 +/- 10	67 +/- 10	37 +/- 6
	1/2 - 13	1K6235X0162	SA193-B7M NCF2	81 +/-12	56 +/-8	66 +/-10	64 +/-10	34 +/-5
	1/2 - 13	1K6235X0012	SA193-B8M CL2	NA	56 +/-8	66 +/-10	64 +/-10	34 +/-5

249K: CL900 - CL1500

Joint Description	Size	Part Number	Standard Material	Studs & Nuts NCF2 Coated	Torque (ft•lb)			
					Lubricant			
					Molykote 321R or Equivalent	Lubriplate Mag-1 or Equivalent	Never-Seez Nickel Special or Equivalent	FFS3C3 or FFS3C6
Torque Tube Retaining Flange:	1/2 - 13	1K6235X0152	SA193-B7 NCF2	101 +/-15	56 +/- 8	71 +/- 10	67 +/- 10	37 +/- 6
Torque Tube Arm / Head:	7/8 - 9	1A3771X0092	SA193-B7 NCF2	425 +/-63/-42	230 +/-35/-23	290 +/-44/-29	275 +/-41/-28	149 +/-22/-15
Cage/Head:	1 - 8	1C7725X0102	SA193-B7 NCF2	590 +/-88/-29	320 +/-48/-16	405 +/-60/-20	385 +/-57/-19	210 +/-31/-10

249L: CL2500

Joint Description	Size	Part Number	Standard Material	Studs & Nuts NCF2 Coated	Torque (ft•lb)			
					Lubricant			
					Molykote 321R or Equivalent	Lubriplate Mag-1 or Equivalent	Never-Seez Nickel Special or Equivalent	FFS3C3 or FFS3C6
Torque Tube Retaining Flange	1/2 - 13	1K6235X0152	SA193-B7 NCF2	101 +/-15	56 +/- 8	71 +/- 10	67 +/- 10	37 +/- 6
Torque Tube Arm / Head:	1 1/8 - 8	1A2033X0092	SA193-B7 NCF2	805 +/-120/-40	430 +/-63/-21	550 +/-81/-27	525 +/-75/-25	280 +/-42/-14
Cage/Head:	1 1/2 - 8	1A5010X0082	SA193-B7 NCF2	1900 +/-285/-95	1000 +/-150/-50	1290 +/-195/-65	1220 +/-183/-61	630 +/-95/-32
Top Blind Flange:	7/8 - 9	1A3657X0322	SA193-B7 / NCF2	425 +/-63/-42	230 +/-35/-23	290 +/-44/-29	275 +/-41/-28	149 +/-22/-15

249W: CL150 - CL600

Joint Description	Size	Part Number	Standard Material	Studs & Nuts NCF2 Coated	Torque (ft•lb)			
					Lubricant			
					Molykote 321R or Equivalent	Lubriplate Mag-1 or Equivalent	Never-Seez Nickel Special or Equivalent	FFS3C3 or FFS3C6
Torque Tube Retaining Flange:	3/8 - 16	17B1392X082	SA193-B7 NCF2	42 +/-6	25 +/- 4	31 +/- 5	30 +/- 5	16.3 +/- 2
	3/8 - 16	17B1392X032	SA193-B8M CL2	NA	23 +1/-3	27 +1/-4	26 +1/-4	14.4 +/-2
	3/8 - 16	17B1392X092	SA193-B7M NCF2	33 +1/-5	23 +1/-3	27 +1/-4	26 +1/-4	14.4 +/-2
Torque Tube Arm / Head:	5/8 - 11	1A3544X0312	SA193-B7 NCF2	180 +/-27	97 +/- 14	125 +/- 18	120 +/- 18	64 +/- 10
	5/8 - 11	1A354435222	SA193-B8M CL2	NA	97 +10/-15	125 +13/-19	120 +12/-18	64 +3/-10
	5/8 - 11	1A3544X0322	SA193-B7M NCF2	160 +8/-24	97 +10/-15	125 +13/-19	120 +12/-18	64 +3/-10

Mating Flange Size & Class	Size	Line Bolt and Nut Material	Studs & Nuts NCF2 Coated	Torque (ft•lb)			
				Lubricant			
				Molykote 321R or Equivalent	Lubriplate Mag-1 or Equivalent	Never-Seez Nickel Special or Equivalent	FFS3C3 or FFS3C6
3" CL150	5/8 - 11	SA193-B7 / 2H	180 +/-27	97 +/- 14	125 +/- 19	120 +/- 18	64 +/-10
3" CL300	3/4 - 10		280 +/-42	155 +/- 23	200 +/- 28	190 +/- 29	101 +/-15
3" CL600	3/4 - 10		280 +/-42	155 +/- 23	200 +/- 28	190 +/- 29	101 +/-15
3" CL150	5/8 - 11	SA193-B7M / 2HM	160 +8/-24	97 +10/-15	125 +13/-19	120 +12/-18	64 +3/-10
3" CL300	3/4 - 10		285 +14/-42	155 +16/-23	200 +20/-30	190 +19/-29	101 +5/-15
3" CL600	3/4 - 10		285 +14/-42	155 +16/-23	200 +20/-30	190 +19/-29	101 +5/-15
3" CL150	5/8 - 11	SA193-B8M CL2 / 8M	N/A	97 +10/-15	125 +13/-19	120 +12/-18	64 +3/-10
3" CL300	3/4 - 10		N/A	155 +16/-23	200 +20/-30	190 +19/-29	101 +5/-15
3" CL600	3/4 - 10		N/A	155 +16/-23	200 +20/-30	190 +19/-29	101 +5/-15

249 (Obsolete)

	Joint Description	Size	Part Number	Standard Material	Studs & Nuts NCF2 Coated	Torque (ft·lb)			
						Lubricant			
						Molykote® 321R or Equivalent	Lubriplate® Mag-1 or Equivalent	Never-Seez® Nickel Special or Equivalent	FFS3C3 or FFS3C6
CL125	Torque Tube Retaining Flange:	3/8 - 16	17B1392X082	SA193-B7 NCF2	42 +/- 4	25 +/- 4	31 +/- 5	30 +/- 5	16.3 +/- 2
CL250		3/8 - 16	17B1392X082	SA193-B7 NCF2	42 +/- 4	25 +/- 4	31 +/- 5	30 +/- 5	16.3 +/- 2
CL125		3/8 - 16	17B1392X042	SA193-B8M CL1	N/A	11 +/- .5	14 +/- 1	13.3 +/- .7	7.3 +/- .4
CL250		3/8 - 16	17B1392X042	SA193-B8M CL1	N/A	11 +/- .5	14 +/- 1	13.3 +/- .7	7.3 +/- .4
CL125	Torque Tube Arm / Head: (Cap Screws)	1/2 - 13	1A5147X0112	SA193-B7 NCF2	101 +/- 8	56 +/- 8	71 +/- 10	67 +/- 10	37 +/- 6
CL250		5/8 - 11	1A9362X0092	SA193-B7 NCF2	180 +/- 14	97 +/- 14	125 +/- 19	120 +/- 18	64 +/- 10
CL125		1/2 - 13	1A5147X0012	SA193-B8M CL1	N/A	26 +/- 1	33 +/- 1.5	32 +/- 1.5	17.3 +/- .9
CL250		5/8 - 11	1A9362X0012	SA193-B8M CL1	N/A	51 +/- 2.5	65 +/- 3	62 +/- 3	34 +/- 1.7
CL125	Cage / Head: (Cap Screws)	1/2 - 13	12B5478X052	SA193-B7 NCF2	101 +/- 8	56 +/- 8	71 +/- 10	67 +/- 10	37 +/- 6
CL250		3/4 - 10	1A3534X0092	SA193-B7 NCF2	285 +/- 23	155 +/- 23	200 +/- 30	190 +/- 29	101 +/- 15
CL125		1/2 - 13	12B5478X022	SA193-B8M CL1	N/A	26 +/- 1	33 +/- 1.5	32 +/- 1.5	17.3 +/- .9
CL250		3/4 - 10	1A3534X0032	SA193-B8M CL1	N/A	89 +/- 4.5	115 +/- 6	110 +/- 5.5	59 +/- 3



249V (Obsolete)

	Joint Description	Size	Part Number	Standard Material	Studs & Nuts NCF2 Coated	Torque (ft·lb)			
						Lubricant			
						Molykote 321R or Equivalent	Lubriplate Mag-1 or Equivalent	Never-Seez Nickel Special or Equivalent	FFS3C3 or FFS3C6
CL125-600	Torque Tube Retaining Flange:	3/8 - 16	17B1392X082	SA193-B7 NCF2	42 +/-6	25 +/- 4	31 +/- 5	30 +/- 5	16.3 +/- 2
CL125-600		3/8 - 16	17B1392X092	SA193-B7M NCF2	33 +/-5	22 +/-3	26 +/-4	25 +/-4	14.4 +/-2
CL900-1500		1/2 - 13	1K6235X0152	SA193-B7 NCF2	101 +/-15	56 +/- 8	71 +/- 10	67 +/- 10	37 +/- 6
CL2500-6000		1/2 - 13	1K6235X0152	SA193-B7 NCF2	101 +/-15	56 +/- 8	71 +/- 10	67 +/- 10	34 +/-5

## Related Documents

- [249 Caged Displacer Sensors Instruction Manual \(D200099X012\)](#)
- [249 Cageless Displacer Sensors Instruction Manual \(D200100X012\)](#)
- [249VS Cageless Displacer Sensor Instruction Manual \(D103288X012\)](#)
- [249W Cageless Wafer Style Level Sensor Instruction Manual \(D102803X012\)](#)

All documents are available from your [Emerson sales office](#) or at [Fisher.com](#).

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