

## Linkage Kits

Beck Linkage Kits are available for completing the mechanical connection from the drive crank arm to the load lever arm. Proper linkage connection is an important consideration in achieving a successful, long-lasting installation. By eliminating slop in the linkage, control is improved. Beck Sales Engineers can assist you with designing your linkage and specifying the appropriate linkage kit.

Beck Linkage Kits are designed to simplify installation of your Beck drive on any application. All Kits are provided with internal left-hand and right-hand threads to permit adjustment of linkage length of  $\pm 1\ 1/2$ " without removal from the crank arm or load lever arm.

Rod ends with bearings are used to provide long term reliability, virtually eliminate binding and wear, and provide tight control of the driven load. These rod ends allow for some lateral misalignment between the drive shaft and driven load which simplifies installation.

Linkage design considerations and specification data for Beck linkage kits are given on the following three pages.





## Linkage Design Considerations

### Linkage Kit Types

Two types of kits are available. Hex linkage kits are used when well-defined short lengths are required, and Pipe linkage kits are used for heavier loads at lengths from 22" to 120".

### Rod end alignment:

Linkage alignment must be within the maximum angle of misalignment, theta ( $\theta$ ), as shown in Table A-2.

### Torque required:

The drive torque must be greater than the total torque required by the driven load and the linkage weight. For smaller drives, the linkage weight may be a significant factor relative to drive torque. Refer to Tables A-1 or A-3 for Linkage Kit weight. Also, for Pipe Linkage Kits, add the Schedule 40 pipe weight as shown below:

#### Schedule 40 Steel Pipe

Pipe Size Inches Nominal	1	1 1/2	2	2 1/2
Weight Lbs. per ft.	1.68	2.72	3.65	5.79
Pipe O.D.	1.315	1.900	2.375	2.875

### Thrust and operating angle:

The angle between the linkage and crank arm or lever arm must not be less than 5° at the end of travel position to avoid developing excessive linkage forces.

Make sure the maximum compression or tension force in the connecting link does not exceed the maximum allowable link thrust shown below:

#### Maximum Thrust

Beck Drive Model No.	11-150	11-200	11-300	11-400
Max. Allowance Link Thrust Lbs.	750	3000	4500	9000



### Avoid "Z" Linkage arrangements:

Linkage arrangements in which the drive crank arm and load lever arm rotate in different directions are not recommended.

### Utilize Beck's Link-Assist™:

Your Beck Sales Engineer can work with you to design a proper installation and linkage assembly. Refer to page 78 for complete details about Link-Assist™.

## Hex Linkage Kits

When well-defined, short lengths are required, Hex Linkage Kits can be used. Table A-1 provides information for specifying Hex Linkage Kits.

Hex Linkage Kits include:

- Load lever rod end (the drive rod end is supplied with the Beck drive)
- Hex Linkage
- Threaded Stud (2)
- Jam Nuts (4)

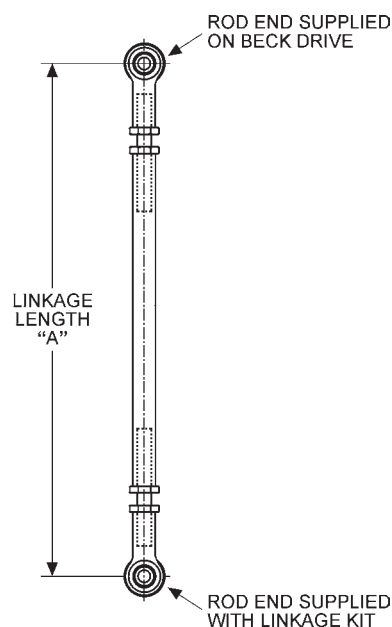
The customer must supply the bolt for the load lever rod end. Use a bolt that results in the minimum clearance in the rod end. See dimension "D" in Table A-2.



**TABLE A-1: Hex Linkage Kit Specifications**

Beck Drive Model No.	Hex Size	Linkage Length Range "A"		Linkage Kit Part Number	Approx. Weight (Lbs.)
		Min.	Max.		
31-XXX	7/16	9	12	14-7990-22	1/2
		12	15	14-7990-24	1/2
		15	18	14-7990-26	3/4
		18	21	14-7990-10	1
11-150	5/8	9.5	11.5	14-8300-22	1
		10.5	14.5	14-8300-32	1
		14.5	18.5	14-8300-04	1
		18	22	14-8300-06	2
		22	26	14-8300-16	2
11-200	5/8	9.5	11.5	14-8300-22	1
		10.5	14.5	14-8300-32	1
		14.5	18.5	14-8300-04	1
		18	22	14-8300-06	2
		22	26	14-8300-16	2
11-300	1	13.5	18	14-8860-24	2
		17.5	22	14-8860-08	3
		22	26.5	14-8860-02	4
		26.5	31	14-8860-04	5
11-400	1	13.5	17.5	15-0110-26	3
		18	22	15-0110-20	4
		22	26	15-0110-03	5
		26	30	15-0110-22	6
		29	33	15-0110-02	7

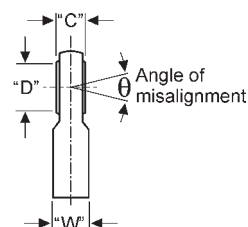
**Hex Linkage Assembly**



**TABLE A-2: Linkage Rod End Data**

Drive Model	31-XXX	11-150	11-200	11-300	11-400	11-430	22-XXX
Thread Size	5/16-24	1/2-20	1/2-20	5/8-18	3/4-16	1 1/2-12	1 1/2-12
Dim. "C"	.437"	.625"	.625"	.750"	.875"	1.312"	1.312"
Dim. "D"	.3125"	.500"	.500"	.625"	.750"	1.500"	1.500"
Dim. "W"	.437"	.750"	.750"	.875"	1.000"	2.000"	2.000"
Angle $\theta$	14°	12°	12°	16°	14°	6.5°	6.5°

**Rod End Detail**





## Pipe Linkage Kits

Pipe Linkage Kits are necessary for heavier loads at lengths from 22" to 120" and are designed in consideration of compression forces at maximum rated drive torque outputs.

*Pipe Linkage Kits include:*

- Load lever rod end (the drive rod end is supplied with the Beck drive)
- Coupling (2)
- Threaded Stud (2)
- Jam Nuts (4)

**The customer must supply the bolt for the load lever rod end.** Use a bolt that results in the minimum clearance in the rod end. See dimension "D" in Table A-2.

**The customer must also supply the length of pipe (using Schedule 40 pipe),** which can be cut and threaded in the field. Standard NPT right-hand threads must be used on both ends of the pipe length. This arrangement allows the required kit to be ordered even if the exact linkage length is not known until the drive and equipment are in place.

**TABLE A-3: Pipe Linkage Kit Specifications**

Beck Drive Model No.	Linkage Length Range "A"		Beck Pipe Linkage Kit Part Number	Pipe Size & NPT Thread	Min. Pipe Nipple Length	Approx. Weight (Lbs.)*	Length of 2 Linkage Ends (tot. adj. +/- 1 1/2")
	Min.	Max.					
11-150	22	84	20-1730-05	1	1 1/2	5	20 1/2
	31	120	20-1740-06	1 1/2	1 3/4	9	29 1/4
11-200	22	45	20-1730-05	1	1 1/2	5	20 1/2
	31	84	20-1740-06	1 1/2	1 3/4	9	29 1/4
	33 1/4	120	20-1750-05	2	2	13	31 1/4
	37	120	20-1760-05	2 1/2	2 1/2	22	34 1/2
11-300	22 1/2	36	20-1730-06	1	1 1/2	5	21
	31 1/2	72	20-1740-07	1 1/2	1 3/4	9	29 3/4
	33 3/4	96	20-1750-06	2	2	13	31 3/4
	37 1/2	120	20-1760-06	2 1/2	2 1/2	22	35
11-400	23 1/4	34	20-1730-07	1	1 1/2	5	21 3/4
	32 1/4	48	20-1740-08	1 1/2	1 3/4	9	30 1/2
	34 1/2	72	20-1750-07	2	2	13	32 1/2
	38 1/4	120	20-1760-07	2 1/2	2 1/2	22	35 3/4
11-430 & 22-XXX	23 1/2	40	20-1760-13	2	2	28	21 1/2
	37 3/4	144	20-1760-10	3	2 5/8	32	35 1/8
	59 3/4	144	20-1760-09**	3	2 5/8	41	57 1/8

\*Does not include customer supplied pipe.

\*\* Use when the angle between the linkage and crank arm is less than 25°.

## Ordering and Assembly

- Obtain the approximate overall linkage length "A".
- Identify the kit part number and required pipe size from Table A-3. For lengths beyond those listed, contact your Beck Sales Engineer.
- Determine the pipe length required by subtracting "Length of 2 Linkage Ends" (see Table A-3) from linkage length "A".
- The pipe length is to be cut and threaded in the field. The final linkage assembly permits  $\pm 1 \frac{1}{2}$ " adjustment in the field.

## Pipe Linkage Assembly

