

FLEX-TEND, 18 inch Double Ball with Flanged Ends.

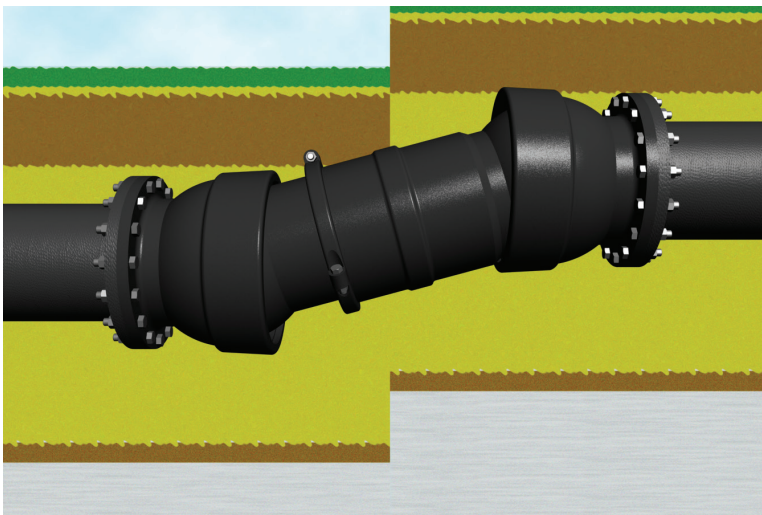


Image depicts direct burial application (Polyethylene wrap not depicted). Refer to "Connections" FT-2 for more details.

### Features and Applications:

- Sizes 2 inch through 48 inch
- Rated 350 PSI working water pressure (Sizes 2 inch and 30 inch and above rated at 250 PSI)
- For Ductile Iron, Steel, PVC or HDPE pipe
- Sizes 4 inch through 12 inch have had a configuration update.
- Expansion/Contraction travel preset at 50/50 setting. 50% percent reserved for expansion and the remaining 50% reserved for contraction.
- Designed to give Deflection and or Expansion/Contraction needs to protect pipeline systems from shear. Refer to submittal drawings for "offset" capability
- Constructed of ASTM A536 Ductile Iron
- Up to 20° Deflection per ball
- Additional Expansion Sleeves can be added for increased expansion capacity
- Each unit tested to rated working pressure prior to shipment
- Due to the design of the seals, no periodic maintenance is required
- End connections can be Flanged, Mechanical Joint or a combination of the two.
- Flange outlets conform to the dimensional requirements of ANSI/AWWA C110/A21.10 (class 150) with the addition of an O-ring gasket (except for 2 inch unit) which is provided to ensure a watertight seal.
- Mechanical Joint end connections conform to the dimensional requirements of either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53 depending on size.
- FLEX-TEND assemblies are suitable for direct burial. Polyethylene wrap is provided with each unit. If installed in a vault, the design must be such that movement is not impeded. Refer to *Connections* FT-2 found at [www.ebaa.com](http://www.ebaa.com).
- All "wetted" parts are coated with a fusion bonded epoxy which is NSF61 Approved.
- For use on water or wastewater pipelines subject to hydrostatic pressure and tested in accordance with either AWWA C600 or ASTM D2774

**Pipeline Protection from ground Motion and Shear**

Pipelines crossing unstable terrain such as faults, swamps or landfills all suffer some degree of vulnerability to damage from ground motion. This motion can be either gradual or sudden, and places damaging shear and bending forces on pipelines. In areas close to, or within structures where differential movement can occur, pipelines should be restrained and supported to isolate and accommodate movement in a controllable manner at a designated location.

FLEX-TEND flexible expansion joints provide pipeline protection from the stresses produced by these forces with their ability to deflect up to 20 degrees per ball, in any direction, while simultaneously expanding or contracting. They are available in sizes from 2 inches to 48 inches and can be used on ductile iron, steel, or PVC pipelines for:

Connection to buildings, tanks, and other structures

Underground to aerial transitions such as bridges

Areas of anticipated ground movement and unstable soils

Areas near roadways and dams

Active faults crossings and liquefaction zones

The FLEX-TENDS are available with both flange and mechanical joint end connections for adaptable protection for pipelines, pumps, bridge crossings, tank connections and many other critical installations, either above or below ground. Sizes of 3-inches through 24-inches are rated for 350 psi working water pressure. Sizes of 2 inch, 30 inch, and larger are rated for 250 psi working water pressure.

FLEX-TENDS are manufactured entirely of ductile iron, conforming to all applicable requirements of ANSI/ AWWA C153/A21.53 and FLEX-TENDS are totally protected from internal corrosion with a lining of fusion-bonded epoxy.

FLEX-TEND flexible expansion joints are available in double ball or single ball configurations. Double-ball units offer the unique ability to accommodate a considerable degree of close-coupled vertical subsidence and will deflect up to 20 degrees per ball in any direction. Single-ball configurations can be used in pairs with a spool piece between them to increase the offset between the two ball ends.

Expansion/contraction capability is cast as an integral part of the ball and socket, and can be adjusted with additional sleeves installed at the factory prior to shipping or in the field at a later date. The use of additional sleeves increases both the axial movement and the available offset. The expansion pre-sets shown in the following tables can easily be changed by the purchaser during his purchase order or later in the field.

**Important Updates**

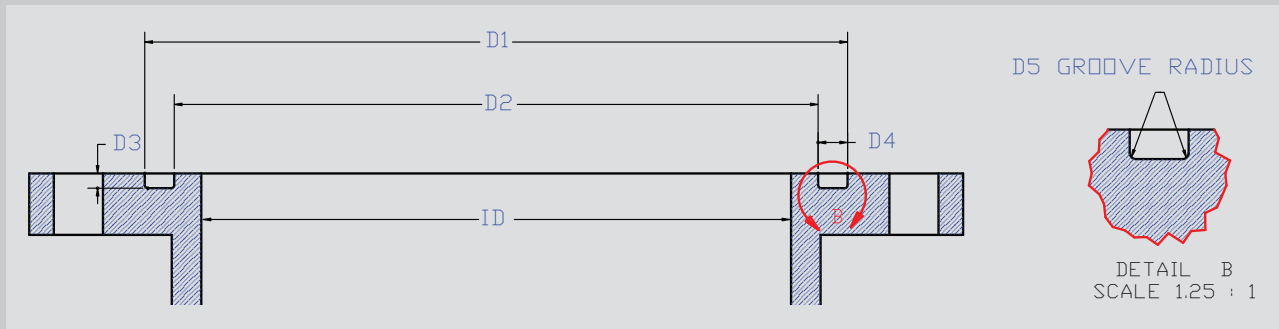
As of 2012-08-27 all FLEX-TEND Flexible Expansion Joints have a factory preset of 50/50 for the expansion/contraction travel. 50% of the total joint's travel will be reserved for Expansion of the pipeline while the remaining 50% will be reserved for Contraction of the pipeline. This is a change from the previous 75% for contraction and 25% for expansion preset.

Sizes 4 inch through 12 inch FLEX-TENDS have had a change in their component configuration. The Sockets are now one piece and no longer have a second flanged gland. This new compact socket allows for a smaller overall outside diameter (OD), stronger more robust design, and lessens the total amount of fasteners on the unit.

The submittal drawings and their dimensions found within this brochure reflects these upgrades and changes. For submittal information of the previous design and presets refer to the FLEX-TEND product brochure with revisioin code letter "S", found in the lower left hand corner of the first page on the brochure.

**Additional Technical Documentation regarding FLEX-TEND and other EBAA Iron products can be found at [www.ebaa.com](http://www.ebaa.com). Refer to the Tech Support page and look under *Connection Bulletins*.**

## FLEX-TEND, EX-TEND, AND FLEX-900 O-ring Groove



Size	ID	D1	D2	D3	D4	D5	O-ring Diameter	O-ring Part Number
3	3.280	4.885	4.185	0.175	0.350	0.063	0.250	983003
4	4.060	5.900	4.700	0.300	0.600	0.063	0.500	983004
6	6.160	8.000	6.800	0.300	0.600	0.063	0.500	983006
8	8.270	10.100	8.900	0.300	0.600	0.063	0.500	983008
10	10.160	12.200	11.000	0.300	0.600	0.063	0.500	983010
12	12.340	14.300	13.100	0.300	0.600	0.063	0.500	983012
14	14.260	16.200	15.000	0.300	0.600	0.063	0.500	983014
16	16.480	18.500	16.900	0.400	0.800	0.125	0.625	983016
18	18.560	20.700	19.100	0.400	0.800	0.125	0.625	983018
20	20.520	23.000	21.400	0.400	0.800	0.125	0.625	983020
24	24.680	27.200	25.600	0.400	0.800	0.125	0.625	983024
30	30.900	33.500	31.700	0.400	0.900	0.125	0.750	983030
36	37.040	40.000	38.300	0.400	0.850	0.125	0.750	983036
42	43.080	46.580	44.080	0.650	1.250	0.125	N/A	983042
48	49.220	52.720	50.220	0.650	1.250	0.125	1.000	983048

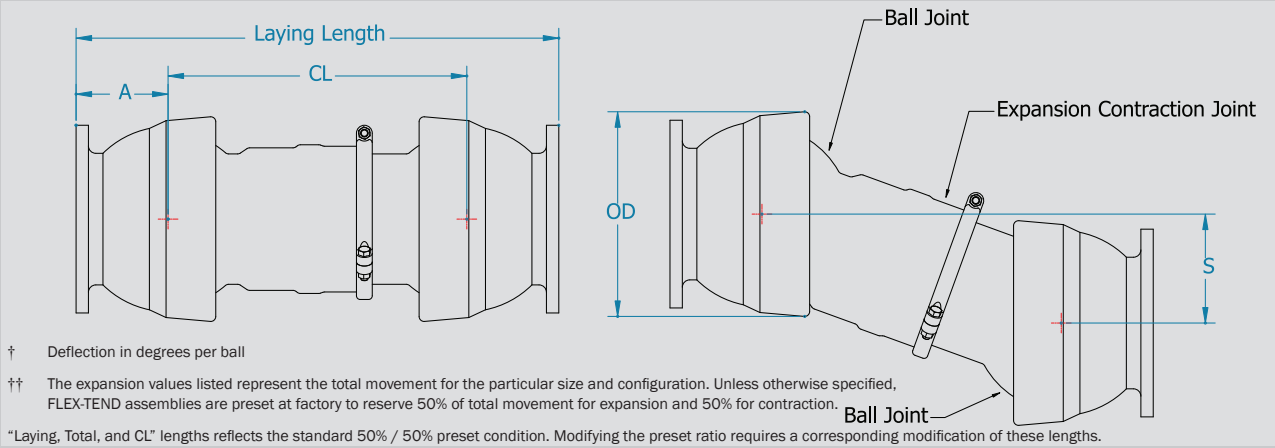
Note: Dimensions are in inches ( $\pm 1\%$ ) and are subject to change without notice.

### Sample Specification – FLEX-TEND®

- Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material requirements of ASTM A536 and ANSI/AWWA C153/A21.53. Foundry certification of material shall be readily available upon request.
- Each flexible expansion joint shall be pressure tested prior to shipment against its own restraint to a minimum of 350 psi (250 psi for flexible expansion joints 2 inch and 30 inch diameter and larger.) A minimum 2:1 safety factor, determined from the published pressure rating, shall apply. Factory Mutual Approval for the 3 inch through 12 inch sizes is required.
- Each flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 20°, 2" - 12"; 15°, 14" - 36"; 12°, 42"-48" and 4-inches minimum expansion. Additional expansion sleeves shall be available and easily added or removed at the factory or in the field. Both standardized mechanical joint and flange end connections shall be available.
- All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Sealing gaskets shall be constructed of EPDM. The coating shall meet ANSI/NSF-61.
- Exterior surfaces shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16.
- Appropriately sized polyethylene sleeves, meeting ANSI/AWWA C105/A21.5, shall be included for direct buried applications.
- Manufacturer's certification of compliance to the above standards and requirements shall be readily available upon request. The purchaser (or owner) shall reserve the right to inspect the manufacturer's facility for compliance. All flexible expansion joints shall be FLEX-TEND as manufactured by EBAA Iron, INC. Eastland, TX., U.S.A.

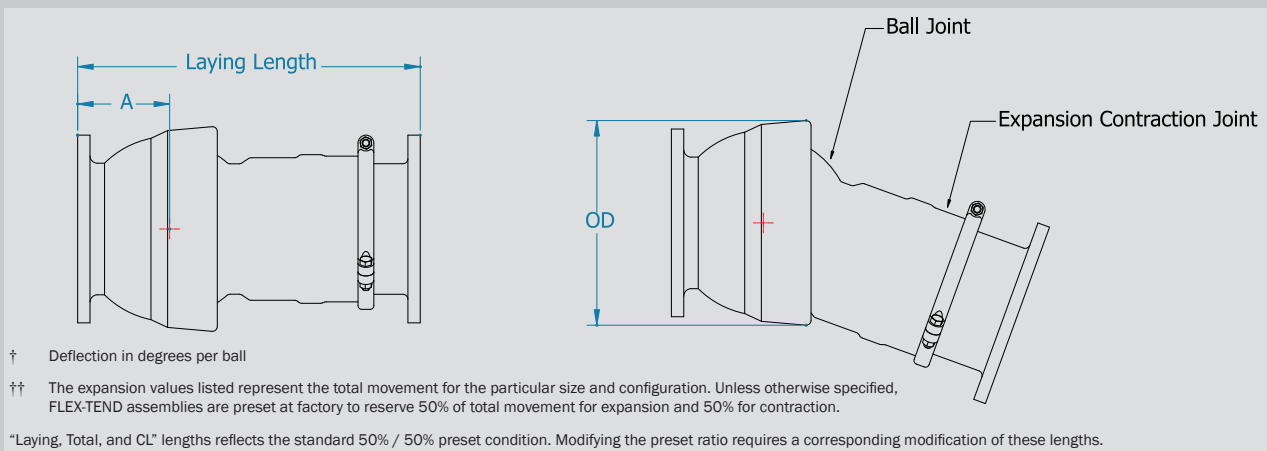
A Microsoft Word Doc Version of this specification is available at [www.ebaa.com](http://www.ebaa.com).

FLEX-TEND Double Ball Submittal Reference Drawing - Flange by Flange



Nominal Pipe Size	OD	Deflection† (Degrees)	A	Expansion††	Laying Length	CL	S (Offset)	Weight (lbs.)	Assembly Number
2	6.1	20	3.9	4 (+2.75, -1.25)	23.8	16	6.2	44	402F20
3	9.2	20	7	4	35.50 (±2.0)	21.50 (±2.0)	7.5	191	403F20
				8	50.80 (±4.0)	36.80 (±4.0)	12.7	235	403F21
				12	66.00 (±6.0)	52.00 (±6.0)	17.9	280	403F22
4	10.85	20	5.62	4	34.04 (±2.0)	22.81 (±2.0)	8.49	161	404F20
				8	49.29 (±4.0)	38.06 (±4.0)	14.39	210	404F21
				12	64.54 (±6.0)	55.31 (±6.0)	20.29	262	404F22
6	12.28	20	6.17	4	36.05 (±2.0)	23.70 (±2.0)	8.79	223	406F20
				8	50.33 (±4.0)	37.98 (±4.0)	14.36	285	406F21
				12	64.61 (±6.0)	52.26 (±6.0)	19.93	346	406F22
8	14.82	20	6.91	4	40.41 (±2.0)	26.59 (±2.0)	9.78	340	408F20
				8	57.51 (±4.0)	43.69 (±4.0)	16.31	432	408F21
				12	74.61 (±6.0)	60.79 (±6.0)	22.84	525	408F22
10	18.03	20	8.21	4	44.80 (±2.0)	28.38 (±2.0)	10.39	510	410F20
				8	60.60 (±4.0)	44.18 (±4.0)	16.48	648	410F21
				12	76.40 (±6.0)	59.98 (±6.0)	22.57	785	410F22
12	20.72	20	9.31	4	48.86 (±2.0)	30.24 (±2.0)	11.03	694	412F20
				8	64.81 (±4.0)	46.19 (±4.0)	17.17	841	412F21
				12	80.76 (±6.0)	62.14 (±6.0)	23.31	989	412F22
14	25	15	13.6	8	64.50 (±4.0)	44.00 (±4.0)	11.79	1,329	414F20
				16	90.90 (±8.0)	70.50 (±8.0)	18.89	1,616	414F21
				24	117.40 (±12.0)	96.90 (±12.0)	25.96	1,904	414F22
16	25	15	13.6	8	73.50 (±4.0)	46.30 (±4.0)	12.41	1,205	416F20
				16	101.50 (±8.0)	74.20 (±8.0)	19.88	1,537	416F21
				24	129.50 (±12.0)	102.10 (±12.0)	27.36	1,869	416F22
18	30.5	15	13.9	8	72.80 (±4.0)	47.00 (±4.0)	12.59	1,905	418F20
				16	99.90 (±8.0)	74.10 (±8.0)	19.86	2,298	418F21
				24	127.00 (±12.0)	101.10 (±12.0)	27.09	2,690	418F22
20	30.5	15	11.4	8	69.00 (±4.0)	45.90 (±4.0)	12.3	1,934	420F20
				16	96.00 (±8.0)	73.20 (±8.0)	19.61	2,358	420F21
				24	123.50 (±12.0)	100.40 (±12.0)	26.9	2,782	420F22
24	37.3	15	15.5	8	83.0 (±4.0)	52.2 (±4.0)	13.99	3,239	424F20
				16	110.5 (±8.0)	79.5 (±8.0)	21.3	3,958	424F21
				24	137.5 (±12.0)	106.8 (±12.0)	28.62	4,678	424F22
30	44.1	15	16.7	10	98.7 (±5.0)	65.3 (±5.0)	17.5	5,047	430F20
				20	133.0 (±10.0)	99.0 (±10.0)	26.53	6,047	430F21
				30	167.0 (±15.0)	132.0 (±15.0)	35.37	7,046	430F22
36	50.6	15	17	10	97.0 (±5.0)	63.0 (±5.0)	16.88	7,118	436F20
				20	131.00 (±10.0)	97.0 (±10.0)	25.99	8,537	436F21
				30	165.0 (±15.0)	131.0 (±15.0)	35.1	9,955	436F22
42	66.25	12	21.56	24	158.8 (±12.0)	113.8 (±12.0)	23.01	14,172	442F20
48	67.1	12	22.5	24	158.8 (±12.0)	113.8 (±12.0)	29.13	17,148	448F20

# FLEX-TEND Single Ball Submittal Reference Drawing - Flange by Flange

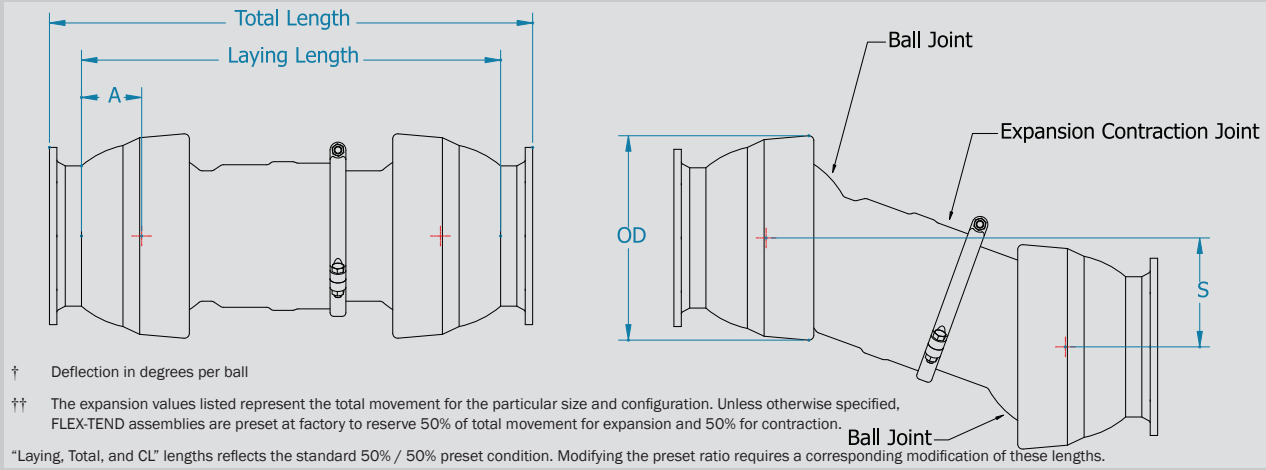


Nominal Pipe Size	OD	Deflection† (Degrees)	A	Expansion††	Laying Length	Weight (lbs.)	Assembly Number
2	~	~	~	~	~	~	~
3	9.2	20	7	4	23.30 (±2.0)	118	403F10
				8	41.80 (±4.0)	163	403F11
				12	60.30 (±6.0)	208	403F12
4	10.85	20	5.62	4	25.43 (±2.0)	112	404F10
				8	40.68 (±4.0)	157	404F11
				12	55.93 (±6.0)	202	404F12
6	12.28	20	6.17	4	27.39 (±2.0)	152	406F10
				8	41.67 (±4.0)	213	406F11
				12	55.95 (±6.0)	274	406F12
8	14.82	20	6.91	4	29.98 (±2.0)	243	408F10
				8	47.08 (±4.0)	335	408F11
				12	64.18 (±6.0)	428	408F12
10	18.03	20	8.21	4	32.79 (±2.0)	359	410F10
				8	48.59 (±4.0)	496	410F11
				12	64.39 (±6.0)	634	410F12
12	20.72	20	9.31	4	34.68 (±2.0)	468	412F10
				8	50.63 (±4.0)	616	412F11
				12	66.58 (±6.0)	763	412F12
14	25	15	13.6	8	48.20 (±4.0)	880	414F10
				16	74.40 (±8.0)	1,168	414F11
				24	101.00 (±12.0)	1,454	414F12
16	25	15	13.6	8	53.50 (±4.0)	911	416F10
				16	81.50 (±8.0)	1,243	416F11
				24	109.50 (±12.0)	1,575	416F12
18	30.5	15	13.9	8	53.30 (±4.0)	1,231	418F10
				16	80.30 (±8.0)	1,624	418F11
				24	107.40 (±12.0)	2,016	418F12
20	30.5	15	11.4	8	50.00 (±4.0)	1,277	420F10
				16	77.00 (±8.0)	1,700	420F11
				24	104.50 (±12.0)	2,111	420F12
24	37.3	15	15.5	8	57.00 (±4.0)	2,083	424F10
				16	84.50 (±8.0)	2,786	424F11
				24	112.00 (±12.0)	3,506	424F12
30	44.1	15	16.7	10	67.10 (±5.0)	3,654	430F10
				20	101.50 (±10.0)	4,595	430F11
				30	135.80 (±15.0)	5,755	430F12
36	50.6	15	17	10	71.90 (±5.0)	4,718	436F10
				20	106.50 (±10.0)	6,136	436F11
				30	141.00 (±15.0)	7,554	436F12
42	Call for Availability						
48	67.1	12	22.5	24		12,016	448F10
All dimensions are ± 1% NOTE: All dimensions listed in brochure are in inches and subject to change without notice.							

All dimensions are ± 1%.

NOTE: All dimensions listed in brochure are in inches and subject to change without notice.

## FLEX-TEND Double Ball Submittal Reference Drawing - M.J. by M.J.



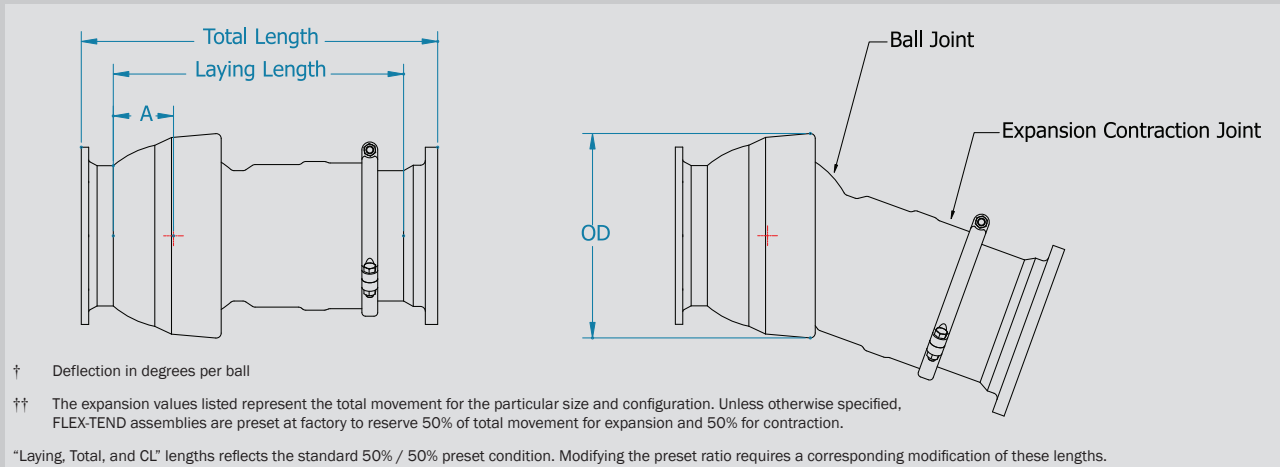
Nominal Pipe Size	OD	Deflection† (Degrees)	A	Expansion††	Total Length	Laying Length	CL	S (Offset)	Weight (lbs.)	Assembly Number
3	9.20	20	4.25	4	35.80 (±2.0)	30.80 (±2.0)	21.30 (±2.0)	7.75	176	403M20
				8	51.00 (±4.0)	46.00 (±4.0)	36.50 (±4.0)	13.28	221	403M21
				12	66.30 (±6.0)	61.30 (±6.0)	51.75 (±6.0)	18.84	265	403M22
4	10.85	20	3.59	4	34.99 (±2.0)	29.99 (±2.0)	22.81 (±2.0)	8.49	152	404M20
				8	50.24 (±4.0)	45.24 (±4.0)	38.06 (±4.0)	14.39	203	404M21
				12	65.49 (±6.0)	60.49 (±6.0)	53.31 (±6.0)	20.29	248	404M22
6	12.28	20	4.20	4	37.11 (±2.0)	32.11 (±2.0)	23.70 (±2.0)	8.79	213	406M20
				8	51.39 (±4.0)	46.39 (±4.0)	37.98 (±4.0)	14.36	274	406M21
				12	65.67 (±6.0)	60.67 (±6.0)	52.26 (±6.0)	19.93	335	406M22
8	14.82	20	4.91	4	41.41 (±2.0)	36.41 (±2.0)	26.59 (±2.0)	9.78	311	408M20
				8	58.51 (±4.0)	53.51 (±4.0)	43.69 (±4.0)	16.31	404	408M21
				12	75.61 (±6.0)	70.61 (±6.0)	60.79 (±6.0)	22.84	497	408M22
10	18.03	20	6.18	4	45.74 (±2.0)	40.74 (±2.0)	28.38 (±2.0)	10.39	475	410M20
				8	61.54 (±4.0)	56.54 (±4.0)	44.18 (±4.0)	16.48	612	410M21
				12	77.34 (±6.0)	72.34 (±6.0)	59.98 (±6.0)	22.57	750	410M22
12	20.69	20	6.84	4	48.91 (±2.0)	43.91 (±2.0)	30.24 (±2.0)	11.03	587	412M20
				8	64.86 (±4.0)	59.86 (±4.0)	46.19 (±4.0)	17.17	735	412M21
				12	80.81 (±6.0)	75.81 (±6.0)	62.14 (±6.0)	23.31	882	412M22
14	25.00	15	7.00	8	65.10 (±4.0)	58.10 (±4.0)	44.00 (±4.0)	11.79	1,222	414M20
				16	91.50 (±8.0)	84.50 (±8.0)	70.50 (±8.0)	18.89	1,510	414M21
				24	117.90 (±12)	110.90 (±12)	96.90 (±12)	25.96	1,798	414M22
16	25.00	15	10.30	8	74.00 (±4.0)	67.00 (±4.0)	46.30 (±4.0)	12.41	1,133	416M20
				16	101.50 (±8.0)	94.50 (±8.0)	74.20 (±8.0)	19.88	1,465	416M21
				24	129.50 (±12)	122.50 (±12)	102.10 (±12)	27.36	1,797	416M22
18	30.50	15	12.60	8	71.90 (±4.0)	65.30 (±4.0)	47.10 (±4.0)	12.62	1,760	418M20
				16	99.20 (±8.0)	92.10 (±8.0)	74.10 (±8.0)	19.86	2,153	418M21
				24	126.20 (±12)	119.20 (±12)	101.10 (±12)	27.09	2,546	418M22
20	30.50	15	10.40	8	73.50 (±4.0)	66.50 (±4.0)	45.90 (±4.0)	12.30	1,874	420M20
				16	101.00 (±8.0)	94.00 (±8.0)	73.20 (±8.0)	19.61	2,298	420M21
				24	128.00 (±12)	121.00 (±12)	100.40 (±12)	26.90	2,721	420M22
24	37.30	15	13.80	8	87.00 (±4.0)	80.00 (±4.0)	52.20 (±4.0)	13.99	3,183	424M20
				16	114.00 (±8.0)	107.00 (±8.0)	79.50 (±8.0)	21.30	3,902	424M21
				24	141.50 (±12)	134.00 (±12)	106.80 (±12)	28.62	4,555	424M22

All dimensions are ± 1%.

NOTE: All dimensions listed in brochure are in inches and subject to change without notice.



# FLEX-TEND Single Ball Submittal Reference Drawing - M.J. by M.J.



Nominal Pipe Size	OD	Deflection† (Degrees)	A	Expansion††	Total Length	Laying Length	Weight (lbs.)	Assembly Number
3	9.20	20	4.25	4	28.50 (±2.0)	23.50 (±2.0)	115	403M10
				8	43.50 (±4.0)	38.50 (±4.0)	160	403M11
				12	58.50 (±6.0)	53.50 (±6.0)	205	403M12
4	10.85	20	3.59	4	28.15 (±2.0)	23.15 (±2.0)	115	404M10
				8	43.40 (±4.0)	38.40 (±4.0)	159	404M11
				12	58.65 (±6.0)	53.65 (±6.0)	204	404M12
6	12.28	20	4.20	4	29.21 (±2.0)	24.46 (±2.0)	150	406M10
				8	43.49 (±4.0)	38.74 (±4.0)	211	406M11
				12	57.77 (±6.0)	53.02 (±6.0)	272	406M12
8	14.82	20	4.91	4	31.98 (±2.0)	26.98 (±2.0)	226	408M10
				8	49.08 (±4.0)	44.08 (±4.0)	319	408M11
				12	66.18 (±6.0)	61.18 (±6.0)	412	408M12
10	18.03	20	6.18	4	34.60 (±2.0)	29.60 (±2.0)	332	410M10
				8	50.40 (±4.0)	45.40 (±4.0)	469	410M11
				12	66.20 (±6.0)	61.20 (±6.0)	607	410M12
12	20.69	20	6.84	4	36.08 (±2.0)	31.21 (±2.0)	416	412M10
				8	52.03 (±4.0)	47.16 (±4.0)	564	412M11
				12	67.98 (±6.0)	63.11 (±6.0)	711	412M12
14	25.00	15	7.00	8	50.10 (±4.0)	43.10 (±4.0)	822	414M10
				16	76.60 (±8.0)	69.60 (±8.0)	1,110	414M11
				24	103.00 (±12.0)	96.00 (±12.0)	1,398	414M12
16	25.00	15	10.30	8	56.00 (±4.0)	49.00 (±4.0)	840	416M10
				16	84.00 (±8.0)	77.00 (±8.0)	1,172	416M11
				24	112.00 (±12.0)	105.00 (±12.0)	1,504	416M12
18	30.50	15	12.60	8	54.40 (±4.0)	47.30 (±4.0)	1,154	418M10
				16	81.50 (±8.0)	74.50 (±8.0)	1,547	418M11
				24	108.60 (±12.0)	101.60 (±12.0)	1,939	418M12
20	30.50	15	10.40	8	54.50 (±4.0)	47.50 (±4.0)	1,226	420M10
				16	81.50 (±8.0)	74.50 (±8.0)	1,650	420M11
				24	109.00 (±12.0)	102.00 (±12.0)	2,074	420M12
24	37.30	15	13.80	8	62.00 (±4.0)	55.00 (±4.0)	2,321	424M10
				16	89.50 (±8.0)	82.50 (±8.0)	3,018	424M11
				24	115.00 (±12.0)	108.00 (±12.0)	3,737	424M12

All dimensions are ± 1%.

NOTE: All dimensions listed in brochure are in inches and subject to change without notice.

# Notes on Thrust Forces and Restraints

Because the FLEX-TEND and EX-TEND both incorporate an expansion joint, it behaves similar to other expansion joint under pressure. Due to their design, expansion joints generate end thrust when subject to internal pressure, as seen in Figure 1.1. This end thrust must be accounted for in pipeline design. The end thrust generated by either the FLEX-TEND or EX-TEND is calculated by multiplying the internal pressure (PSI) by the area listed in Table 1.1.

When used in a long and relatively straight pipeline, the pipe-to-soil friction is generally sufficient to balance the force. The use of thrust blocks or other means of anchoring is required when fittings are placed in close proximity to the expansion joint underground. This protects the pipeline from the tendency of the unit to expand when pressurized. In an above ground installation such as a bridge application, some means must be provided to prevent the expansion of the joint due to internal pressure. This can be accomplished by anchoring the piping to the structure while allowing room for movement when motion occurs. **Please also consider EBAA's thrust or Force Balanced FLEX-TEND models that do not generate axial thrust under water pressure.**

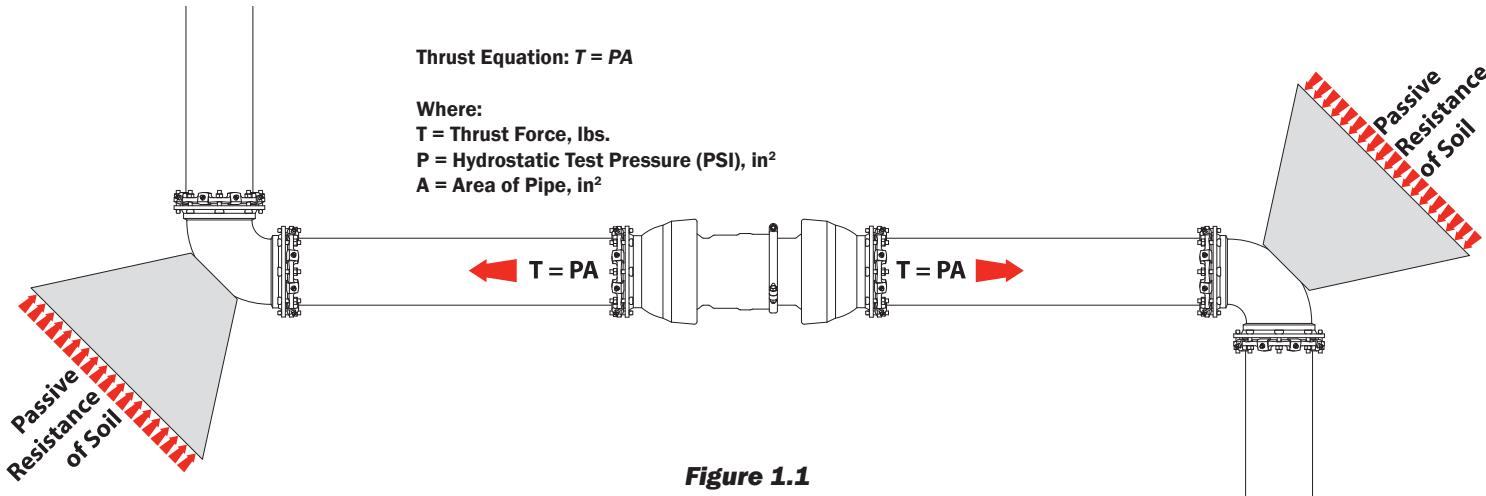
In order for the FLEX-TEND and EX-TEND to protect pipeline connections, any load must be transferred to the unit by the restrained joints. Depending on the piping arrangement and the anticipated movement of the pipelines, adjacent piping must be restrained to adequately transfer the loads to the unit. Joint restraint is provided with each mechanical joint end connection. The Table 1.2 lists some of the restraint products offered by EBAA Iron, Inc. as well as the pipe material on which each is used.

Weld-on flanges are generally used for applications on steel piping. For other piping materials please contact EBAA. For technical information call EBAA Engineering at 800.633.9190.

Table 1.1		Thrust Calculations	
Size (Inch)	Area (Inch <sup>2</sup> )	Thrust @ 150 PSI (lb)	
2	4.43	664.5	
3	12.3	1,845	
4	18.1	2,715	
6	37.4	5,610	
8	64.3	9,645	
10	96.8	14,520	
12	136.9	20,535	
14	237.8	35,670	
16	237.8	35,670	
18	366.4	54,960	
20	366.4	54,960	
24	522.8	78,420	
30	804.3	120,645	
36	1,152.1	172,815	
42	1,555.3	233,295	
48	2,027.0	304,050	

Table 1.2		Mechanical Joint Restraints	
Size Range	Pipe Material	Restraint Product	
3 inch - 48 inch	Ductile Iron	Series 1100	
3 inch - 24 inch	PVC	Series 2000PV	

**EBAA IRON Sales, Inc.**  
P.O. Box 857, Eastland, TX 76448  
Tel: (254) 629-1731  
Fax: (254) 629-8931  
(800) 433-1716 within US and Canada  
contact@ebaa.com  
www.ebaa.com



8 **Figure 1.1**