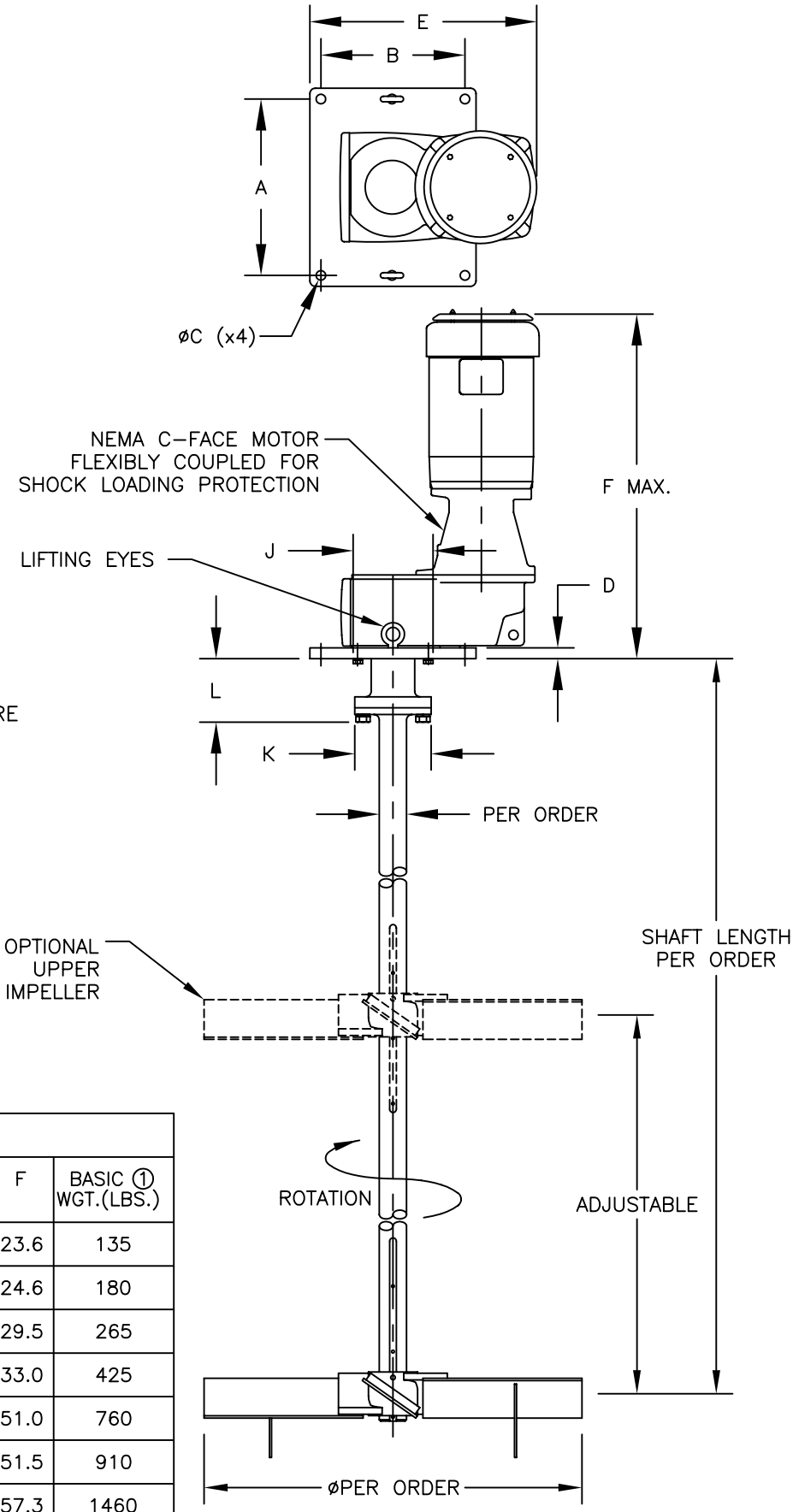
NOTE:
BASIC WEIGHT DOES NOT INCLUDE SHAFT, IMPELLER(S) OR MOTOR.



J: MIN HARDWARE CLEARANCE
REQUIRED IN MOUNTING STRUCTURE

DIMENSIONS			
CASE SIZE	J	øK	L
2	5.9	5.5	5.2
3	7.4	6.0	5.8
4	8.8	6.75	6.9
5	9.3	6.75	7.5
6	11.5	9.2	8.3
7	12.8	10.2	9.8
8	14.8	11.8	11.5
9	16.9	13.0	13.3

DIMENSIONS							
CASE SIZE	A	B	øC	D	E	F	BASIC ① WGT.(LBS.)
2	12.0	12.0	.75	.63	16.5	23.6	135
3	12.0	12.0	.75	.75	17.8	24.6	180
4	16.5	10.0	.88	.88	19.1	29.5	265
5	16.5	10.0	.88	1.00	21.2	33.0	425
6	22.5	15.0	.88	1.25	28.2	51.0	760
7	22.5	15.0	1.12	1.25	29.5	51.5	910
8	25.0	22.0	1.38	1.50	32.0	57.3	1460
9	32.0	28.0	1.38	1.50	42.9	58.5	2300

DRAWN BY: CMW | DATE: 3–23–93 |

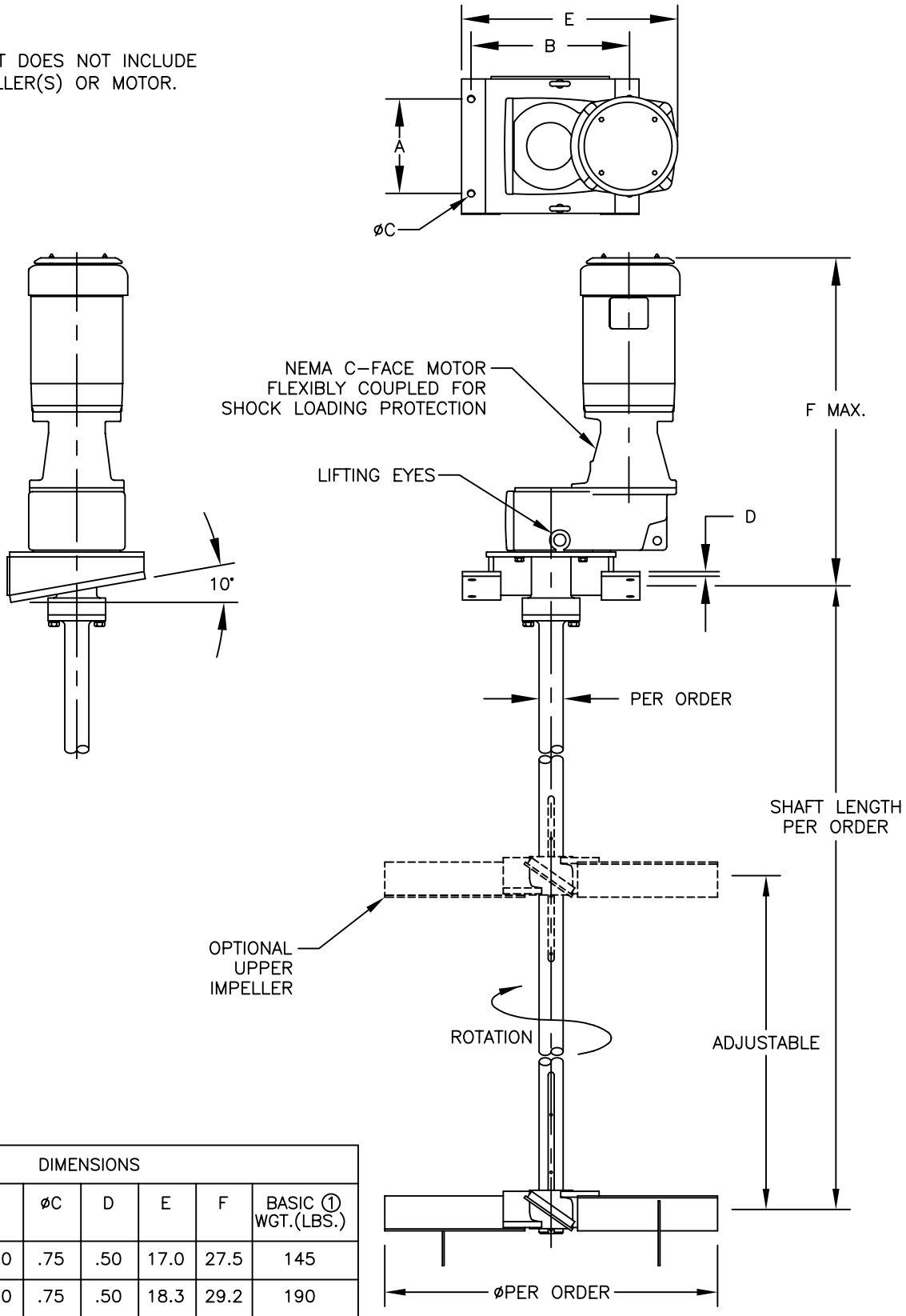
APPROVED BY: | DATE:

BRAWN™ MIXER, INC.
3389 128TH AVENUE
HOLLAND, MI. 49424
PH. 616–399–5600
FAX 616–399–3084

MIXER MODEL
BTO
OPEN TANK MOUNTED MIXER
DIMENSION AND ASSEMBLY DRAWING

DWG. NO. A– TK0023 | REV. C

NOTE:
BASIC WEIGHT DOES NOT INCLUDE SHAFT, IMPELLER(S) OR MOTOR.



DIMENSIONS							
CASE SIZE	A	B	øC	D	E	F	BASIC ① WGT.(LBS.)
2	8.0	13.0	.75	.50	17.0	27.5	145
3	8.0	13.0	.75	.50	18.3	29.2	190
4	10.0	16.50	.88	.75	22.3	35.0	305

* ALL DIMENSIONS AND WEIGHTS ARE FOR REFERENCE ONLY UNLESS THE DRAWING IS CERTIFIED.
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DRAWN BY: BSB | DATE: 10–27–99 |

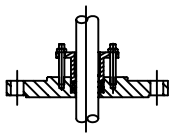
APPROVED BY: | DATE:

BRAWN™ MIXER, INC.
3389 128TH AVENUE
HOLLAND, MI. 49424
PH. 616–399–5600
FAX 616–399–3084

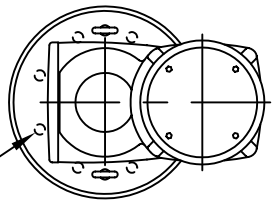
MIXER MODEL
BTO
ANGLE RISER MOUNTED MIXER
DIMENSION AND ASSEMBLY DRAWING

DWG. NO. A– TK0099 | REV.

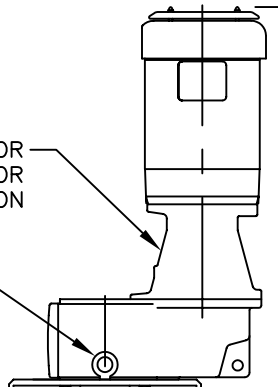
NOTE:
BASIC WEIGHT DOES NOT INCLUDE SHAFT, IMPELLER(S) OR MOTOR.



ALTERNATE
LOW PRESSURE
STUFFING BOX



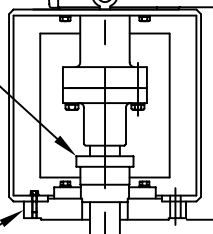
MOUNTING BOLT HOLES
STRADDLE CENTERLINE



NEMA C–FACE MOTOR
FLEXIBLY COUPLED FOR
SHOCK LOADING PROTECTION

LIFTING EYES

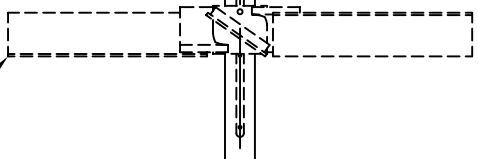
SINGLE MECHANICAL SEAL
SHOWN. DOUBLE MECHANICAL
SEALS AND PACKED STUFFING
BOX ALSO AVAILABLE.



2.4

A MAX.

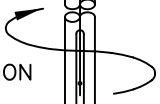
8"–150# ANSI DRILLING
8, ø.875 HOLES ON
ø11.75 BOLT CIRCLE.
OTHER SIZES OPTIONALLY AVAILABLE



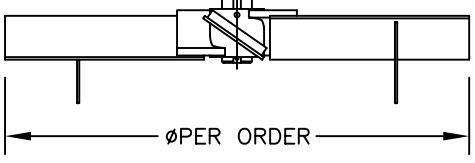
OPTIONAL
UPPER
IMPELLER

SHAFT LENGTH
PER ORDER

ADJUSTABLE



ROTATION



øPER ORDER

DIMENSIONS		
CASE SIZE	A	BASIC ① WGT.(LBS.)
2	43.5	285
3	45.5	330
4	51.5	440

* ALL DIMENSIONS AND WEIGHTS ARE FOR REFERENCE ONLY UNLESS THE DRAWING IS CERTIFIED.
* ALL EQUIPMENT DESIGN AND APPLICATION DATA SHOWN HEREIN IS CONFIDENTIAL AND THE PROPERTY OF BRAWN MIXER, INC. NO USE OR DISCLOSURE THEREOF MAY BE MADE WITHOUT OUR WRITTEN PERMISSION.

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APPROVED BY:	DATE:	

BRAWN™ MIXER, INC.
3389 128TH AVENUE
HOLLAND, MI. 49424
PH. 616–399–5600
FAX 616–399–3084

MIXER MODEL
BTO
CLOSED TANK NOZZLE MOUNTED MIXER
DIMENSION AND ASSEMBLY DRAWING

DWG. NO. A– TK0024 REV. B

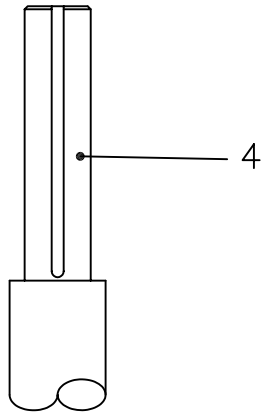
MIXER SHAFT ASSEMBLY

1. ATTACH THE SHAFT COLLAR (ITEM 5) TO THE MIXER SHAFT (ITEM 4).

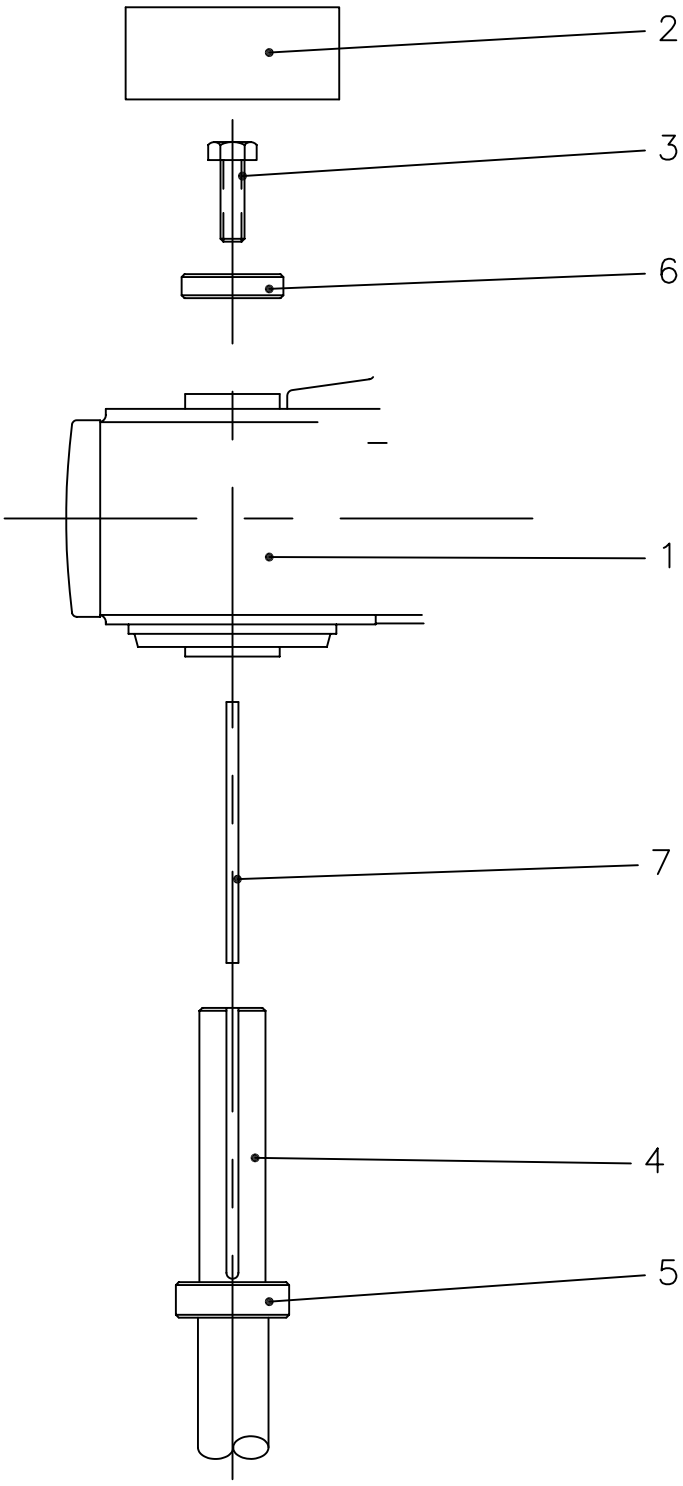
2. PLACE THE KEY (ITEM 7) ON THE MIXER SHAFT AND SLIDE THE MIXER SHAFT INTO THE HOLLOW OUTPUT SHAFT ON THE GEARDRIVE (ITEM 1).

3. PLACE THE THRUST WASHER (ITEM 6) OVER THE HOLLOW OUTPUT SHAFT ON THE TOP OF THE GEARDRIVE. APPLY THREADLOCKER TO THE THREADS OF THE HEX HEAD CAP SCREW (ITEM 3), INSTALL IT THRU THE THRUST WASHER AND INTO THE MIXER SHAFT. TORQUE THE GRADE 5 HEX HEAD CAP SCREW TO THE RECOMMENDED VALUE IN THE O&M MANUAL.

4. ATTACH THE GUARD (ITEM 2) ON THE TOP OF THE GEARDRIVE.



ALTERNATE CONST. OF SHAFT



ITEM NO.	QTY.	PART NAME
7	1	KEY
6	1	THRUST WASHER
5	1	SHAFT COLLAR
4	1	MIXER SHAFT
3	1	HEX HEAD CAP SCREW
2	1	GUARD
1	1	GEARDRIVE

DRAWN BY: DAD | DATE: 8-23-06 |

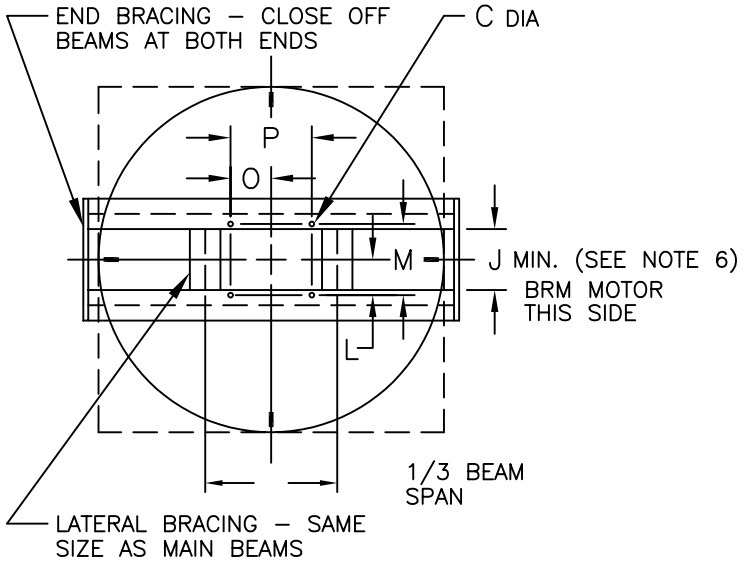
APPROVED BY: | DATE:

BRAWN™ MIXER, INC.
3389 128TH AVENUE
HOLLAND, MI. 49424
PH. 616-399-5600
FAX 616-399-3084

MIXER MODEL
BTO SHAFT ASSEMBLY

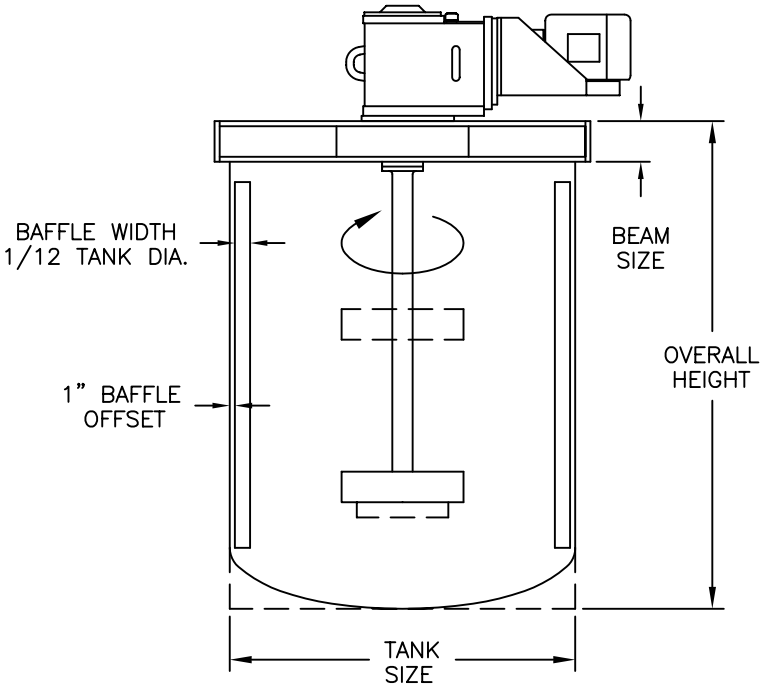
DIMENSION AND ASSEMBLY DRAWING

DWG. NO. A- TK0145 | REV.



MOUNTING HOLE DIMENSIONS									DESIGN LOADS		
CASE SIZE			DIMENSION – INCHES						DOWNWARD LOAD (LBS.)	BENDING (IN. LBS.)	TORSIONAL (IN. LBS.)
BTO	BTD	BRM	C	J	L	M	O	P			
2			.75	5.9	6.00	12.00	6.00	12.00	620	7,500	5,110
3			.75	7.4	6.00	12.00	6.00	12.00	1,015	17,650	8,450
4			.88	8.8	8.25	16.50	5.00	10.00	1,510	34,500	14,350
5			1.00	9.3	8.25	16.50	5.00	10.00	3,275	60,000	21,000
	20		1.00	7.5	6.00	12.00	6.00	12.00	1,015	17,650	8,450
	21		1.00	8.5	7.00	14.00	7.00	14.00	1,510	34,500	14,350
	22		1.00	9.5	8.00	16.00	8.00	16.00	3,275	60,000	21,000
		30	.88	13.5	11.25	22.50	5.75	13.25	3,275	60,000	21,000
		40	.88	14.0	11.25	22.50	6.75	15.00	4,715	95,000	42,960
		50	1.00	15.0	12.63	25.25	7.25	16.25	6,300	142,000	57,275
		60	1.12	17.0	13.75	27.50	8.38	21.75	10,350	235,000	85,950
		70	1.12	20.0	16.25	32.50	9.75	24.00	13,100	319,000	143,200
		80	1.38	23.0	19.00	38.00	11.50	30.00	16,350	476,000	175,000
		90	1.38	23.0	19.00	38.00	11.50	30.00	19,950	476,000	229,100

TYPICAL MOUNTING BEAM SIZES							
CASE SIZE			TANK DIAMETER OR BEAM SPAN – FEET				
BTO	BTD	BRM	UP TO 10'	OVER 10' UP TO 15'	OVER 15' UP TO 20'	OVER 20' UP TO 25'	OVER 25' UP TO 30'
2			M4 X 13	M6 X 20	W8 X 24	W10 X 33	W10 X 49
3	20		W5 X 16	W8 X 18	W8 X 28	W10 X 39	W10 X 60
4&5	21&22	30	W5 X 16	W8 X 18	W8 X 35	W10 X 45	W10 X 68
		40	M6 X 20	W8 X 21	W8 X 48	W10 X 60	W10 X 100
		50	M6 X 25	W8 X 28	W8 X 48	W10 X 68	W10 X 100
		60	W8 X 24	W8 X 40	W10 X 45	W10 X 100	W14 X 82
		70	W8 X 35	W8 X 58	W10 X 60	W14 X 61	W14 X 109
		80	W8 X 48	W8 X 67	W10 X 77	W14 X 74	W14 X 120
		90	W8 X 48	W8 X 67	W10 X 77	W14 X 82	W14 X 132



NOTES:
1. TYPICAL SUPPORT STRUCTURE IS CONSTRUCTED OF TWO STEEL BEAMS WITH LATERAL AND END BRACING. ALL WELDS ARE CONTINUOUS.
2. TANK MAY BE ROUND, SQUARE, OR RECTANGULAR.
3. ROUND TANKS REQUIRE BAFFLES AS SHOWN.
4. BRAWN MIXER INC. WARRANTY APPLIES ONLY TO ITEMS FURNISHED BY BRAWN MIXER INC. ALL OTHER EQUIPMENT AND DESIGNS ARE THE RESPONSIBILITY OF OTHERS. BRAWN MIXER INC. DOES NOT WARRANT, GUARANTEE, OR ASSUME ANY RESPONSIBILITY FOR THE DESIGN OR CONSTRUCTION OF THE MOUNTING STRUCTURE FOR THE MIXER.
5. DESIGN LOADS ARE GREATER THAN ACTUAL LOADS BY A SUITABLE FACTOR TO PROVIDE FOR ADEQUATE DESIGN OF MIXER MOUNTING STRUCTURE.
6. DIMENSION "J" IS FOR CLEARANCE IN MOUNTING STRUCTURE AND IS TO BE CENTERED ON MIXER SHAFT CENTER LINE.

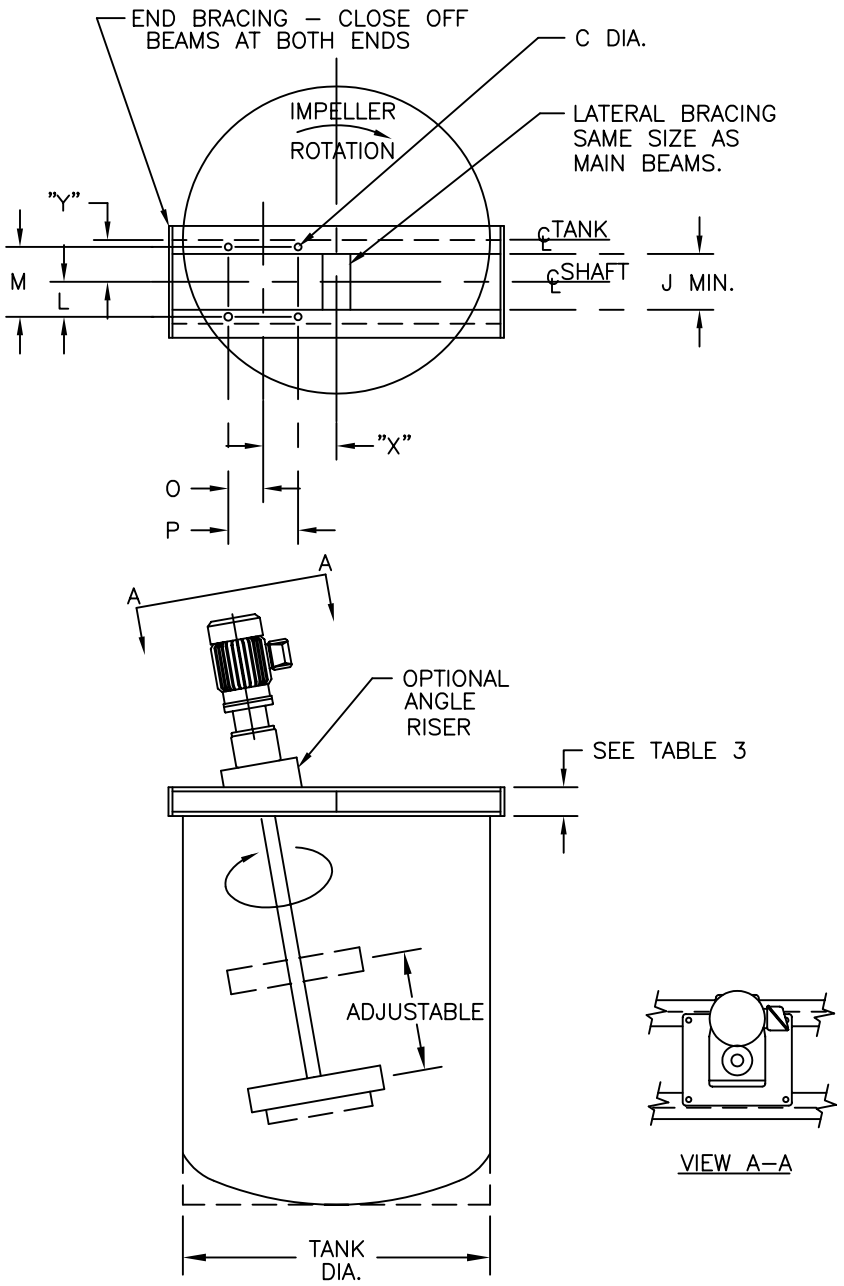
FILE NO. SDB100E DATE 2-27-01

BRAWN MIXER, INC.

MIXER MODEL

BTO, BTD & BRM SUPPORT STRUCTURE

DIMENSION AND ASSEMBLY DRAWING



ANGULAR OFF–SET MOUNTING
(SEE TABLE 4 FOR DIMENSIONS X & Y)

VIEW A–A

MOUNTING HOLE DIMENSIONS						
CASE SIZE	DIMENSION – INCHES					
BTO	C	J	L	M	O	P
2	.75	5.9	6.50	13.00	4.00	8.00
3	.75	7.4	6.50	13.00	4.00	8.00
4	.88	8.8	8.25	16.50	5.00	10.00

TABLE1

DESIGN LOADS			
CASE SIZE	DOWNWARD LOAD (LBS.)	BENDING (IN. LBS.)	TORSIONAL (IN. LBS.)
2	620	7,500	5,110
3	1,015	17,650	8,450
4	1,510	34,500	14,350

TABLE 2

TYPICAL MOUNTING BEAM SIZES			
CASE SIZE	TANK DIAMETER OR BEAM SPAN		
BTO	UP TO 10°	OVER 10° UP TO 15°	OVER 15° UP TO 20°
2	M4 x 13	M6 x 20	W8 x 24
3	W5 x 16	W8 x 18	W8 x 28
4	W5 x 16	W8 x 18	W8 x 35

TABLE 3

TANK DIA.	"X"	"Y"
65"	17"	9.75"
68"	18"	10.25"
72"	18.75"	10.75"
75"	19.5"	11.25"
79"	20.25"	11.75"
82"	21.25"	12.25"
88"	22.25"	12.75"
89"	23"	13.25"
92"	24"	13.75"
96"	24.75"	14.25"
99"	26.75"	14.75"
103"	28.5"	15.25"
107"	29.25"	16.25"
111"	30"	17.25"
117"	31.75"	18.25"
124"	33.5"	19.25"
130"	35.25"	20.25"
137"	37"	21.25"
143"	38.75"	22.25"
146"	40.5"	23.25"
149"	42.5"	24.25"
155"	44"	25.25"
161"	45.5"	25.5"
167"	47.5"	27.5"
171"	49"	28.5"
176"	50.75"	29.5"
179"	52.5"	30.5"
187"	56"	32.5"
196"	59.5"	34.5"
207"	63"	36.5"
219"	66.5"	38.5"
230"	70"	40.5"

TABLE 4

NOTES:
1. TYPICAL SUPPORT STRUCTURE IS CONSTRUCTED OF TWO STEEL BEAMS WITH LATERAL AND END BRACING
2. CONTINUOUS WELDS ARE PREFERRED OVER SKIP WELDS WHEN INSTALLING LATERAL AND END BRACING.
3. WARRANTY APPLIES ONLY TO ITEMS FURNISHED BY BRAWN MIXER, INC. ALL OTHER EQUIPMENT AND DESIGNS ARE THE RESPONSIBILITY OF OTHERS. BRAWN MIXER, INC. DOES NOT WARRANT, GUARANTEE, OR ASSUME ANY RESPONSIBILITY FOR THE DESIGN OR CONSTRUCTION OF THE MOUNTING STRUCTURE FOR THE MIXER.
4. DESIGN LOADS ARE GREATER THAN ACTUAL LOADS BY A SUITABLE FACTOR TO PROVIDE FOR ADEQUATE DESIGN OF MIXER MOUNTING STRUCTURE.

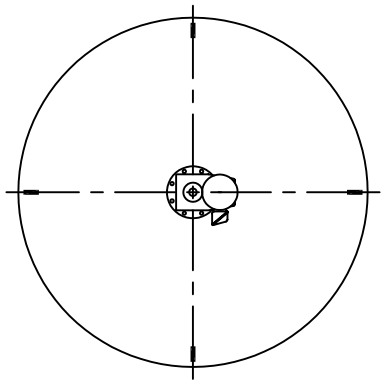
FILE NO. SDB104B DATE 3–31–97

BRAWN MIXER, INC.

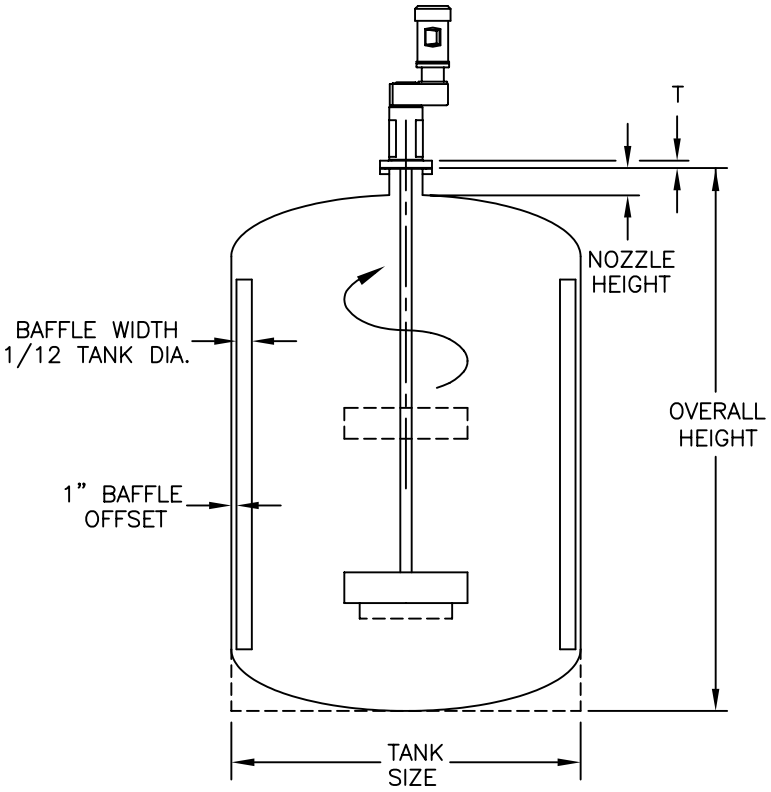
MIXER MODEL

BTO ANGLE MOUNT

DIMENSION AND ASSEMBLY DRAWING



MOUNTING HOLE DIMENSIONS									DESIGN LOADS		
CASE SIZE			150 LB. ANSI FLANGE DRILLING						DOWNWARD LOAD (LBS.)	BENDING (IN. LBS.)	TORSIONAL (IN. LBS.)
BTO	BTD	BRM	ANSI SIZE	O.D.	BOLT CIRC.	NO. HOLES	BOLT DIA.	T			
2			8	13.5	11.75	8	.75	2.00	810	7,500	5,110
3			8	13.5	11.75	8	.75	2.00	1,205	17,650	8,450
4			8	13.5	11.75	8	.75	2.00	2,500	34,500	14,350
	20		8	13.5	11.75	8	.75	2.00	1,205	17,650	8,450
	21		8	13.5	11.75	8	.75	2.00	2,500	34,500	14,350
	22		10	16.0	14.25	12	.88	2.25	3,550	60,000	21,000
		30	10	16.0	14.25	12	.88	2.25	3,550	60,000	21,000
		40	12	19.0	17.00	12	.88	2.50	5,100	95,000	42,960
		50	14	21.0	18.75	12	1.00	2.75	6,790	142,000	57,275
		60	16	23.5	21.25	16	1.00	2.75	11,100	235,000	85,950
		70	18	25.0	22.75	16	1.12	3.00	14,100	319,000	143,200
		80	20	27.5	25.00	20	1.12	3.25	17,550	476,000	175,000
		90	24	32.0	29.50	20	1.25	3.63	21,900	476,000	229,100



NOTES:

1. WARRANTY APPLIES ONLY TO ITEMS FURNISHED BY BRAWN MIXER, INC. ALL OTHER EQUIPMENT AND DESIGNS ARE THE RESPONSIBILITY OF OTHERS. BRAWN MIXER, INC. DOES NOT WARRANT, GUARANTEE, OR ASSUME ANY RESPONSIBILITY FOR THE DESIGN OR CONSTRUCTION OF THE MOUNTING STRUCTURE FOR THE MIXER.
2. DESIGN LOADS ARE GREATER THAN ACTUAL LOADS BY A SUITABLE FACTOR TO PROVIDE FOR ADEQUATE DESIGN OF MIXER MOUNTING STRUCTURE.
3. ROUND TANKS REQUIRE BAFFLES AS SHOWN.
4. DESIGN LOAD AND NOZZLE MOUNTING INFORMATION, FOR CLOSED TANK INSTALLATION, IS APPLICABLE FOR BOTH STUFFING BOX AND MECHANICAL SEAL MIXERS.
5. FLANGE SIZES LARGER THAN STANDARD ARE AVAILABLE AS AN OPTION.

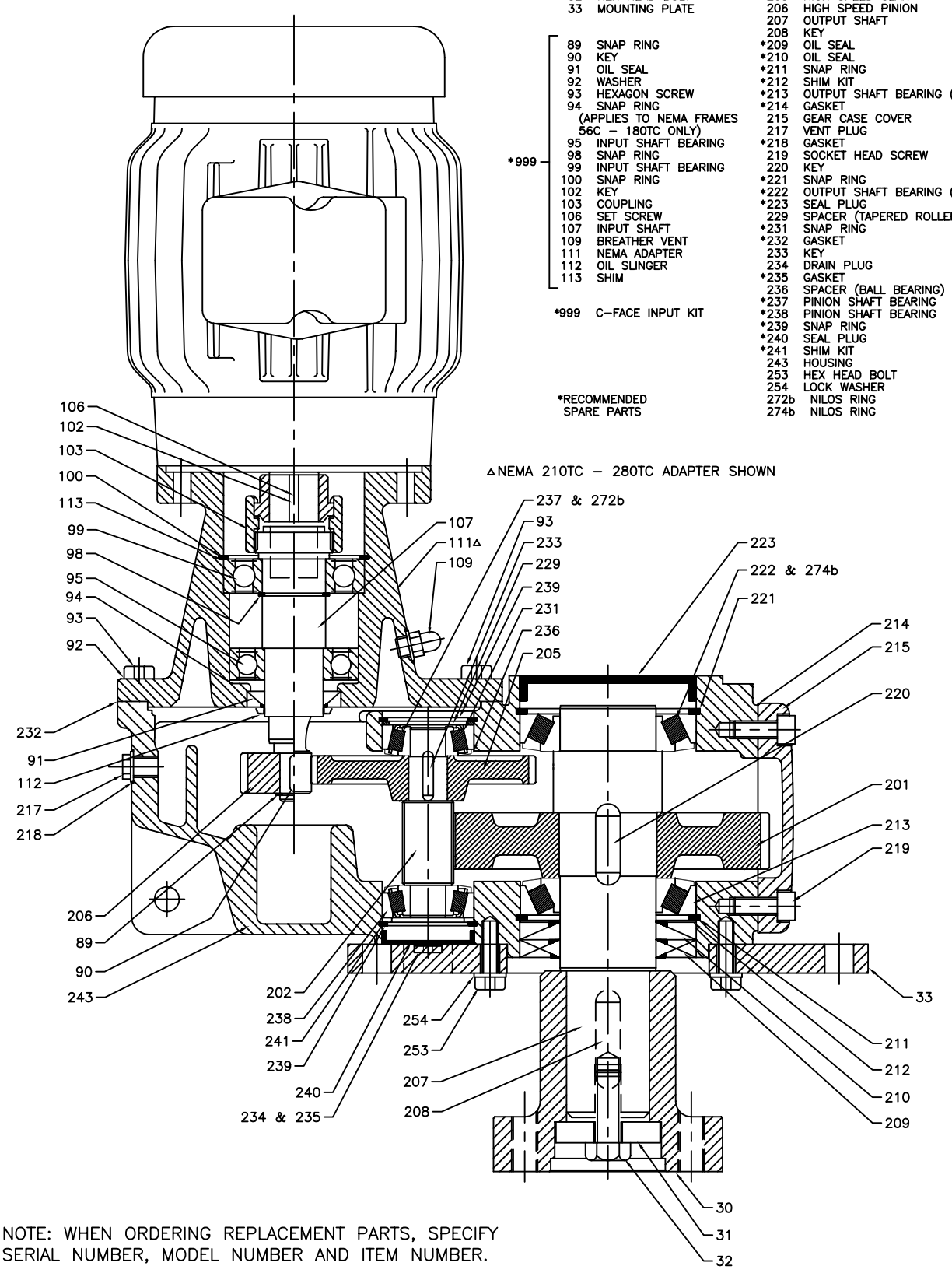
FILE NO. SDB102C DATE 3-26-02

BRAWN MIXER, INC.

MIXER MODEL

BTO, BTD & BRM ANSI FLANGE MOUNT

DIMENSION AND ASSEMBLY DRAWING



NOTE: WHEN ORDERING REPLACEMENT PARTS, SPECIFY SERIAL NUMBER, MODEL NUMBER AND ITEM NUMBER.

DRAWN BY: TJD	DATE: 5–19–97	© 1997
APPROVED BY:	DATE:	

BRAWN™ MIXER, INC.
3389 128TH AVENUE
HOLLAND, MI. 49424
PH. 616–399–5600
FAX 616–399–3084

MIXER MODEL
BTO CUT–AWAY
SIZE 2 THRU 5 DOUBLE REDUCTION
DIMENSION AND ASSEMBLY DRAWING

DWG. NO.	REV.
A– TK0065	

3389 ~ 128th Avenue Holland, MI 49424 Phone: 616/399-5600 Fax 616/399-3084

CONTENTS

Mixer Installation / Assembly / Dimension Drawings

SAFETY

The precautions mentioned in this manual are not intended to cover all hazards that may exist in a plant or on this equipment. Using safety mechanisms requires the constant attention of everyone in the vicinity of this (or any) equipment.

A plant and the related equipment are only as safe as the personnel are safety-minded. Proper equipment maintenance and the use of personal safety devices will contribute as much toward safety as will any number of mechanical safety devices.

WARNING

- To assure maximum safety, optimum performance, and to gain knowledge of the product, it is essential that you or any other operator of this equipment read and understand the contents of this manual before the mixer is operated.
- Installation, operation and maintenance must be performed only by qualified personnel.
- Do not operate this equipment unless all safety devices are installed and working properly. Check all devices prior to starting the equipment.
- Disconnect and lock out electrical power before installing or servicing the mixer.
- Do not touch rotating parts (keep all guards and safety devices installed while operating).
- Develop a safety checklist for this equipment and perform regular maintenance to ensure continued and proper operation. Develop a safety checklist for this equipment and perform regular maintenance to ensure continued and proper operation.
- Do not make any field changes or modifications without reviewing the change with your BRAWN sales representative or the BRAWN Customer Service Department.

CUSTOMER SERVICE

Mixer Model # ..... **BTO-SERIES**
Mixer Serial # _____
Contact:

- Customer Service 616/399-5600
- E-Mail ..... brawn@brawnmixer.com

You have received a quality engineered and manufactured BRAWN Mixer. We value your business, and we will strive to provide you with the proper service and equipment to meet your needs.

The information contained in this BRAWN Mixer Operator's Manual is designed to assist you in putting your BRAWN Mixer into operation without further delay. **Please read the entire manual before attempting to start your mixer.** If you have any further questions or if, by some chance, there are some missing components, contact your BRAWN Mixer Representative or the factory immediately.

We welcome your comments and suggestions concerning any BRAWN Mixer product. Please direct these comments in writing to the National Sales Manager at BRAWN Mixer, Inc., located in Holland, Michigan. To expedite troubleshooting service, please make your initial contact through your BRAWN Mixer Representative. If, for whatever reason, your representative cannot be reached and you have an emergency condition, please call us directly at 616/399-5600 and ask for the Customer Service Department.

Remember, you are backed by your BRAWN Mixer Technical representative and the factory support team. We are here to assist you; let us know how we can be of help.

3389 ~ 128th Avenue Holland, MI 49424 Phone: 616/399-5600 Fax 616/399-3084

INITIAL INSPECTION

1. Upon receipt of your Brawn Mixer, check for possible shipping damage. Report any damage immediately to the carrier and to Brawn Mixer, Inc.

2. All Brawn Mixers are shipped with the shaft and impeller(s) disassembled from the drive assembly. In addition, the clamp or cup mount and any mounting hardware for portable mixers are shipped loose.

3. Storage: Mixers should not be stored near vibrating machinery to avoid damage to the bearings. Store mixers as packaged by the factory. For longer storage periods, consult factory. If electric motors have been subjected to humid conditions, check the insulation resistance between phase and mass and between the different phases. The resistance should not be less than 100 megohms. If the resistance is less, please consult the factory. If mixer is stored for more than a year, the condition of the gear lubricant should be checked before the mixer is put in operation (see lubrication instructions).

INSTALLATION

[REFER TO ASSEMBLY / DIMENSION DRAWING]

Refer to the mixer installation / assembly drawing for important mounting structure design, assembly, mounting and dimensional data.

1. The mixer is shipped with two eyebolts located in the mounting base. These should be used in combination with the hole at the rear of the gear drive for lifting of the mixer assembly.

2. Install the mixer drive on the mounting structure and secure with properly-sized, Grade 5 or better hardware. Torque the hardware as recommended in **TABLE 1**.

3. Couple the mixer shaft to the gear drive output shaft coupling and secure with the hardware provided. Torque as recommended in **TABLE 1**. Refer to precautions under the **Shaft and Impeller Assembly** section.

4. Install impeller(s) on lower shaft (refer to **Shaft and Impeller Assembly** section).

TABLE 1: RECOMMEND TORQUE VALUES

HARDWARE SIZE	*TORQUE VALUES (FOOT POUNDS)*	
	STANDARD GRADE 2 & 300 SERIES STAINLESS	*HIGH STRENGTH GRADES 5 & 8*
3/8-16	17	27
7/16-14	27	40
1/2-13	40	65
9/16-12	65	90
5/8-11	85	125
3/4-10	135	225
7/8-9	145	365
1-8	210	545

BOLT-TIGHTENING RECOMMENDATIONS:
Inadequately or improperly tightened hardware can loosen, due to vibration during mixer operation. This can result in reduced mixer life or damage to equipment. Recommended torque values for tightening all in-tank and mounting hardware are listed in **TABLE 1**. These average torque values should be considered only as a guide and not as absolute values.

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SHAFT & IMPELLER ASSEMBLY

To install the impeller on the shaft, slide the impeller hub over the mixer shaft, place the hook key in position, lower the hub over the hook key and tighten the set screw. The set screw must seat in the countersunk hole in the hook key. Proper impeller mounting is illustrated in **FIGURE 1**. If an axial flow impeller of bolt together construction is used, blades should be bolted to the bottom of the impeller hub ears as shown in **FIGURE 2**.

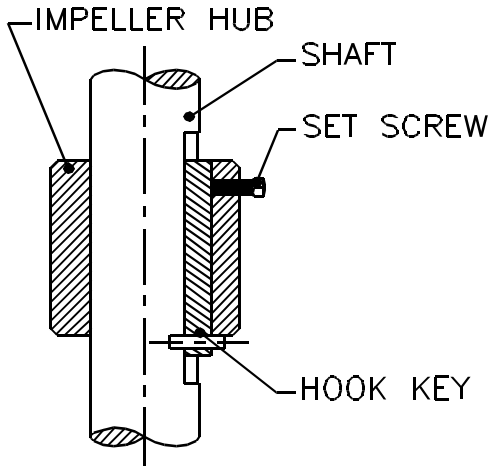

FIGURE 1: IMPELLER MOUNT WITH HOOK KEY

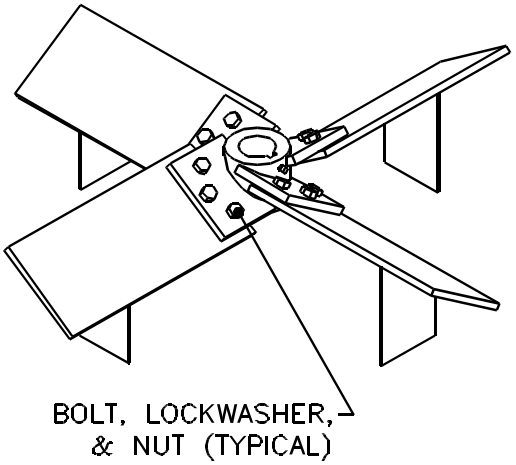

FIGURE 2: TYPICAL AXIAL FLOW IMPELLER ASSEMBLY (A45 SHOWN)

START UP

1. All units are lubricated before shipment. The lubricant level should be checked with the unit mounted in its correct operating position. Lubricant should be added or removed to bring it to the correct level. The catalog for the gear unit shows the oil level for various mounting positions.

2. Connect the motor in accordance with the motor nameplate. The motor starter should incorporate overload protection. Before operating the mixer, jog the motor and observe mixer shaft rotation. Proper rotation is clockwise, as viewed from the top, unless otherwise noted.

3. Check all bolts and fasteners for tightness. It is good maintenance practice to recheck all bolts after two weeks of operation and periodically thereafter. Refer to **TABLE 1** for recommended torque values.

4. Do not attempt to start mixer with impellers buried in solids or solidified liquids.

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ELECTRIC MOTORS

This equipment contains HAZARDOUS VOLTAGES, ROTATING PARTS AND HOT SURFACES. SEVERE PERSONAL INJURY OR PROPERTY DAMAGE CAN RESULT IF SAFETY INSTRUCTIONS ARE NOT FOLLOWED. Only qualified personnel should work on or around this equipment after becoming thoroughly familiar with all warnings, safety notices, and maintenance procedures contained herein. The successful and safe operation of this equipment is dependant upon proper handling, installation, operation and maintenance.

WARNING

Explosion-proof motors-these motors are constructed to comply with the U.L. Label Service Procedure Manual. When repairing and reassembling a motor that has an underwriter's label, it is imperative that the unit be reinspected and:

1. All original fits and tolerance be maintained.
2. All plugs and hardware be securely fastened.
3. Any parts replacements, including hardware, be accurate duplicates of the originals.

Repair work on explosion-proof motors can only be done by the original manufacturing or U.L. certified shops. Violations of any of the above items will invalidate the significance of the U.L. Label.

STORAGE

Motors must be stored in a clean, dry, well ventilated location free from vibration and rapid or wide temperature variations. If the unit is to be stored longer than three months, consult factory. Ball bearing motors are shipped from the factory properly lubricated and ready to operate. When in storage, the motor shaft must be turned several rotations every month and bearings relubricated every year. On non-explosion-proof TEFC motors, a removable plug in the bottom of the frame or housing permits removal of accumulated moisture. Drain regularly if storage atmosphere results in formation of condensation.

INSTALLATION

Installation must be handled by qualified service or maintenance personal.

OPERATION

CAUTION

Repeated trial starts can overheat the motor and may result in motor burnout. If repeated trial starts are made, allow sufficient time between trials to permit heat to dissipate from windings and rotor to prevent overheating. Starting currents are several times running currents, and heating varies as the square of the current.

After installation is completed, but before motor is put in regular service, make an initial start as follows:

1. Check motor starting and control device connections against wiring diagrams.
2. Check voltage, phase, and frequency of line circuit (power supply) against motor nameplate.
3. If possible, remove external load (disconnect drive) and turn shaft by hand to ensure free rotation. This may have been done during installation procedure; if so, and conditions have not changed since, this check may not be necessary.
   a. If drive is disconnected, run motor at no load long enough to be certain that no unusual conditions develop. Listen and feel for excessive noise, vibration, clicking, or pounding. If present, stop motor immediately. Investigate the cause and correct before putting motor in service.
   b. If drive is not disconnected, interrupt the starting cycle after motor has accelerated to low speed. Carefully observe for unusual conditions as motor coasts to a stop.
4. When checks are satisfactory, operate at minimum load and look for unusual condition. Increase load slowly to maximum. Check unit for satisfactory operation.

CAUTION

Guard against overloading. Overloading causes overheating and overheating means shortened insulation life. A motor subjected to a 10°C temperature rise above the maximum limit for the insulation may cause the insulation life to be reduced by 50%. To avoid overloading, be sure motor current does not exceed nameplate current when nameplate voltage is applied.

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ELECTRIC MOTORS, Cont.

Electric motors operating under normal conditions become quite warm. Although some places may feel hot to the touch, the unit may be operational within limits. Use a thermocouple to measure winding temperature.

The total temperature, not the temperature rise, is the measure of safe operation. Investigate the operating conditions if the total temperature measured by a thermocouple placed on the windings exceeds:

230°F (110°C) for class “B” insulation
275°F (135°C) for class “F” insulation
302°F (150°C) for class “H” insulation

VOLTAGE REGULATION

Motors will operate successfully under the following conditions of voltage and frequency variation, but not necessarily in accordance with the standard established for operation under rated conditions:

1. When the variation in voltage does not exceed 10% above or below normal, with all phases balanced.
2. When the variation in frequency does not exceed 5% above or below normal.
3. When the sum of the voltage and frequency of the voltage does not exceed 10% above or below normal (provided the frequency variation does not exceed 5%).

MAINTENANCE

Failure to properly maintain the equipment can result in severe personal injury and product failure. The instructions contained herein should be carefully reviewed, understood and followed. The following maintenance procedures should be performed regularly:

1. Bearing lubrication
2. Insulation resistance check
3. Cleaning

This checklist does not represent an exhaustive survey of maintenance steps necessary to ensure safe operation of the equipment. Particular applications may require further procedures

Dangerous voltages are present in the equipment which can cause severe personal injury and product failure. Always de-energize and ground the equipment before maintenance. Maintenance should be performed only by qualified personal.

The use of unauthorized parts in the repair of the equipment, tampering by unqualified personal, or removal or alteration of guards or conduit covers will result in dangerous conditions which can cause severe personal injury or equipment damage. Follow all safety instructions contained herein.

BEARING LUBRICATION

CAUTION

Do not lubricate motor while in operation, since excess grease will be forced through the bearings and into the motor before it will force its way out the drain plug. Excess grease accumulation on windings reduces insulation life.

Prior to shipment, motor bearings are lubricated with the proper amount and grade to provide six months of satisfactory service under normal operation and conditions.

For best results, grease should be compounded from a polyurea base and a good grade of petroleum oil. It should be of No. 2 consistency and stabilized against oxidation. Operating temperature ranges should be from -15°F to +250°F for class B insulation, and to +300°F for class F and H. Most leading oil companies have special bearing greases that are satisfactory.

Relubricate bearings every six months (more often if conditions require), as follows:

1. Stop the motor. Lock out the switch.
2. Thoroughly clean off pipe plugs and remove from housings.
3. Remove hardened grease from drains with stiff wire or rod.
4. Add grease to inlet with hand gun until small amount of new grease is forced out drain.
5. Remove excess grease from ports, replace inlet plugs, and run motor ½ hour before replacing drain plug.
6. Put motor back in operation.

ELECTRIC MOTORS, Cont.

INSULATION RESISTANCE

Check insulation resistance periodically. Any approved method of measuring insulation resistance may be used, provided the voltage across the insulation is at a safe value for the type and condition of the insulation. A hand crank megger of not over 500 volts is the most convenient and safest method. Standards of the Institute of Electrical and Electronics Engineers, Inc., recommend that the insulation resistance of the stator windings at 75° C, measured at 500 volts dc, after one minute should not be less than:

$$\frac{\text{Rated Voltage of Machine} + 1000}{1000} = \text{Insulation Resistance in Megohms}$$

This formula is satisfactory for most checks. For more information, see IEEE Standard No. 43 “Recommended Practice for Insulation Resistance Testing of AC Rotating Machinery.”

CLEANING

WARNING

Do not attempt to clean the motor while it is operating. Contact with rotating parts can cause severe personal injury or property damage. Stop the motor and lock out switch before cleaning.

The motor exterior must be kept free of oil, dust, water, and chemicals. For fan cooled motors, it is particularly important to keep the air intake openings free of foreign material. Do not block air outlet or inlet.

On non-explosion-proof TEFC motors, a removable plug in the bottom center of the motor frame or housing permits removal of accumulated moisture. Drain regularly.

MAINTENANCE / LUBRICATION

Gear units should have the oil changed every 10,000 hours or 2 years. If synthetic lubricant is used, it should be changed every 20,000 hours or 4 years. For adverse operating conditions, the interval should be shorter. **DO NOT MIX SYNTHETIC AND MINERAL BASE OILS.** Units should be checked periodically for increased noise, surface temperature, vibration, shaft movement and amperage draw. Units with inspection covers should not be operated with the inspection cover removed.

CAUTION

Oil should be changed more often if reducer is used in a severe environment. (i.e. dusty, humid)

All reducers are shipped from the factory properly filled with lubricant and all plugs are installed according to the mounting position given on the reducer nametag. Acceptable oil level is within ½ inch of the bottom of the fill plug threads. Consult the sticker adjacent to the fill plug to determine the type of lubricant installed at the factory. Standard lubricant is ISO VG220 mineral-based oil. However, some units have special lubricants designed to operate in certain environments or to extend the service life of the lubricant. If in doubt about which lubricant is needed, contact Brawn.

TABLES 2 and 3 offer suggestions on the viscosity and manufacturers of recommended lubricants.

CAUTION

In the Food and Drug Industry (including animal food), consult the lubrication supplier for recommendation of lubricants which are acceptable to the Food and Drug Administration and/or other authoritative bodies having jurisdiction. Factory supplied oil is not suitable for these applications or this industry.

MAINTENANCE / LUBRICATION, Cont.

TABLE 2: APPROXIMATE OIL CAPACITY (QTS.) FOR GEAR DRIVES

CASE SIZE	OIL CAPACITY
2	2.1
3	4.3
4	5.7
5	9.3

AUTOVENT PLUG: The Autovent plug **(FIGURE 3)** is brass in color and will be located at the highest point on the gearbox. It operates like a check-valve to allow the reducer to relieve internal pressure while preventing lubricant contamination during cooling. A spring presses a ball or plunger against a machined orifice until pressure exceeds 2 psi. Above 2 psi, the air is allowed to escape depressurizing the gearcase. When internal pressure drops below 2 psi, the autovent re-seals closing the unit to the outside environment. After shutdown the reducer cools along with the air inside the reducer. The unit will temporarily maintain a slight vacuum until normalization occurs.

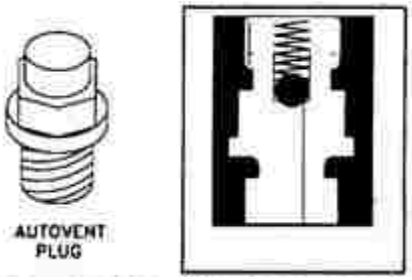

FIGURE 3: THE AUTOVENT RELEASES BUILT-UP AIR PRESSURE FROM INSIDE THE GEARBOX (MAX. PRESSURE 2PSI).

FILL LEVEL & DRAIN PLUGS: The drain plugs **(FIGURE 4)** are metric socket head cap screws. They will be located at the lowest part of the gearbox for ease of draining. The fill level plug is a hex head cap screw. It will be located between the Autovent and the drain plug. Both types of plugs will have gaskets included to prevent oil from leaking.

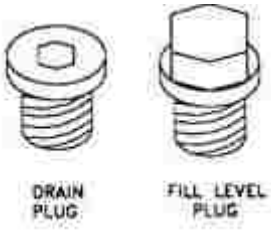

FIGURE 4: TWO TYPES OF PLUGS FOR MAINTENANCE

TABLE 3: RECOMMENDED LUBRCANTS

STANDARD OIL - ISO VG220

Ambient Temperature (F)	*Formulation*	*Oil Manufacturer*	*Oil Brand Name*
20° to 104°	Mineral	Texaco	Meropa 220
20° to 104°	Mineral	Shell	Omala EP 220

OPTIONAL LUBRICANTS

Ambient Temperature (F)	*Formulation*	*Oil Manufacturer*	*Oil Brand Name*
14° to 176°	Synthetic	Texaco	Pinnacle EP680
14° to 176°	Synthetic	Shell	Omala HD 680
-13° to 140°	Synthetic	Texaco	Pinnacle EP220
-13° to 140°	Synthetic	Shell	Omala HD 220
-40° to 50°	Synthetic	Texaco	Pinnacle EP32
-40° to 50°	Synthetic	Shell	Omala HD 32
20° to 104°	Food Grade	Chevron	FM ISO 220
20° to 104°	Synthetic Food Grade	OilJAX	Magnaplate 85W140-FG
5° to 125°	Fluid Grease	Mobil	Mobilux EP023
-30° to 140°	Synthetic Fluid Grease	Mobil	Mobilith SHC 007
-30° to 140°	Synthetic Fluid Grease	Shell	Tivela Compound A

STANDARD BREARING GREASE - NL GI 2EP lithium

Ambient Temperature (F)	*Formulation*	*Grease Manufacturer*	*Grease Brand Name*
-20° to 140°	Mineral	Texaco	Multifak EP2
-20° to 140°	Mineral	Shell	Cypernia RA/C3

OPTIONAL BEARING GREASE

Ambient Temperature (F)	*Formulation*	*Grease Manufacturer*	*Grease Brand Name*
-58° to 230°	Synthetic	Texaco	Starfak 2202
-58° to 230°	Synthetic	Shell	Aero Shell
5° to 230°	Food Grade	Lubriplate	SIF 1

STORAGE

Units shipped from Brawn Mixer, Inc. are intended to be used within 30 days after receipt and presumed to be stored indoors in a heated building. Store mixers as packaged by the factory. If you intend storing units under adverse conditions or for a long period of time, special storage precautions will be necessary.

1. Store in a sheltered area away from chemical vapors or steam.
2. Cover.
3. Do not store in sunlight or near high heat.
4. Spray oil on exposed shafts and seals. Remove oil on start-up.
5. Rotate output shaft 360º every 3-4 weeks.
6. Mixers should not be stored near vibrating machinery to avoid damage to the bearings.
7. If electric motors have been subjected to humid conditions, check the insulation resistance between phase and mass and between the different phases. The resistance should not be less than 100 megohms. If the resistance is less, please consult the factory

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WARRANTY

WARRANTY: All equipment or parts covered by this manual are guaranteed free from defective material and workmanship for a period of twelve (12) months from date of shipment, under normal use and service. This warranty does not cover failure of normal wear parts unless the failure of such part has resulted from defective material and workmanship. BRAWN Mixer, Inc. will repair or replace, at its option, any equipment which has been found to be defective and is within the warranty period, provided that the equipment is shipped, with previous factory authorization, freight prepaid, to BRAWN's plant in Holland, Michigan, USA. All return shipments are made FOB BRAWN's factory. BRAWN is not responsible for removal, installation, or any other incidental expenses incurred in shipping the equipment to or from BRAWN. In the case of components purchased by BRAWN Mixer, Inc. and incorporated in the equipment, the component manufacturer's guarantee shall apply. NOTE: Any modifications or corrective work done to the equipment which were not specifically authorized in writing by BRAWN Mixer, Inc. shall void this limited warranty, and BRAWN Mixer, Inc. shall accept no liability for any of the corrective work or expenditures which were conducted without their prior, written authorization. BRAWN Mixer, Inc. shall not be held liable for any further cost, expense, or labor to replace equipment or replaceable parts, or indirect or consequential damages.

With the exceptions of the limited warranty set out above, there are no other understandings, agreements, representatives, or warranties implied (including any regarding the merchant-ability or fitness for a particular purpose), not specified herein, respecting this agreement or equipment, hereunder. This contract states the entire obligation of BRAWN Mixer, Inc. in connection with this transaction.

SHOULD WE MAKE A MISTAKE...

BRAWN Mixer, Inc.'s Direct Returns Policy

To ensure proper handling of your return, please take a moment to read the following:

- **ALL** returns require a **RETURN GOODS AUTHORIZATION (RGA) NUMBER**. We are unable to process your return or issue proper credit without an approved **RGA** number.
- **ALL** returns must be **COMPLETE**, including all original warranties, manuals, documentation and packaging.
- **ALL** product must be received within 14 days of issuing an **RGA** number.

How to Return Product

You must have a **RETURN GOODS AUTHORIZATION (RGA)** number before you return any product to BRAWN Mixer, Inc. To obtain this number, call **616/399-5600** and ask for Customer Service. Be sure to have available the following information:

- ✓ your order number
- ✓ the BRAWN product serial number
- ✓ the part number and description of the product
- ✓ the reason for the return

♦ IMPORTANT ♦

The Return Goods Authorization number must be written clearly on all boxes being returned. C.O.D. shipments will not be accepted.