

Appendix C – Pump Selection

This appendix contains the cut sheets and other data for the Bell & Gossett pumps used as a part of the design process.

Please see the all the pump information on the following pages.

Pump Selection Charts

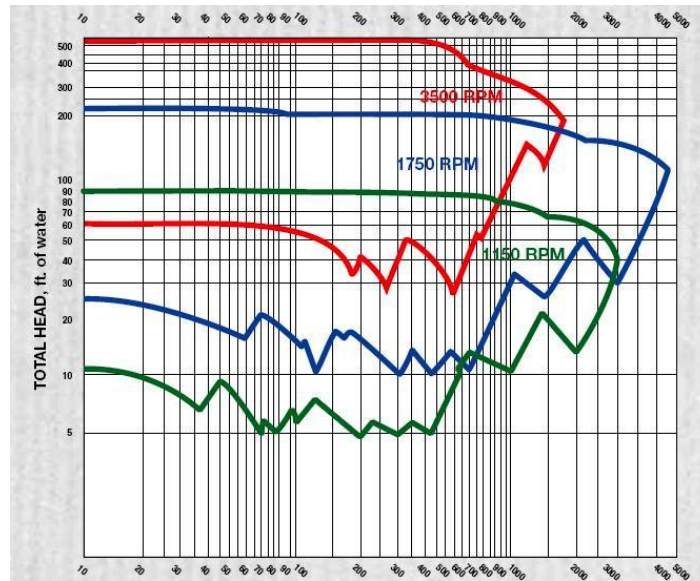


Figure C1 - Pump Selection Curves

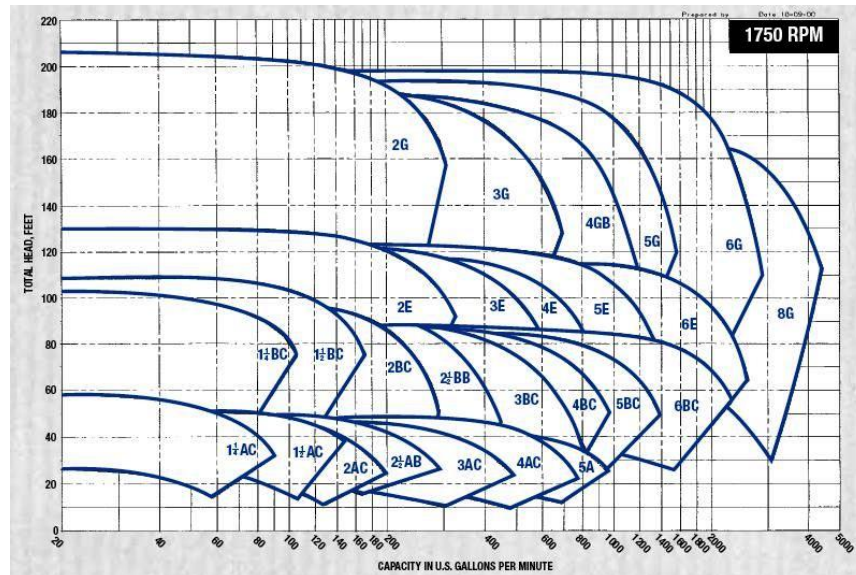


Figure C2 - 1750 rpm Performance Curves



10901 Pump House Road Annapolis Junction, Md 20701
Washington: 301-953-9370 Baltimore: 410-792-4230 Fax: 301-490-7156

To: Nathan

Job Name: Thesis

Engineer:

3/31/06

Quote Number:

***** Quotation ***** Quotation *****

Item	Quantity	Description	Unit Price	Extended Price
		<u>Chilled Water Pumps P-1</u>		
1)	1	Bell & Gossett End Suction Pump Series: 1510 Model: 5 G 700 GPM @ 110.7 'TDH 40 HP 1800 RPM 460/3/60 Inverter Duty Frame: 324T ODP High Efficiency Motor Dodge Para-Flex Coupling Shipping Weight: 1055 lbs.	\$5,164.00	\$5,164.00
		<u>Condenser Water Pumps P-2</u>		
2)	1	Bell & Gossett End Suction Pump Series: 1510 Model: 5 E 1050 GPM @ 70.8 'TDH 25 HP 1800 RPM 460/3/60 Inverter Duty Frame: 284T ODP High Efficiency Motor Dodge Para-Flex Coupling Shipping Weight: 710 lbs.	\$4,337.00	\$4,337.00
		<u>Geothermal Pumps P-3</u>		
3)	1	Bell & Gossett End Suction Pump Series: 1510 Model: 4 BC 570 GPM @ 54 'TDH 15 HP 1800 RPM 460/3/60 Inverter Duty Frame: 254T ODP High Efficiency Motor Dodge Para-Flex Coupling Shipping Weight: 475 lbs.	\$3,050.00	\$3,050.00



10901 Pump House Road Annapolis Junction, Md 20701
Washington: 301-953-9370 Baltimore: 410-792-4230 Fax: 301-490-7156

To: Nathan

Job Name: Thesis

Engineer:

3/31/06

Quote Number:

***** Quotation ***** Quotation *****

Item	Quantity	Description	Unit Price	Extended Price
		<u>Geothermal Pumps P-5</u>		
4)	1	Bell & Gossett End Suction Pump Series: 1510 Model: 5 A 570 GPM @ 27 'TDH 7.5 HP 1800 RPM 460/3/60 Inverter Duty Frame: 213T ODP High Efficiency Motor Dodge Para-Flex Coupling Shipping Weight: 455 lbs.	\$2,812.00	\$2,812.00
		<u>Variable Speed Drive P-1</u>		
5)	1	AC Tech Model: MCH4400BG 40 HP 480/400/3/60 52/60 amps Basic Drive With Manual By Pass, NEMA 1 Enclosure Standard Features : Bypass AC Line Terminals 3 Contactor Manual Transfer Bypass Class 10 Thermal Overload VFD Input Fuses Hand - Off - Automatic Switch Drive Mode - Off - Bypass Mode Switch Drive Normal - Off - Drive Test Switch Lights: Power On, Drive Mode, Bypass Mode, Safety Fail Circuit 120 VAC Transformer (2) Form C Relays For Logic Output Communication Protocol : Modbus RTU 2 Year Warranty Parts And Labor Motor Fuses 2 Year Warranty Parts And Labor	\$3,225.00	\$3,225.00



10901 Pump House Road Annapolis Junction, Md 20701
Washington: 301-953-9370 Baltimore: 410-792-4230 Fax: 301-490-7156

To: Nathan Job Name: Thesis
 Engineer:
3/31/06 Quote Number:

***** Quotation ***** Quotation *****

Item	Quantity	Description	Unit Price	Extended Price
		<u>Variable Speed Drive P-2</u>		
6)	1	AC Tech Model: MCH4250BG15 25 HP 480/400/3/60 34/39 amps Basic Drive With Manual By Pass, NEMA 1 Enclosure Standard Features : Bypass AC Line Terminals 3 Contactor Manual Transfer Bypass Class 10 Thermal Overload VFD Input Fuses Hand - Off - Automatic Switch Drive Mode - Off - Bypass Mode Switch Drive Normal - Off - Drive Test Switch Lights: Power On, Drive Mode, Bypass Mode, Safety Fail Circuit 120 VAC Transformer (2) Form C Relays For Logic Output Communication Protocol : Modbus RTU Disconnect Motor Fuses 2 Year Warranty Parts And Labor	\$2,649.00	\$2,649.00
		<u>Variable Speed Drive P-3</u>		
7)	1	AC Tech Model: MCH4150BG 15 HP 480/400/3/60 21/24 amps Basic Drive With Manual By Pass, NEMA 1 Enclosure Standard Features : Bypass AC Line Terminals 3 Contactor Manual Transfer Bypass Class 10 Thermal Overload VFD Input Fuses Hand - Off - Automatic Switch Drive Mode - Off - Bypass Mode Switch Drive Normal - Off - Drive Test Switch Lights: Power On, Drive Mode, Bypass Mode, Safety Fail Circuit	\$1,886.00	\$1,886.00

Submitted By: Jae Chon

Quotation Is Valid For Fourteen (30) Days

Document2

Bell & Gossett

SUBMITTAL

B-229.3E

JOB: Thesis Report

REPRESENTATIVE: Cummins-Wagner Co., Inc.

UNIT TAG: P-1

ORDER NO.

DATE: 3/31/2006

ENGINEER:

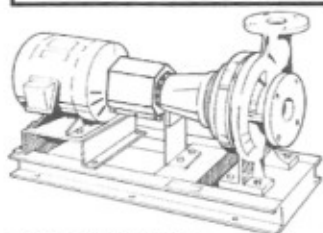
SUBMITTED BY:

DATE:

CONTRACTOR:

APPROVED BY:

DATE:



5G Series 1510 Centrifugal Pumps - Base Mounted

SPECIFICATIONS

FLOW	700 (GPM)	HEAD	110.7 (FT)
HP	40	RPM	1800
VOLTS			230/460
CYCLE	60	PHASE	3
Lincoln ODP Inverter Duty			
APPROX. WEIGHT	1019		
SPECIALS	Special Coupling(Dodge Paraflex)		

Note: Equipped with EPDM coupling

MATERIALS OF CONSTRUCTION

- BRONZE FITTED ALL IRON

FEATURES

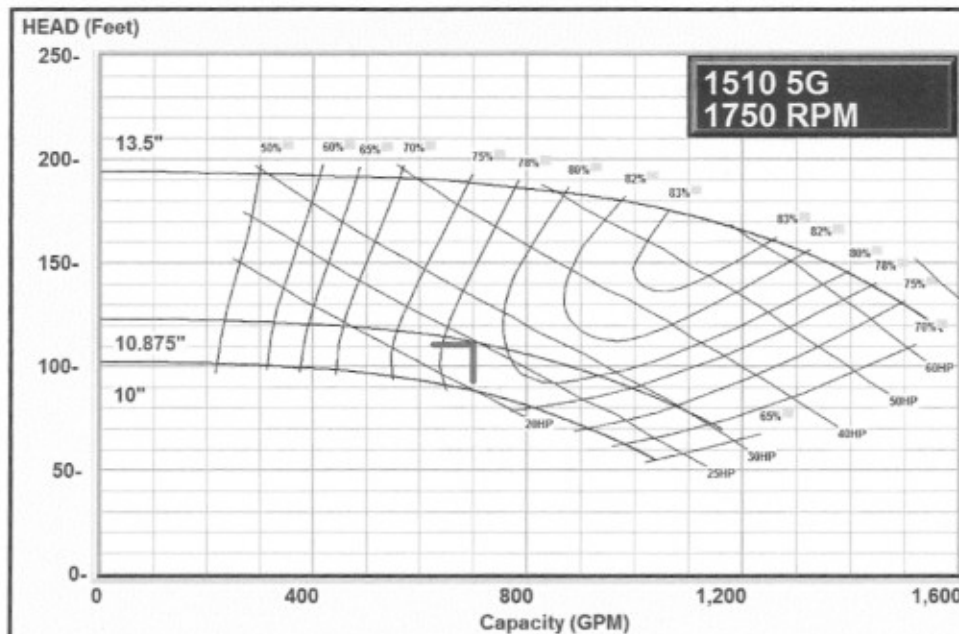
- ANSI/OSHA Coupling Guard
- Center Drop Out Spacer Coupling
- Fabricated Heavy Duty Baseplate

MAXIMUM WORKING PRESSURE

- 175 psi (12 bar) W.P. w/ 125# ANSI flange drilling
- 250 psi (17 bar) W.P. w/ 250# ANSI flange drilling (requires 1510-S)

TYPE OF SEAL

- 1510 Standard Seal (Buna-Carbon/Ceramic)
- 1510 -F Standard Seal w/ Flush Line (Buna-Carbon/Ceramic)
- 1510 -S Stuffing Box construction w/ Flushed Mechanical Single Seal (EPR-Tungsten Carbide/Carbon)
- 1510 -D Stuffing Box construction w/ Flushed Double Mechanical Seal (EPR-Carbon/Ceramic) Requires external water source
- 1510 -PF Stuffing Box Construction w/ Packing (Graphite Impregnated Teflon)



Design Capacity = 700.0 GPM
Design Head = 110.7 Feet

Suction Size = 6 "
Suct. Velocity = 7.8 fps
Discharge Size = 5 "
Disc. Velocity = 11.2 fps

Min. Imp. Dia. = 10 "
Max. Imp. Dia. = 13.5 "
Cut Dia. = 10.875 "

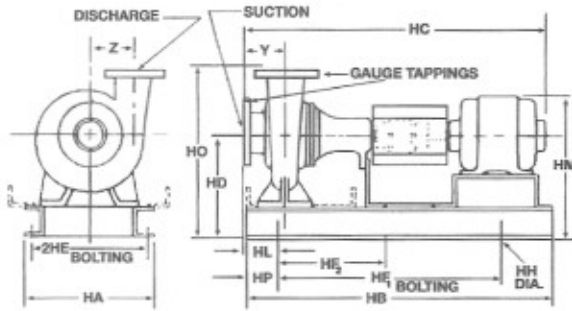
Max. Flow = 1194 GPM
B.E.P. Flow = 840 GPM

Eff. @ Duty-Point = 79.19 %
Motor Size = 40 HP

B.H.P. @
Duty-Point = 24.91 BHP
Max. B.H.P. for
Imp. Cut = 30.32 BHP

Series 1510 5G Centrifugal Pump Submittal

B-229.3E



FLANGE DIMENSIONS IN INCHES (MM)			
	SIZE	THICKNESS	O.D.
Discharge	5" (127)	1-3/8 (35)	10-3/4 (273)
Suction	6" (152)	1-7/16 (37)	12-1/8 (308)

FLANGES ARE: 125# ANSI - STANDARD
250# ANSI - AVAILABLE

DIMENSIONS - Inches (mm) STANDARD SEAL 1510, 1510-F

MOTOR FRAME	HA	HB	HC MAX	HD	2HE	HF ₁	HF ₂	HH	HL	HM MAX	HO	HP	Y	Z
"L" FRAME														
254T	24 (610)	56 (1422)	47-1/8 (1197)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	23-3/8 (594)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
256T	24 (610)	56 (1422)	48-7/8 (1241)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	23-3/8 (594)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
284T	24 (610)	56 (1422)	49-7/8 (1267)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	24-1/2 (622)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
286T	24 (610)	56 (1422)	51-3/8 (1305)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	24-1/2 (622)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
324T	24 (610)	56 (1422)	53-3/8 (1356)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	25-5/8 (651)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
326T	24 (610)	56 (1422)	54-7/8 (1394)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	25-5/8 (651)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
364T	24 (610)	56 (1422)	57-1/8 (1451)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	26-3/4 (679)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
365T	24 (610)	56 (1422)	58-1/8 (1476)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	26-3/4 (679)	29-1/2 (749)	6 (152)	6 (152)	9 (229)

STUFFING BOX 1510-PF, 1510-S, 1510-D

MOTOR FRAME	HA	HB	HC MAX	HD	2HE	HF ₁	HF ₂	HH	HL	HM MAX	HO	HP	Y	Z
"L" FRAME														
254T	24 (610)	56 (1422)	49-1/2 (1257)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	23-3/8 (594)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
256T	24 (610)	56 (1422)	51-1/4 (1302)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	23-3/8 (594)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
284T	24 (610)	56 (1422)	52-1/4 (1327)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	24-1/2 (622)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
286T	24 (610)	56 (1422)	53-3/4 (1365)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	24-1/2 (622)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
324T	24 (610)	56 (1422)	55-3/4 (1416)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	25-5/8 (651)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
326T	24 (610)	56 (1422)	57-1/4 (1454)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	25-5/8 (651)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
364T	24 (610)	56 (1422)	59-1/2 (1511)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	26-3/4 (679)	29-1/2 (749)	6 (152)	6 (152)	9 (229)
365T	24 (610)	56 (1422)	60-1/2 (1537)	16-1/2 (419)	21-1/2 (546)	44 (1118)	22 (559)	1 (25)	5-7/16 (138)	26-3/4 (679)	29-1/2 (749)	6 (152)	6 (152)	9 (229)

Dimensions are subject to change. Not to be used for construction purposes unless certified.



Bell & Gossett

SUBMITTAL

B-226C

JOB: Thesis Report

REPRESENTATIVE: Cummins-Wagner Co., Inc.

UNIT TAG: P-2

ORDER NO.

DATE: 3/31/2006

ENGINEER:

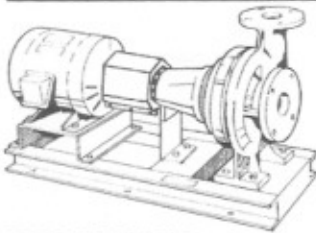
SUBMITTED BY:

DATE:

CONTRACTOR:

APPROVED BY:

DATE:



5E Series 1510 Centrifugal Pumps - Base Mounted

SPECIFICATIONS

FLOW 1050 (GPM) HEAD 70.8 (FT)
 HP 25 RPM 1800
 VOLTS 230/460
 CYCLE 60 PHASE 3
 Lincoln ODP Inverter Duty
 APPROX. WEIGHT 632
 SPECIALS Special Coupling(Dodge Paraflex)

MATERIALS OF CONSTRUCTION

BRONZE FITTED ALL IRON

FEATURES

ANSI/OSHA Coupling Guard
 Center Drop Out Spacer Coupling
 Fabricated Heavy Duty Baseplate

MAXIMUM WORKING PRESSURE

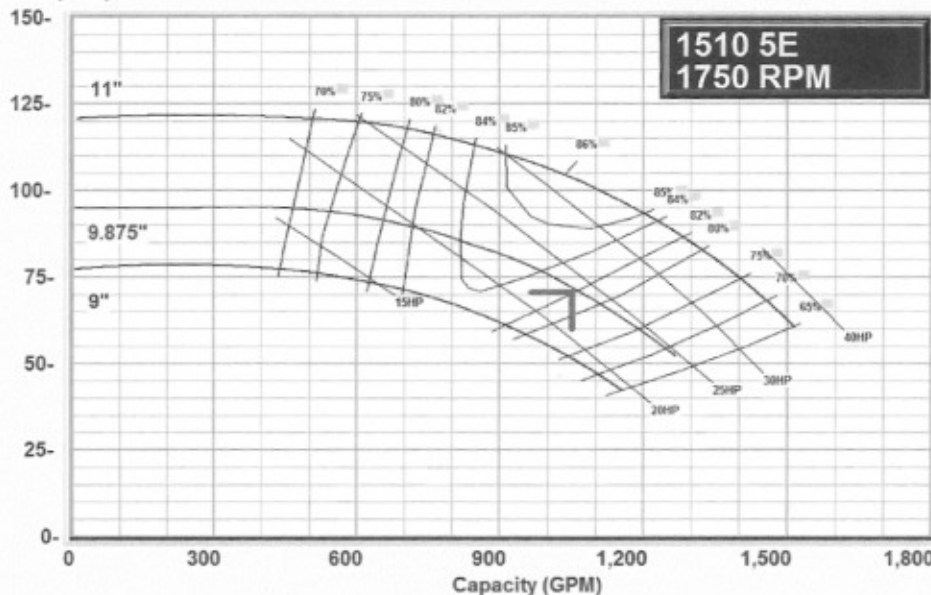
175 psi (12 bar) W.P.
 w/ 125# ANSI flange drilling
 250 psi (17 bar) W.P.
 w/ 250# ANSI flange drilling (requires 1510-S)

TYPE OF SEAL

1510 Standard Seal (Buna-Carbon/Ceramic)
 1510 -F Standard Seal w/ Flush Line (Buna-Carbon/Ceramic)
 1510 -S Stuffing Box construction w/ Flushed Mechanical Single Seal (EPR-Tungsten Carbide/Carbon)
 1510 -D Stuffing Box construction w/ Flushed Double Mechanical Seal (EPR-Carbon/Ceramic) Requires external water source
 1510 -PF Stuffing Box Construction w/ Packing (Graphite Impregnated Teflon)

Note: Equipped with EPDM coupling

HEAD (Feet)



Design Capacity = 1050.0 GPM
 Design Head = 70.8 Feet

Suction Size = 6 "
 Suct. Velocity = 11.7 fps
 Discharge Size = 5 "
 Disc. Velocity = 16.8 fps

Min. Imp. Dia. = 9 "
 Max. Imp. Dia. = 11 "
 Cut Dia. = 9.875 "

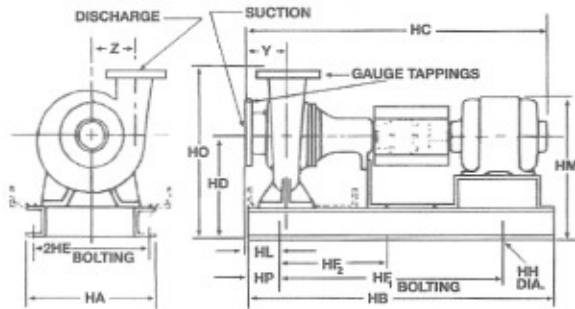
Max. Flow = 1303 GPM
 B.E.P. Flow = 898 GPM

Eff. @ Duty-Point = 82.14 %
 Motor Size = 25 HP

B.H.P. @
 Duty-Point = 23.16 BHP
 Max. B.H.P. for
 Imp. Cut = 24.8 BHP

Series 1510 5E Centrifugal Pump Submittal

B-226C



FLANGE DIMENSIONS IN INCHES (MM)			
	SIZE	THICKNESS	O.D.
Discharge	5" (127)	1-3/8" (35)	10-3/4" (273)
Suction	6" (152)	1-7/16" (37)	12-1/8" (308)

MAXIMUM WORKING PRESSURE 250 PSI
FLANGES ARE 125# ANSI - STANDARD
250# ANSI - AVAILABLE

DIMENSIONS - Inches (mm)

STANDARD SEAL 1510, 1510-F

MOTOR FRAME	HA	HB	HC MAX	HD	2HE	HF ₁	HF ₂	HH	HL	HM MAX	HO	HP	Y	Z
	"L" FRAME													
254T	16 (406)	46-1/2 (1181)	46-3/4 (1187)	15 (381)	14 (356)	36-1/2 (927)	18-1/4 (464)	7/8 (22)	4-7/16 (113)	21-7/8 (556)	25-1/2 (648)	5 (127)	5-7/16 (138)	7-15/16 (202)
256T	16 (406)	46-1/2 (1181)	48-1/2 (1232)	15 (381)	14 (356)	36-1/2 (927)	18-1/4 (464)	7/8 (22)	4-7/16 (113)	21-7/8 (556)	25-1/2 (648)	5 (127)	5-7/16 (138)	7-15/16 (202)
284T	16 (406)	51-3/4 (1314)	49-1/4 (1251)	15 (381)	14 (356)	41-3/4 (1060)	20-7/8 (530)	7/8 (22)	4-7/16 (113)	23 (584)	25-1/2 (648)	5 (127)	5-7/16 (138)	7-15/16 (202)
286T	16 (406)	51-3/4 (1314)	50-3/4 (1289)	15 (381)	14 (356)	41-3/4 (1060)	20-7/8 (530)	7/8 (22)	4-7/16 (113)	23 (584)	25-1/2 (648)	5 (127)	5-7/16 (138)	7-15/16 (202)
324T	16 (406)	51-3/4 (1314)	53 (1346)	15 (381)	14 (356)	41-3/4 (1060)	20-7/8 (530)	7/8 (22)	4-7/16 (113)	24-1/8 (613)	25-1/2 (648)	5 (127)	5-7/16 (138)	7-15/16 (202)

STUFFING BOX 1510-PF, 1510-S, 1510-D

MOTOR FRAME	HA	HB	HC MAX	HD	2HE	HF ₁	HF ₂	HH	HL	HM MAX	HO	HP	Y	Z
	"L" FRAME													
254T	16 (406)	51-3/4 (1314)	49-1/8 (1248)	15 (381)	14 (356)	41-3/4 (1060)	20-7/8 (530)	7/8 (22)	4-7/16 (113)	21-7/8 (555)	25-1/2 (648)	5 (127)	5-7/16 (138)	7-15/16 (202)
256T	16 (406)	51-3/4 (1314)	50-7/8 (1292)	15 (381)	14 (356)	41-3/4 (1060)	20-7/8 (530)	7/8 (22)	4-7/16 (113)	21-7/8 (555)	25-1/2 (648)	5 (127)	5-7/16 (138)	7-15/16 (202)
284T	16 (406)	51-3/4 (1314)	51-5/8 (1311)	15 (381)	14 (356)	41-3/4 (1060)	20-7/8 (530)	7/8 (22)	4-7/16 (113)	23 (584)	25-1/2 (648)	5 (127)	5-7/16 (138)	7-15/16 (202)
286T	16 (406)	51-3/4 (1314)	53-1/8 (1349)	15 (381)	14 (356)	41-3/4 (1060)	20-7/8 (530)	7/8 (22)	4-7/16 (113)	23 (584)	25-1/2 (648)	5 (127)	5-7/16 (138)	7-15/16 (202)
324T	16 (406)	51-3/4 (1314)	55-3/8 (1407)	15 (381)	14 (356)	41-3/4 (1060)	20-7/8 (530)	7/8 (22)	4-7/16 (113)	24-1/8 (613)	25-1/2 (648)	5 (127)	5-7/16 (138)	7-15/16 (202)

Dimensions are subject to change. Not to be used for construction purposes unless certified.

