HYUNDAI
HEAVY INDUSTRIES CO.,LTD.
ELECTRO ELECTRIC SYSTEMS

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INSPECTION & TEST REPORT

Customer	WORLD WIDE/WWE Stock Motor(700HP)		
Project No.	20122662RM1711	Date of Test	2012, 08
Type:	HLE5 5812-48E	Voltage: 3 phase	60 [Hz] 4160/2300 [V]
Capacity:	700.0 [HP] * 2 Units	Serial No.	20122662RM1711001,002

TEST ITEMS

FINAL INSPECTION

1. Visual and dimensional inspection
2. Measurement of winding resistance
3. Locked rotor test
4. No-load test and Direction of rotation check
5. Measurement of noise level
6. Measurement of vibration
7. Determination of characteristics
8. Temperature rise test
9. Measurement of insulation resistance
10. High potential test (Dielectric test)
11. Other tests (WTD, Space heater)

TEST RESULT: Good

Approved By: RM-206 2012. 08. 13 M.J.LEE ES-G

Reviewed and Witnessed By:

Checked By:

Tested By: 2012. 08. 17 ES-QA

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

Test Report of 3 Phase Induction Machine

customer	WORLD WIDE/WWE Stock Motor(700HP)	Project no.	20122662RMH711
model no.	HLE5 5812-48E	Serial no.	20122662RMH711001
***	***	shaft no.	2RMH711-1

general rating

Output HP	700	poles	4	voltage [V]	4160
Frequency [Hz]	60.0	speed [rpm]	1789.0	current [A]	87.7
Service factor	1.15	insulation	F	max. amb. [℃]	40
time rating	S1	enclose	TEFC - IP54	weight [lb]	7050
DE. bearing:	NU324	NDE. bearing:	6322C3	efficiency [pu]	0.9500

winding resistance in [Ω] at ambient temperature 29.8 [℃]

phase	Ru-v:	Rv-w:	Rw-u:	averaged:	max. deviation [%]
stator	0.2829	0.2931	0.2831	0.2864	2.35
rotor	***	***	***	***	***

no load and short circuit(locked rotor) **current unbalance**

item	[V]	[A]	[kW]	[Hz]	Iu [A]	Iv [A]	Iw [A]	deviation [%]
no load	4160.0	23.41	11.079	60.00	23.39	23.44	23.4	0.13
locked rotor	866.96	87.78	16.516	60.00	***	***	***	***
rotor voltage	*** [V]		remark: ***					

vibration measurement

position	horizontal	vertical	axial	remark
DE	1.7	1.1	0.2	meas. Unit
NDE	1.8	0.7	0.3	mm/s(pk)

temperature rise in [K]

stator (R/E)	57.8 / 62.4	[V]	4160
rotor (R)	***	[Hz]	60
de. bearing	35.1	[A]	84.8
nde bearing	***	[kW]	***
slip ring	***	[Nm]	***
***	***	[rpm]	***

noise level in dB(A) at 1 [m] distance from major frame

averaged sound level (@)	remark
86.3	***

@ averaged value from 4 measured result (measured at front, rear, right, left side of machine)

insulation resistance in [MΩ]

item	before test	after test	test voltage [V]
stator	2000	2000	2500
Rotor	***	***	***
E.T.D.	1000	1000	500
heater	1000	1000	500

high voltage with AC 60 Hz

item	test voltage [V]		duration [s]
stator	AC	9320	60
Rotor	***	***	***
E.T.D.	AC	***	***
heater	AC	1500	60

over load and over speed

item	test value		duration [s]	Remark
over load	***	[%] of rated load(current)	***	***
over speed	***	[%] of rated speed	***	***

accessories and other data

space heater	1	phase	240 [W]	120 [V]	59.8 [Ω]
name of item	accessory type	Q'ty	check result	Remark	
winding temperature	PT100	6	Good	***	
bearing temperature	***	***	***	***	

* Direction of rotation : C.W (viewed from D.E) = U.V.W Connection

Tested By

We hereby confirm that the specified test were carried out in accordance with applicable standard(s) and that the satisfactory test result were obtained.

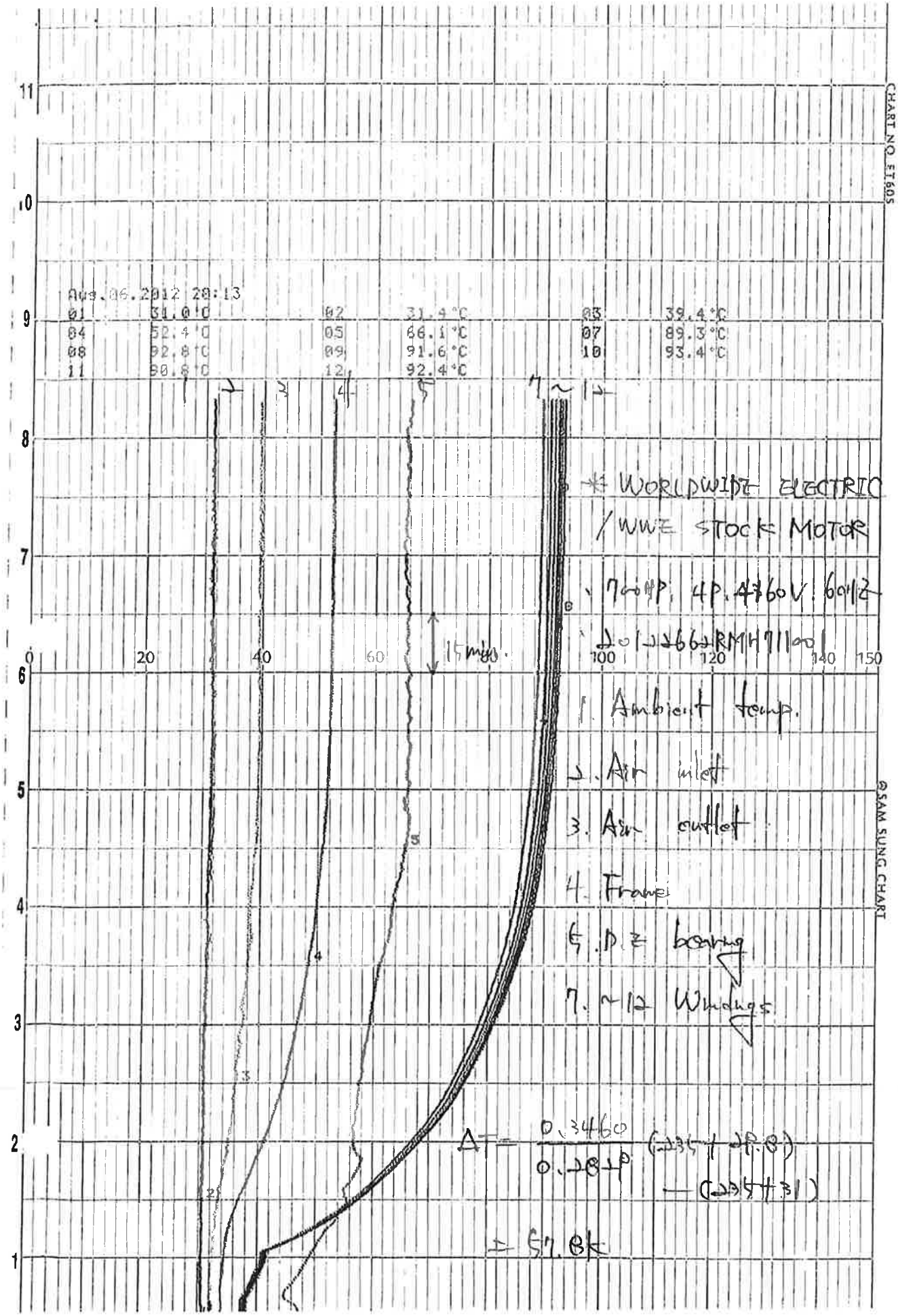


CHART NO. ET605
Aug.06.2012 20:13
01 31.0°C
02 31.4°C
03 39.4°C
04 52.4°C
05 66.1°C
07 89.3°C
08 92.8°C
09 91.6°C
10 93.4°C
11 90.8°C
12 92.4°C
0
20
40
60
100
120
140
150
15min.
1 ~ 12
* WORLDWIDE ELECTRIC
/ WWE STOCK MOTOR
1. 7.5HP, 4P, 4160V, 60Hz
2. 1266RPM
1. Ambient temp.
2. Air inlet
3. Air outlet
4. Frame
5. DE bearing
7. ~12 Windings
ΔT = 0.3460 / 0.2814 (93.4 + 92.8) − (39.4 + 31)
= 51.8K
©SAM SUNG CHART

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

Determination of characteristics of 3 phase induction machine

customer	WORLD WIDE/WWE Stock Motor(700HP)	Project no.	20122662RMH711
model no.	HLE5 5812-48E	Serial no.	20122662RMH711001

basic rating

Output HP	700	poles	4	voltage [V]	4160
Frequency [Hz]	60.0	speed [rpm]	1789.0	current [A]	87.7
Service factor	1.15	insulation	F	max. amb. [℃]	40

winding resistance in [Ω]

measured value at	29.8 [℃]	u-v:	0.2829	v-w: 0.2931	w-u: 0.2831
averaged phase resistance (refer to Y connection) [Ω]	0.178438	at specified temperature	95.00 [℃]		

no load and short circuit(locked rotor) + actual load point for correction

item	[V]	[A]	[kW]	[Hz]	[℃]	line-line [Ω]	[rpm]
no load	4160.0	23.41	11.079	60.00	40.80	***	***
locked rotor	237.31	87.75	8.350	15.00	30.70	***	***
	453.22	87.79	11.930	30.00	30.90	***	***
	866.96	87.78	16.516	60.00	31.20	***	***
	1586.40	175.57	66.579	60.00	32.40	***	***
	***	***	***	***	***	***	***
actual load	***	***	***	***	***	***	***

summary of constants

temperature constant	stator: 235.0		Rotor: 235.0	
constant loss	Wh = 4.843	[kW]	Wf = 5.991	[kW]
stray load loss	Wll = 2.748 [kW]	at primary current I1 = 87.70		[A]
reactance ratio	X1/X2 = 0.6700			

f2	[Hz]	1.200	15.00	30.00	60.00	60.00	***
stator current	[A]	***	87.75	87.79	87.78	175.57	***
V1	[V]	2401.8	2401.8	2401.8	2401.8	2401.8	***
r1	[ohms]	0.178438	0.178438	0.178438	0.178438	0.178438	***
r2	[ohms]	0.173607	0.290608	0.494364	0.752428	0.751637	***
rfe	[ohms]	3399.71	3402.43	3408.24	3414.32	3428.22	***
X1	[ohms]	2.5311E+00	2.4909E+00	2.4052E+00	2.3158E+00	2.1113E+00	***
X2	[ohms]	3.7778E+00	3.7177E+00	3.5899E+00	3.4564E+00	3.1512E+00	***
bm	[mhos]	9.9700E-03	9.9662E-03	9.9578E-03	9.9490E-03	9.9289E-03	***
gfe	[mhos]	2.9414E-04	2.9391E-04	2.9341E-04	2.9288E-04	2.9170E-04	***
corrected constant from actual load point reading				Xm = ***		r2 = ***	

summary of load characteristics

load	[pu]	0.25	0.50	0.75	1.00	1.25	2.74
current	[A]	31.3	46.8	65.0	84.8	106.1	327.1
efficiency	[pu]	0.9165	0.9508	0.9602	0.9627	0.9621	0.8818
power factor	[pu]	0.6309	0.8145	0.8706	0.8875	0.8878	0.6875
slip	[pu]	0.00145	0.00288	0.00437	0.00596	0.00769	0.05566
torque	[Nm]	694	1389	2087	2787	3490	8028

locked rotor and break down characteristics

locked rotor current [A]	531	break down torque [pu]	2.881
locked rotor torque [pu]	0.920	***	***

@ calculation method (IEEE112 F-method 1 or 2):From no load test, (Reduced frequency) locked rotor test

HYUNDAI HEAVY INDUSTRIES CO.,LTD

Segregation of no load loss

customer	WORLD WIDE/WWE Stock Motor(700HP)	Project no.	20122662RMH711
model no.	HLE5 5812-48E	Serial no.	20122662RMH711001

basic rating

Output HP	700	poles	4	voltage [V]	4160
Frequency [Hz]	60.0	speed [rpm]	1789.0	current [A]	87.7
Service factor	1.15	insulation	F	max. amb. [℃]	40

winding resistance in [Ω]

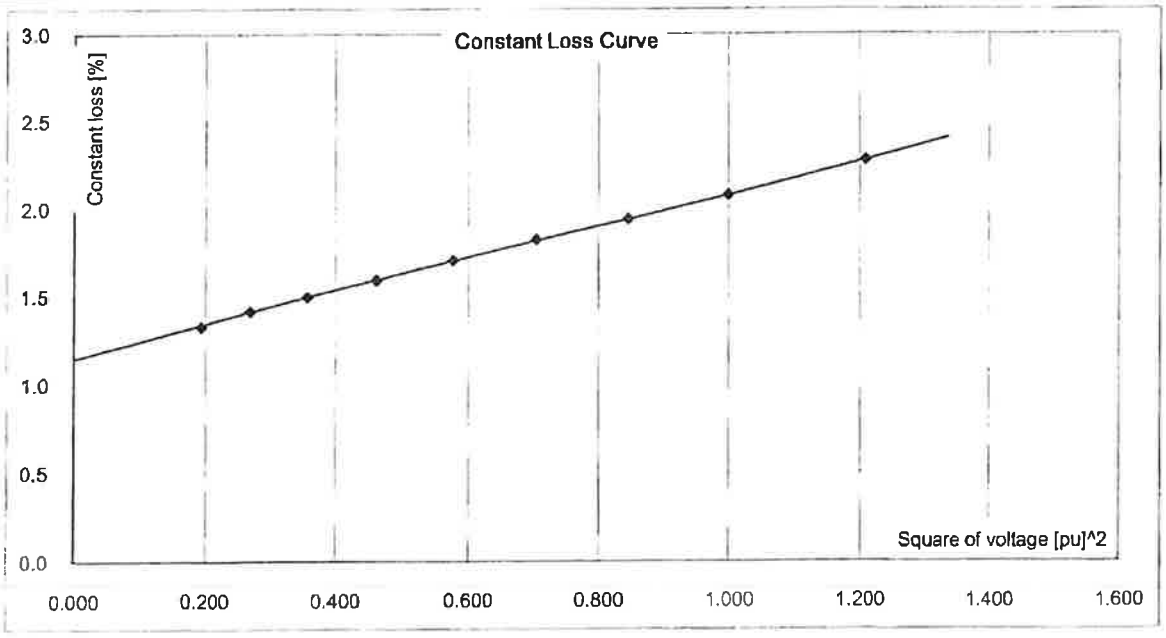
measured value at 29.80 [℃]	u-v: 0.2829	v-w: 0.2931	w-u: 0.2831
averaged phase resistance (refer to Y connection)	0.143183 [Ω]		

no load reading

[V]	[A]	[kW]	[Hz]	[rpm]	[℃]	line-line [Ω]
4574.70	26.53	12.191	60.00	***	40.80	***
4160.00	23.41	11.079	60.00	***	40.80	***
3823.60	21.18	10.327	60.00	***	40.80	***
3491.60	19.24	9.681	60.00	***	40.80	***
3158.90	17.19	9.032	60.00	***	40.80	***
2827.00	15.31	8.422	60.00	***	40.80	***
2488.00	13.53	7.894	60.00	***	40.80	***
2159.00	11.73	7.452	60.00	***	40.80	***
1828.70	10.08	6.979	60.00	***	40.80	***
***	***	***	***	***	***	***

calculation and measured result

no load core loss	[kW]	4.843
friction and windage loss	[kW]	5.991
no load current	[A]	23.40



HYUNDAI HEAVY INDUSTRIES CO.,LTD.

Test Report of 3 Phase Induction Machine

customer	WORLD WIDE/WWE Stock Motor(700HP)	Project no.	20122662RMH711
model no.	HLE5 5812-48E	Serial no.	20122662RMH711001
***	***	shaft no.	2RMH711-1

general rating

Output HP	700	poles	4	voltage [V]	2300
Frequency [Hz]	60.0	speed [rpm]	1788.0	current [A]	158.6
Service factor	1.15	insulation	F	max. amb. [℃]	40
time rating	S1	enclose	TEFC - IP54	weight [lb]	7050
DE. bearing:	NU324	NDE. bearing:	6322C3	efficiency [pu]	0.9500

winding resistance in [Ω] at ambient temperature 29.8 [℃]

phase	Ru-v:	Rv-w:	Rw-u:	averaged:	max. deviation [%]
stator	0.09430	0.09420	0.09430	0.09427	0.07
rotor	***	***	***	***	***

no load and short circuit(locked rotor) **current unbalance**

Item	[V]	[A]	[kW]	[Hz]	Iu [A]	Iv [A]	Iw [A]	deviation [%]
no load	2300.0	38.78	10.498	60.00	38.72	38.83	38.8	0.16
locked rotor	513.78	158.70	17.814	60.00	***	***	***	***
rotor voltage	*** [V]		remark: ***					

vibration measurement

position	horizontal	vertical	axial	remark
DE	1.6	0.8	0.3	meas. Unit
NDE	0.9	0.5	0.3	mm/s(pk)

noise level in dB(A) at 1 [m] distance from major frame

averaged sound level (@)	remark
86.8	***

@ averaged value from 4 measured result (measured at front, rear, right, left side of machine)

temperature rise in [K]

stator (R/E)	*** / ***	[V]	***
rotor (R)	***	[Hz]	***
de. bearing	***	[A]	***
nde bearing	***	[kW]	***
slip ring	***	[Nm]	***
***	***	[rpm]	***

insulation resistance in [MΩ]

item	before test	after test	test voltage [V]
stator	2000	2000	2500
Rotor	***	***	***
E.T.D.	1000	1000	500
heater	1000	1000	500

high voltage with AC 60 Hz

item	test voltage [V]		duration [s]
stator	AC	5600	60
Rotor	***	***	***
E.T.D.	AC	***	***
heater	AC	1500	60

over load and over speed

item	test value		duration [s]	Remark
over load	***	[%] of rated load(current)	***	***
over speed	***	[%] of rated speed	***	***

accessories and other data

space heater	1 phase	240 [W]	120 [V]	59.8 [Ω]
name of item	accessory type	Q'ty	check result	Remark
winding temperature	PT100	6	Good	***
bearing temperature	***	***	***	***

* Direction of rotation : C.W (viewed from D.E) = U.V.W Connection

Tested By

2012. 05. 13

We hereby confirm that the specified test were carried out in accordance with applicable standard(s) and that the satisfactory test result were obtained.

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

Determination of characteristics of 3 phase induction machine

customer	WORLD WIDE/WWE Stock Motor(700HP)	Project no.	20122662RMH711
model no.	HLE5 5812-48E	Serial no.	20122662RMH711001

basic rating

Output HP	700	poles	4	voltage [V]	2300
Frequency [Hz]	60.0	speed [rpm]	1788.0	current [A]	158.6
Service factor	1.15	insulation	F	max. amb. [℃]	40

winding resistance in [Ω]

measured value at	29.8 [℃]	u-v:	0.09430	v-w: 0.09420	w-u: 0.09430
averaged phase resistance (refer to Y connection) [Ω]	0.058739			at specified temperature	95.00 [℃]

no load and short circuit(locked rotor) + actual load point for correction

item	[V]	[A]	[kW]	[Hz]	[℃]	line-line [Ω]	[rpm]
no load	2300.0	38.78	10.498	60.00	37.60	***	***
locked rotor	143.30	158.78	9.028	15.00	31.80	***	***
	268.98	158.75	12.858	30.00	32.10	***	***
	513.78	158.70	17.814	60.00	32.50	***	***
	946.07	317.70	71.524	60.00	33.50	***	***
	***	***	***	***	***	***	***
actual load	***	***	***	***	***	***	***

summary of constants

temperature constant	stator: 235.0			Rotor: 235.0	
constant loss	Wh = 4.152	[kW]		Wf = 6.127	[kW]
stray load loss	Wll = 2.748	[kW]	at primary current I1 =	158.60	[A]
reactance ratio	X1/X2 = 0.6700				

f2	[Hz]	1.200	15.00	30.00	60.00	60.00	***
stator current	[A]	***	158.78	158.75	158.70	317.70	***
V1	[V]	1327.9	1327.9	1327.9	1327.9	1327.9	***
r1	[ohms]	0.058739	0.058739	0.058739	0.058739	0.058739	***
r2	[ohms]	0.057009	0.095516	0.161846	0.246744	0.245012	***
rfe	[ohms]	1212.1	1213.06	1216.16	1218.36	1222.94	***
X1	[ohms]	8.4506E-01	8.3176E-01	7.8901E-01	7.5873E-01	6.9571E-01	***
X2	[ohms]	1.2613E+00	1.2414E+00	1.1776E+00	1.1324E+00	1.0384E+00	***
bm	[mhos]	2.9868E-02	2.9856E-02	2.9819E-02	2.9792E-02	2.9736E-02	***
gfe	[mhos]	8.2501E-04	8.2436E-04	8.2226E-04	8.2078E-04	8.1770E-04	***
corrected constant from actual load point reading				Xm = ***		r2 = ***	

summary of load characteristics

load	[pu]	0.25	0.50	0.75	1.00	1.25	2.48
current	[A]	54.0	82.9	116.6	153.2	192.8	533.8
efficiency	[pu]	0.9203	0.9525	0.9609	0.9627	0.9614	0.8878
power factor	[pu]	0.6595	0.8302	0.8777	0.8890	0.8842	0.6866
slip	[pu]	0.00156	0.00310	0.00472	0.00647	0.00842	0.05229
torque	[Nm]	694	1389	2088	2788	3492	7256

locked rotor and break down characteristics

locked rotor current [A]	872	break down torque [pu]	2.602
locked rotor torque [pu]	0.804	***	***

@ calculation method (IEEE112 F-method 1 or 2):From no load test, (Reduced frequency) locked rotor test

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

Segregation of no load loss

customer	WORLD WIDE/WWE Stock Motor(700HP)	Project no.	20122662RMH711
model no.	HLE5 5812-48E	Serial no.	20122662RMH711001

basic rating

Output HP	700	poles	4	voltage [V]	2300
Frequency [Hz]	60.0	speed [rpm]	1788.0	current [A]	158.6
Service factor	1.15	insulation	F	max. amb. [℃]	40

winding resistance in [Ω]

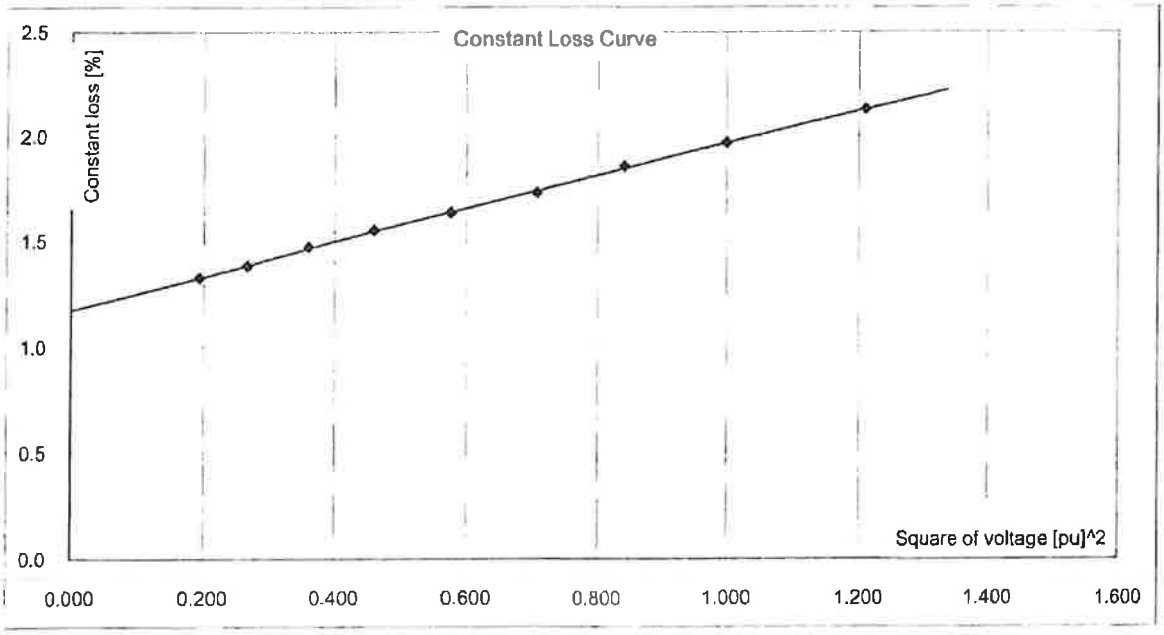
measured value at	29.80	[℃]	u-v:	0.09430	v-w: 0.09420	w-u: 0.09430
averaged phase resistance (refer to Y connection)			0.047133	[Ω]		

no load reading

[V]	[A]	[kW]	[Hz]	[rpm]	[℃]	line-line [Ω]
2530.60	43.49	11.392	60.00	***	37.60	***
2300.00	38.78	10.498	60.00	***	37.60	***
2110.90	34.84	9.872	60.00	***	37.60	***
1931.90	31.83	9.193	60.00	***	37.60	***
1745.80	28.48	8.663	60.00	***	37.60	***
1561.30	25.39	8.209	60.00	***	37.60	***
1378.50	22.47	7.773	60.00	***	37.60	***
1186.90	19.18	7.288	60.00	***	37.60	***
1011.80	16.94	6.980	60.00	***	37.60	***
***	***	***	***	***	***	***

calculation and measured result

no load core loss	[kW]	4.152
friction and windage loss	[kW]	6.127
no load current	[A]	38.80



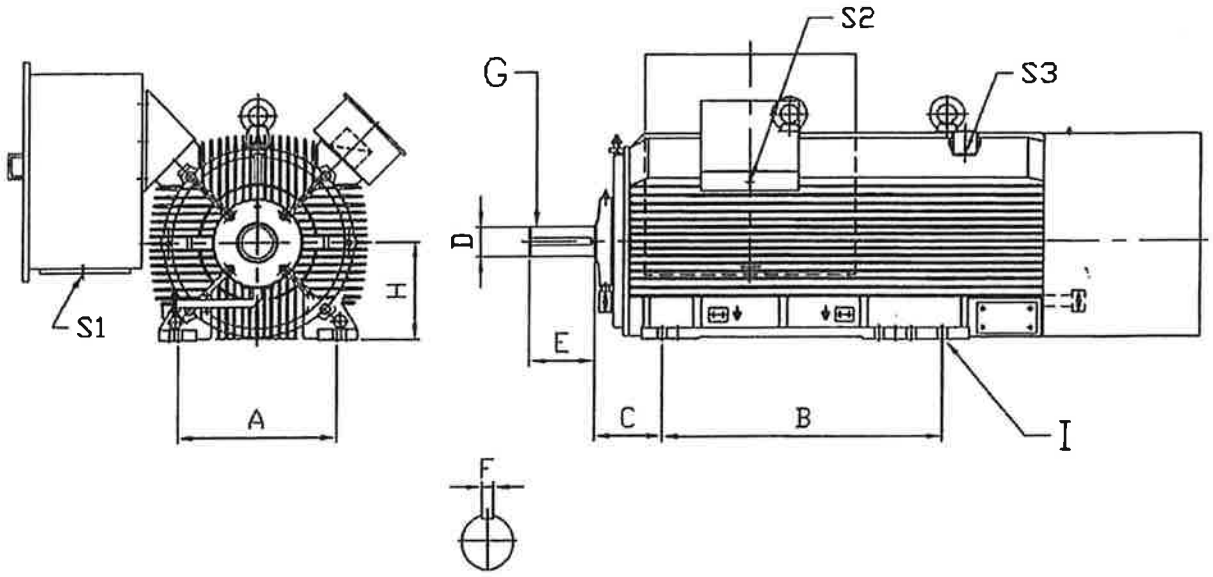
PAGE

INSPECTION REPORT
검사 성적서

CHECKED BY : 검 토 자

PROJ. NO. 수주번호	20122662RMH711	SPEC 용량,형식	700HP,4P,2300/4160V	INSP. DATE 검 사 일	
CUSTOMER 수 주 처	WORLDWIDE	DWG. NO. 도면번호	HM-088084/R.0	INSPECTOR 검 사 자	
PROJ.NAME 수 주 명		Q'TY 수 량	1SET	SERIAL NO. 일련번호	20122662RMH71100/

FINAL CHECK SHEET(D)



#.CHECK POINT 'G' SHAFT RUN OUT

CHECK DIVIDE : V-CALIPERS, MICROMETER, DEPTH GAUGE

PART \ MK	A	B	C	D	E	F	G	H	I	
SPEC	±0.059" 23"	±0.098" 40"	±0.039" 10"	-0.001" ø4.375"	±0.031" 11.88"	+0.002" 0 1.0"	0.003"	-0.039" 0 14.5"	6-ø1.18"	
CHECK	+0.001"	+0.003"	+0.001"	-0.0005"	±0	+0.0001"	0.0001"	-0.011"	6-ø1.18"	
RESULT	G	G	G	G	G	G	G	G	G	
PART \ MK	S1	S2	S3							
SPEC	1-NPT3"	1-NPT3/4"	1-NPT3/4"							
CHECK	1-NPT3"	1-NPT3/4"	1-NPT3/4"							
RESULT	G	G	G							

NOTE(특기)

VISUAL INSPECTION : G

G : GOOD (양호) NG : NO GOOD (불량) NA : NOT APPLICATION (해당없음)

FINAL INSPECTION 합 ACCEPT

HHI A24-478-0

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

Test Report of 3 Phase Induction Machine

customer	WORLD WIDE/WWE Stock Motor(700HP)	Project no.	20122662RMH711
model no.	HLE5 5812-48E	Serial no.	20122662RMH711002
***	***	shaft no.	2RMH711-2

general rating

Output HP	700	poles	4	voltage [V]	4160
Frequency [Hz]	60.0	speed [rpm]	1789.0	current [A]	87.7
Service factor	1.15	insulation	F	max. amb. [℃]	40
time rating	S1	enclose	TEFC - IP54	weight [lb]	7050
DE. bearing:	NU324	NDE. bearing:	6322C3	efficiency [pu]	0.9500

winding resistance in [Ω] at ambient temperature 29.8 [℃]

phase	Ru-v:	Rv-w:	Rw-u:	averaged:	max. deviation [%]
stator	0.2827	0.2829	0.2829	0.2828	0.05
rotor	***	***	***	***	***

no load and short circuit(locked rotor) **current unbalance**

item	[V]	[A]	[kW]	[Hz]	Iu [A]	Iv [A]	Iw [A]	deviation [%]
no load	4160.0	23.49	10.834	60.00	23.47	23.5	23.5	0.09
locked rotor	***	***	***	***	***	***	***	***
rotor voltage	*** [V]		remark: ***					

vibration measurement

position	horizontal	vertical	axial	remark
DE	0.6	0.8	0.2	meas. Unit
NDE	1	0.4	0.3	mm/s(pk)

noise level in dB(A) at 1 [m] distance from major frame

averaged sound level (@)	remark
86.5	***

temperature rise in [K]

stator (R/E)	*** / ***	[V]	***
rotor (R)	***	[Hz]	***
de. bearing	***	[A]	***
nde bearing	***	[kW]	***
slip ring	***	[Nm]	***
***	***	[rpm]	***

@ averaged value from 4 measured result (measured at front, rear, right, left side of machine)

insulation resistance in [MΩ]

item	before test	after test	test voltage [V]
stator	2000	2000	2500
Rotor	***	***	***
E.T.D.	1000	1000	500
heater	1000	1000	500

high voltage with AC 60 Hz

item	test voltage [V]		duration [s]
stator	AC	9320	60
Rotor	***	***	***
E.T.D.	AC	***	***
heater	AC	1500	60

over load and over speed

item	test value		duration [s]	Remark
over load	***	[%] of rated load(current)	***	***
over speed	***	[%] of rated speed	***	***

accessories and other data

space heater	1 phase	240 [W]	120 [V]	59.4 [Ω]
name of item	accessory type	Q'ty	check result	Remark
winding temperature	PT100	6	Good	***
bearing temperature	***	***	***	***

* Direction of rotation : C.W (viewed from D.E) = U.V.W Connection

Tested By

We hereby confirm that the specified test were carried out in accordance with applicable standard(s) and that the satisfactory test result were obtained.

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

Determination of characteristics of 3 phase induction machine

customer	WORLD WIDE/WWE Stock Motor(700HP)	Project no.	20122662RMH711
model no.	HLE5 5812-48E	Serial no.	20122662RMH711002

basic rating

Output HP	700	poles	4	voltage [V]	4160
Frequency [Hz]	60.0	speed [rpm]	1789.0	current [A]	87.7
Service factor	1.15	insulation	F	max. amb. [℃]	40

winding resistance in [Ω]

measured value at	29.8 [℃]	u-v:	0.2827	v-w: 0.2829	w-u: 0.2829
averaged phase resistance (refer to Y connection) [Ω]	0.176237			at specified temperature	95.00 [℃]

no load and short circuit(locked rotor) + actual load point for correction

item	[V]	[A]	[kW]	[Hz]	[℃]	line-line [Ω]	[rpm]
no load	4160.0	23.49	10.834	60.00	38.90	***	***
locked rotor	237.31	87.75	8.350	15.00	30.70	***	***
	453.22	87.79	11.930	30.00	30.90	***	***
	866.96	87.78	16.516	60.00	31.20	***	***
	1586.40	175.57	66.579	60.00	32.40	***	***
	***	***	***	***	***	***	***
actual load	***	***	***	***	***	***	***

summary of constants

temperature constant	stator: 235.0	Rotor: 235.0	
constant loss	Wh = 4.652 [kW]	Wf = 5.940 [kW]	
stray load loss	Wll = 2.748 [kW]	at primary current I1 = 87.70 [A]	
reactance ratio	X1/X2 = 0.6700		

f2	[Hz]	1.200	15.00	30.00	60.00	60.00	***
stator current	[A]	***	87.75	87.79	87.78	175.57	***
V1	[V]	2401.8	2401.8	2401.8	2401.8	2401.8	***
r1	[ohms]	0.176237	0.176237	0.176237	0.176237	0.176237	***
r2	[ohms]	0.175983	0.293066	0.496899	0.75514	0.754288	***
rfe	[ohms]	3538.62	3541.46	3547.53	3553.88	3568.41	***
X1	[ohms]	2.5313E+00	2.4911E+00	2.4054E+00	2.3160E+00	2.1114E+00	***
X2	[ohms]	3.7781E+00	3.7180E+00	3.5901E+00	3.4566E+00	3.1514E+00	***
bm	[mhos]	1.0006E-02	1.0002E-02	9.9938E-03	9.9850E-03	9.9647E-03	***
gfe	[mhos]	2.8260E-04	2.8237E-04	2.8189E-04	2.8138E-04	2.8024E-04	***
corrected constant from actual load point reading				Xm = ***		r2 = ***	

summary of load characteristics

load	[pu]	0.25	0.50	0.75	1.00	1.25	2.74
current	[A]	31.4	46.8	65.0	84.8	106.1	327.2
efficiency	[pu]	0.9181	0.9517	0.9607	0.9631	0.9624	0.8818
power factor	[pu]	0.6290	0.8135	0.8700	0.8870	0.8874	0.6872
slip	[pu]	0.00147	0.00292	0.00443	0.00604	0.00780	0.05611
torque	[Nm]	694	1389	2087	2787	3490	8030

locked rotor and break down characteristics

locked rotor current [A]	531	break down torque [pu]	2.881
locked rotor torque [pu]	0.923	***	***

@ calculation method (IEEE112 F-method 1 or 2):From no load test, (Reduced frequency) locked rotor test

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

Segregation of no load loss

customer	WORLD WIDE/WWE Stock Motor(700HP)	Project no.	20122662RMH711
model no.	HLE5 5812-48E	Serial no.	20122662RMH711002

basic rating

Output HP	700	poles	4	voltage [V]	4160
Frequency [Hz]	60.0	speed [rpm]	1789.0	current [A]	87.7
Service factor	1.15	insulation	F	max. amb. [℃]	40

winding resistance in [Ω]

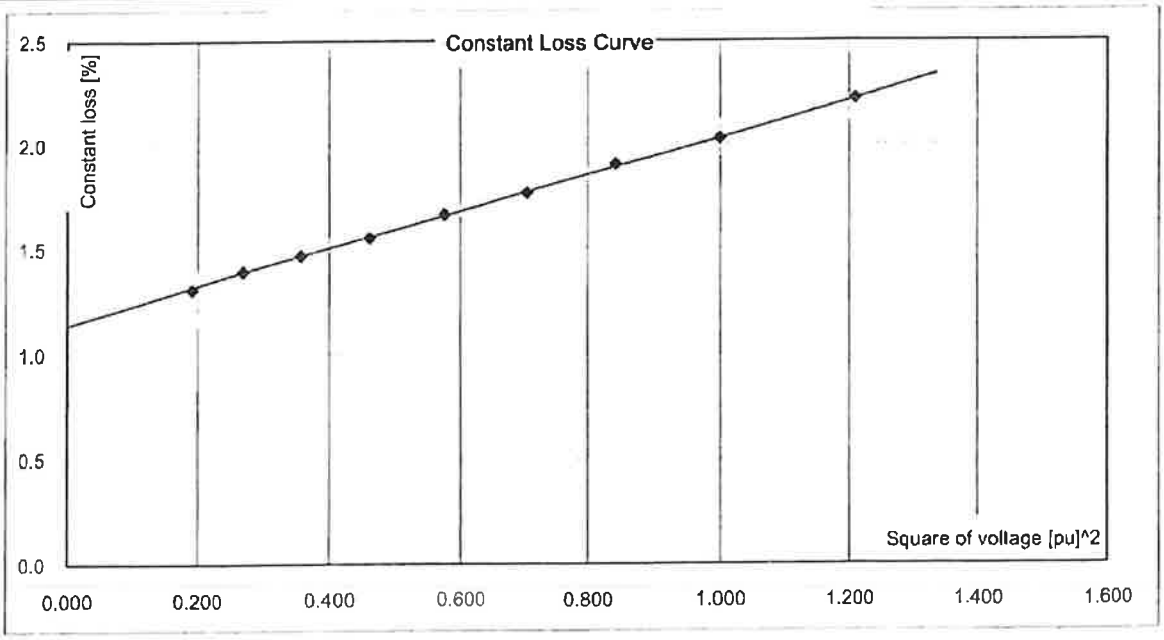
measured value at	29.80 [℃]	u-v:	0.2827	v-w: 0.2829	w-u: 0.2829
averaged phase resistance (refer to Y connection)		0.141417	[Ω]		

no load reading

[V]	[A]	[kW]	[Hz]	[rpm]	[℃]	line-line [Ω]
4576.60	26.48	11.898	60.00	***	38.90	***
4160.00	23.49	10.834	60.00	***	38.90	***
3821.80	21.07	10.139	60.00	***	38.90	***
3495.90	19.13	9.390	60.00	***	38.90	***
3155.80	17.01	8.820	60.00	***	38.90	***
2825.60	15.36	8.221	60.00	***	38.90	***
2489.90	13.43	7.750	60.00	***	38.90	***
2161.30	11.71	7.333	60.00	***	38.90	***
1822.90	9.97	6.865	60.00	***	38.90	***
***	***	***	***	***	***	***

calculation and measured result

no load core loss	[kW]	4.652
friction and windage loss	[kW]	5.940
no load current	[A]	23.50



HYUNDAI HEAVY INDUSTRIES CO.,LTD.

Test Report of 3 Phase Induction Machine

customer	WORLD WIDE/WWE Stock Motor(700HP)	Project no.	20122662RMH711
model no.	HLE5 5812-48E	Serial no.	20122662RMH711002
***	***	shaft no.	2RMH711-2

general rating

Output HP	700	poles	4	voltage [V]	2300
Frequency [Hz]	60.0	speed [rpm]	1788.0	current [A]	158.6
Service factor	1.15	insulation	F	max. amb. [℃]	40
time rating	S1	enclose	TEFC - IP54	weight [lb]	7050
DE. bearing:	NU324	NDE. bearing:	6322C3	efficiency [pu]	0.9500

winding resistance in [Ω] at ambient temperature 29.8 [℃]

phase	Ru-v:	Rv-w:	Rw-u:	averaged:	max. deviation [%]
stator	0.09420	0.09430	0.09430	0.09427	0.07
rotor	***	***	***	***	***

no load and short circuit(locked rotor) **current unbalance**

item	[V]	[A]	[kW]	[Hz]	Iu [A]	Iv [A]	Iw [A]	deviation [%]
no load	2300.0	38.60	10.291	60.00	38.58	38.58	38.64	0.10
locked rotor	***	***	***	***	***	***	***	***
rotor voltage	*** [V]		remark: ***					

vibration measurement

position	horizontal	vertical	axial	remark
DE	1	0.6	0.4	meas. Unit
NDE	1.1	0.4	0.4	mm/s(pk)

noise level in dB(A) at 1 [m] distance from major frame

averaged sound level (@)	remark
86.1	***

temperature rise in [K]

stator (R/E)	*** / ***	[V]	***
rotor (R)	***	[Hz]	***
de. bearing	***	[A]	***
nde bearing	***	[kW]	***
slip ring	***	[Nm]	***
***	***	[rpm]	***

@ averaged value from 4 measured result (measured at front, rear, right, left side of machine)

insulation resistance in [MΩ]

item	before test	after test	test voltage [V]
stator	2000	2000	2500
Rotor	***	***	***
E.T.D.	1000	1000	500
heater	1000	1000	500

high voltage with AC 60 Hz

item	test voltage [V]		duration [s]
stator	AC	5600	60
Rotor	***	***	***
E.T.D.	AC	***	***
heater	AC	1500	60

over load and over speed

item	test value		duration [s]	Remark
over load	***	[%] of rated load(current)	***	***
over speed	***	[%] of rated speed	***	***

accessories and other data

space heater	1 phase	240 [W]	120 [V]	59.4 [Ω]
name of item	accessory type	Q'ty	check result	Remark
winding temperature	PT100	6	Good	***
bearing temperature	***	***	***	***

* Direction of rotation : C.W (viewed from D.E) = U.V.W Connection

Tested By

We hereby confirm that the specified test were carried out in accordance with applicable standard(s) and that the satisfactory test result were obtained.

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

Determination of characteristics of 3 phase induction machine

customer	WORLD WIDE/WWE Stock Motor(700HP)	Project no.	20122662RMH711
model no.	HLE5 5812-48E	Serial no.	20122662RMH711002

basic rating

Output HP	700	poles	4	voltage [V]	2300
Frequency [Hz]	60.0	speed [rpm]	1788.0	current [A]	158.6
Service factor	1.15	insulation	F	max. amb. [℃]	40

winding resistance in [Ω]

measured value at	29.8 [℃]	u-v:	0.09420	v-w: 0.09430	w-u: 0.09430
averaged phase resistance (refer to Y connection) [Ω]	0.058739			at specified temperature	95.00 [℃]

no load and short circuit(locked rotor) + actual load point for correction

item	[V]	[A]	[kW]	[Hz]	[℃]	line-line [Ω]	[rpm]
no load	2300.0	38.60	10.291	60.00	41.50	***	***
locked rotor	143.30	158.78	9.028	15.00	31.80	***	***
	268.98	158.75	12.858	30.00	32.10	***	***
	513.78	158.70	17.814	60.00	32.50	***	***
	946.07	317.70	71.524	60.00	33.50	***	***
	***	***	***	***	***	***	***
actual load	***	***	***	***	***	***	***

summary of constants

temperature constant	stator: 235.0		Rotor: 235.0	
constant loss	Wh = 4.243	[kW]	Wf = 5.828	[kW]
stray load loss	Wll = 2.748	[kW]	at primary current I1 = 158.60	[A]
reactance ratio	X1/X2 = 0.6700			

f2	[Hz]	1.200	15.00	30.00	60.00	60.00	***
stator current	[A]	***	158.78	158.75	158.70	317.70	***
V1	[V]	1327.9	1327.9	1327.9	1327.9	1327.9	***
r1	[ohms]	0.058739	0.058739	0.058739	0.058739	0.058739	***
r2	[ohms]	0.056995	0.095482	0.161786	0.246639	0.244918	***
rfe	[ohms]	1186.41	1187.34	1190.36	1192.5	1196.96	***
X1	[ohms]	8.4497E-01	8.3168E-01	7.8894E-01	7.5866E-01	6.9565E-01	***
X2	[ohms]	1.2612E+00	1.2413E+00	1.1775E+00	1.1323E+00	1.0383E+00	***
bm	[mhos]	2.9728E-02	2.9717E-02	2.9679E-02	2.9653E-02	2.9598E-02	***
gfe	[mhos]	8.4288E-04	8.4222E-04	8.4008E-04	8.3858E-04	8.3545E-04	***
corrected constant from actual load point reading				Xm = ***		r2 = ***	

summary of load characteristics

load	[pu]	0.25	0.50	0.75	1.00	1.25	2.48
current	[A]	53.8	82.7	116.4	153.0	192.6	533.8
efficiency	[pu]	0.9217	0.9533	0.9614	0.9631	0.9617	0.8880
power factor	[pu]	0.6607	0.8311	0.8783	0.8895	0.8847	0.6868
slip	[pu]	0.00156	0.00310	0.00472	0.00646	0.00841	0.05229
torque	[Nm]	694	1389	2088	2788	3492	7259

locked rotor and break down characteristics

locked rotor current [A]	872	break down torque [pu]	2.604
locked rotor torque [pu]	0.804	***	***

@ calculation method (IEEE112 F-method 1 or 2):From no load test, (Reduced frequency) locked rotor test

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

Segregation of no load loss

customer	WORLD WIDE/WWE Stock Motor(700HP)	Project no.	20122662RMH711
model no.	HLE5 5812-48E	Serial no.	20122662RMH711002

basic rating

Output HP	700	poles	4	voltage [V]	2300
Frequency [Hz]	60.0	speed [rpm]	1788.0	current [A]	158.6
Service factor	1.15	insulation	F	max. amb. [℃]	40

winding resistance in [Ω]

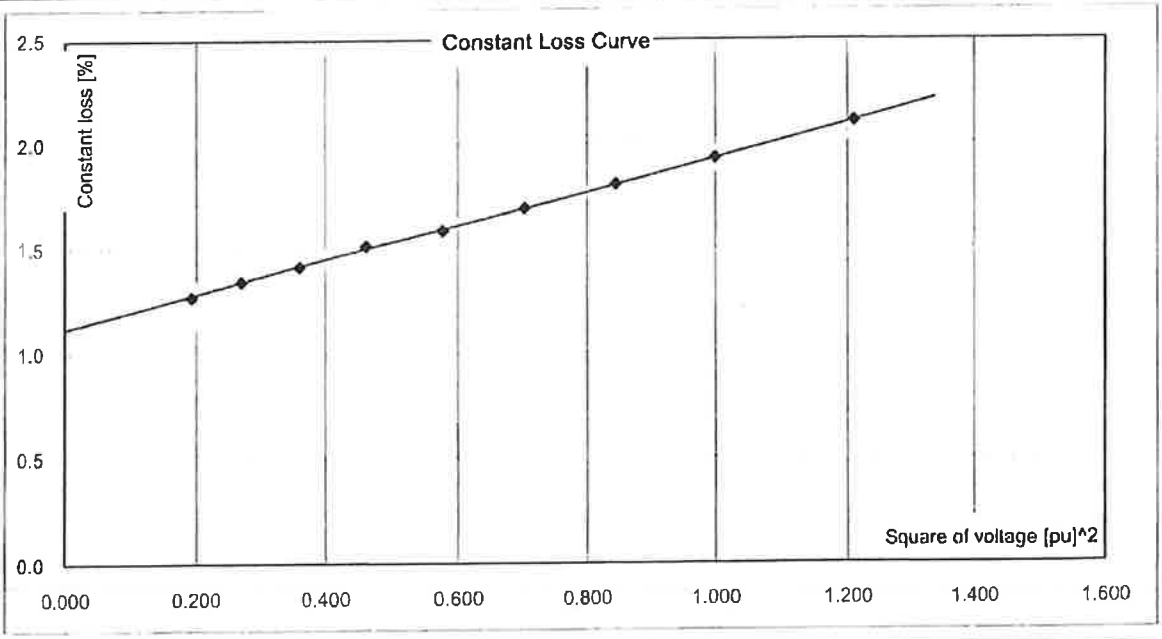
measured value at 29.80 [℃]	u-v: 0.09420	v-w: 0.09430	w-u: 0.09430
averaged phase resistance (refer to Y connection)	0.047133 [Ω]		

no load reading

[V]	[A]	[kW]	[Hz]	[rpm]	[℃]	line-line [Ω]
2530.90	43.41	11.277	60.00	***	41.50	***
2300.00	38.60	10.291	60.00	***	41.50	***
2115.10	35.02	9.610	60.00	***	41.50	***
1928.90	31.40	8.971	60.00	***	41.50	***
1747.60	28.47	8.386	60.00	***	41.50	***
1563.90	25.45	7.980	60.00	***	41.50	***
1381.20	22.63	7.453	60.00	***	41.50	***
1196.30	19.66	7.068	60.00	***	41.50	***
1009.60	16.68	6.667	60.00	***	41.50	***
***	***	***	***	***	***	***

calculation and measured result

no load core loss	[kW]	4.243
friction and windage loss	[kW]	5.828
no load current	[A]	38.60



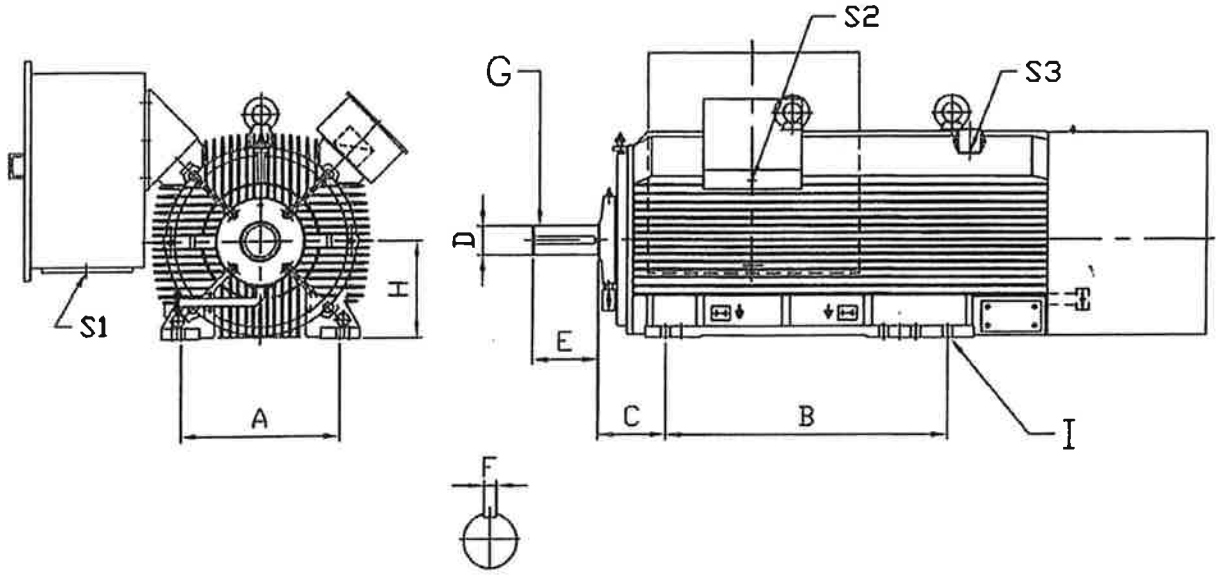
PAGE

INSPECTION REPORT
검사 성적서

CHECKED BY : 검 토 자

PROJ. NO. 수주번호	20122662RMH711	SPEC 용량,형식	700HP,4P,2300/4160V	INSP. DATE 검 사 일	
CUSTOMER 수 주 처	WORLDWIDE	DWG. NO. 도면번호	HM-088084/R.0	INSPECTOR 검 사 자	
PROJ.NAME 수 주 명		Q'TY 수 량	1SET	SERIAL NO. 일련번호	20122662RMH711002

FINAL CHECK SHEET(D)



#.CHECK POINT 'G' SHAFT RUN OUT

CHECK DIVIDE : V-CALIPERS, MICROMETER, DEPTH GAUGE

PART \ MK	A	B	C	D	E	F	G	H	I	
SPEC	±0.059" 23"	±0.098" 40"	±0.039" 10"	0 -0.001" ø4.375"	±0.031" 11.88"	+0.002" 0 1.0"	0.003"	0 -0.039" 14.5"	6-ø1.18"	
CHECK	+0.01"	-0.01"	+0.019"	±0	±0	+0.0001"	0.0019"	-0.001"	6-ø1.18"	
RESULT	G	G	G	G	G	G	G	G	G	
PART \ MK	S1	S2	S3							
SPEC	1-NPT3"	1-NPT3/4"	1-NPT3/4"							
CHECK	1-NPT3"	1-NPT3/4"	1-NPT3/4"							
RESULT	G	G	G							

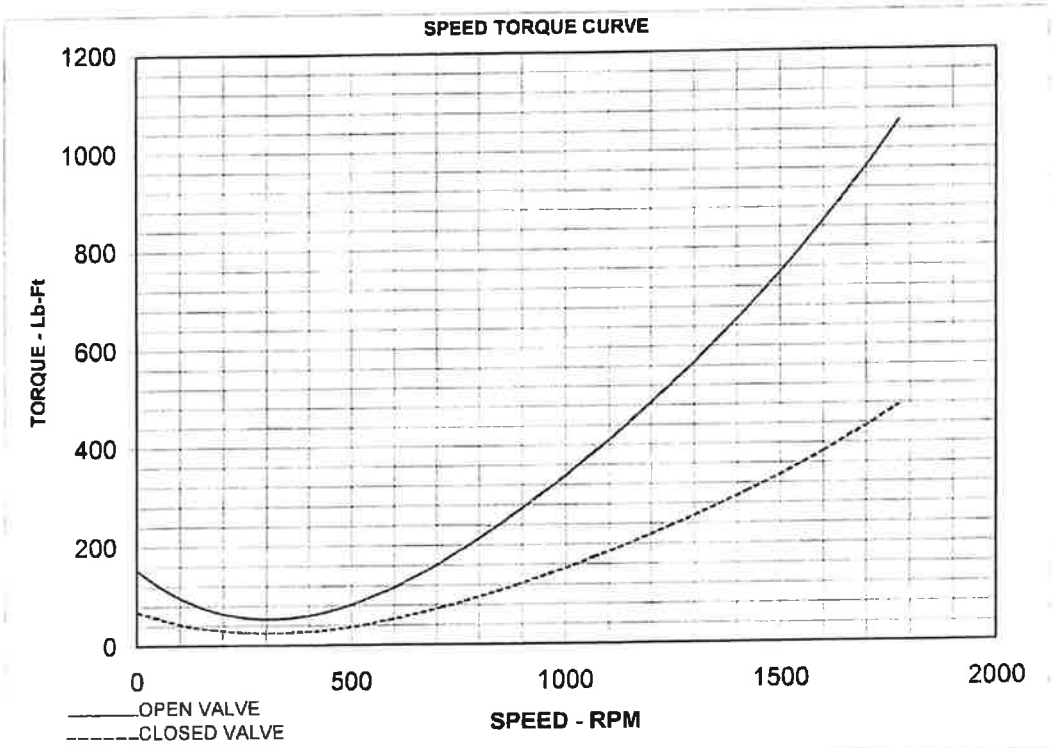
NOTE(특기)

VISUAL INSPECTION : G

G : GOOD (양호) NG : NO GOOD (불량) NA : NOT APPLICATION (해당없음)

FINAL INSPECTION ACCEPT

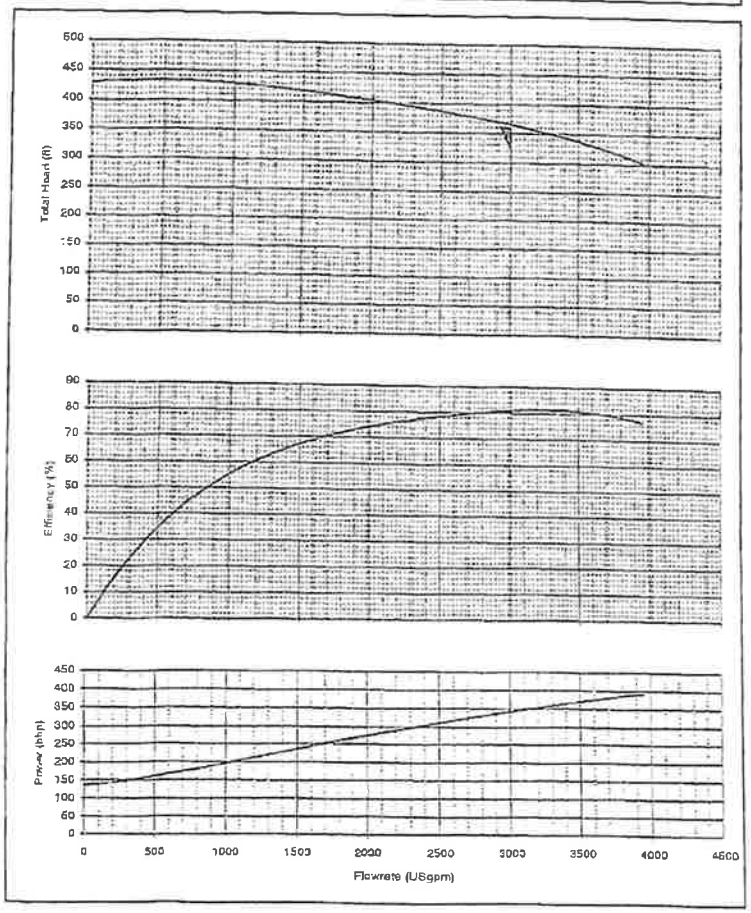
HHI A24-478-0

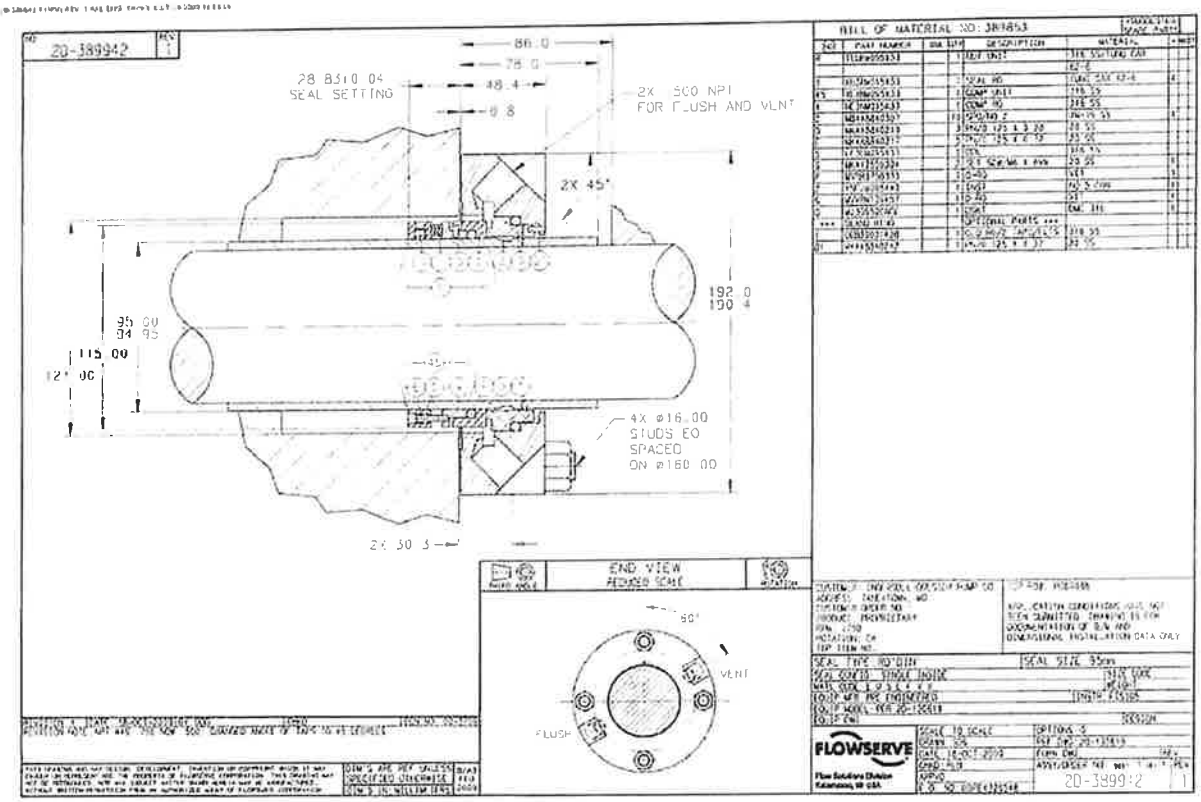


CUSTOMER:		CUSTOMER ORDER NO.	MODEL	IDP ORDER NO.
BEERS CONSTRUCTION		69221-11212	200LNN600	S001587
MOTOR DATA		PUMP DATA		
400 HP	1775 F. L. RPM	356 DESIGN HP	160 SHUT OFF HP	40 WK^2 (LB-FT^2)

FLOWSERVE PUMP DIVISION Newark Operations		PERFORMANCE TEST CURVE	
Customer	I.D.F. TANEYTOWN 7179	Order No.	G415643/0010
Customer Order No.	PO69953	Serial No.	415643-0010-01
Customer Item No.	01 P-1	Pump Size	200LNN600

DUTY CONDITIONS					
Flowrate	3000 USgpm	Total Head	360 ft	Speed	1775 rpm
Specific Gravity	1.00	Efficiency	76.5 %	Impeller Diameter	19.68 in





DO NOT SCALE PRINTS | CAD ENGINEERED - NO MANUAL CHANGES PERMITTED | UNLESS OTHERWISE STATED

REF. No.	DESCRIPTION
060.01	NAMEPLATE
060.03	NAMEPLATE
060.04	DRIVE SCREW
101.00	CASING LOWER HALF
101.01	SCREW
101.02	SCREW
101.03	SCREW
101.04	STUD
101.05	NUT
101.06	PLUG
101.07	WASHER
101.08	PLUG
101.09	WASHER
101.10	STUD
102.00	CASING UPPER HALF
102.01	FORCING SCREW
102.02	LOCATING DOWEL
102.11	PLUG
102.12	WASHER
109.00	GASKET
161.00	CASING RING
161.01	PIN
202.00	BEARING HOUSING
202.01	SETSCREW
202.02	PLUG

REF. No.	DESCRIPTION
202.03	WASHER
202.04	PLUG
202.05	WASHER
202.06	PLUG
202.07	WASHER
218.00	THRUST WASHER
231.00	RADIAL BALL BEARING
231.01	SHIM SET
235.00	CIRCLIP
241.00	RADIAL BALL BEARING
251.00	END COVER
251.01	CAPSCREW
251.02	O'RING
252.00	BEARING COVER
252.01	SETSCREW
253.00	END COVER D.E.
280.00	GREASE NIPPLE
295.00	CONSTANT LEVEL OILER
295.00	BREATHER
299.01	REDUCING BUSH
301.00	SHAFT
302.00	KEY
309.00	KEY
311.00	IMPELLER

REF. No.	DESCRIPTION
321.00	WEAR RING
321.01	LOCKING SCREW
351.00	SLEEVE
363.00	SHAFT NUT
363.01	LOCKING SCREW
366.00	LOCKNUT
374.00	"O" RING SEAL
378.00	"V" RING SEAL
378.01	"V" RING SEAL
379.00	"V" RING SEAL (PERFORATED)
379.01	"V" RING SEAL (PERFORATED)
401.00	STUFFING BOX HOUSING
401.01	PLUG
401.04	PIN
401.05	PIN
401.20	STUD
401.21	NUT
404.00	GLAND PACKING
405.00	LANTERN RING
406.00	GLAND
409.00	GLAND RING
414.00	"O" RING SEAL
420.00	MECHANICAL SEAL ASS'Y
500.01	FLUSH LINE ASS'Y

ISSUE	DATE	INITIAL	ZONE	DESCRIPTION OF ALTERATION
A	29/09/98	KN		GENERAL UPDATE

DRAWN BY CPS
DATE 19980408
AGREED FOR MFG.
DATE
DRAWN SCALE 1

BASED ON DRAWING No.
PROJECTION - THIRD ANGLE (I.S.O. 128)
CLIENT AND ORDER No.
FACTORY
SUBJECT SIZE, SECTION
LN4 SPLIT CASING PUMP

INGERSOLL-DRESSER PUMPS (UK) LTD
NEWARK, ENGLAND

Q C751/006 DRAWING NUMBER SHEET 3 OF 7

A2

REF. No.	DESCRIPTION	MATERIAL
060.01	NAMEPLATE	ST.ST.
060.03	NAMEPLATE	BRASS
060.04	DRIVE SCREW	ST.ST.
101.00	CASING LOWER HALF	BS1452 GD250
101.01	SCREW	STEEL GD 8.8
101.02	SCREW	" " 8.8
101.03	SCREW	" " 8.8
101.04	STUD	" " 8.8
101.05	NUT	" " 8
101.06	PLUG	" " 5.8
101.07	WASHER	COPPER
101.08	PLUG	STEEL GD 5.8
101.09	WASHER	COPPER
101.10	STUD	STEEL GD 8.8
102.00	CASING UPPER HALF	BS1452 GD250
102.01	FORCING SCREW	STEEL GD 8.8
102.02	LOCATING DOWEL	BS970 070M20
102.11	PLUG	" " 5.8
102.12	WASHER	COPPER
109.00	GASKET	KLINGERSIL C4200
161.00	CASING RING	BRONZE BS1400 PB1
161.01	PIN	ST.ST. GD302
202.00	BEARING HOUSING	BS1452 GD180
202.01	SETSCREW	STEEL GD 8.8
202.02	PLUG	STEEL GD 5.8

REF. No.	DESCRIPTION	MATERIAL
202.03	WASHER	COPPER
202.04	PLUG	STEEL GD 5.8
202.05	WASHER	COPPER
202.06	PLUG	STEEL GD 5.8
202.07	WASHER	COPPER
218.00	THRUST WASHER	BS970 070M20
231.00	RADIAL BALL BEARING	STEEL
231.01	SHIM SET	" STEEL
235.00	CIRCLIP	SPRING STEEL
241.00	RADIAL BALL BEARING	STEEL
251.00	END COVER	BS1452 GD180
251.01	CAPSCREW	STST 316
251.02	O'RING	NITRILE
252.00	BEARING COVER	BS1452 GD180
252.01	SETSCREW	STEEL GD 8.8
253.00	END COVER D.E.	BS1452 GD180
280.00	GREASE NIPPLE	PLATED STEEL
295.00	CONSTANT LEVEL OILER	STEEL/GLASS
299.00	BREATHER	PLATED STEEL
299.01	REDUCING BUSH	STEEL
301.00	SHAFT	BS970 080M40
302.00	KEY	"
309.00	KEY	"
311.00	IMPELLER	10 TIN/BRONZE

REF. No.	DESCRIPTION	MATERIAL
321.00	WEAR RING	BRONZE BS1400 PB1
321.01	LOCKING SCREW	ST.ST. 316
351.00	SLEEVE	BRONZE BS1400 PB1
363.00	SHAFT NUT	"
363.01	LOCKING SCREW	ST.ST. 316
366.00	LOCKNUT	STEEL ZINC PLATED
374.00	'O' RING SEAL	NITRILE RUBBER
378.00	'V' RING SEAL	"
378.01	'V' RING SEAL	"
379.00	'V' RING SEAL (PERFORATED)	"
379.01	'V' RING SEAL (PERFORATED)	"
401.00	STUFFING BOX HOUSING	BS1452 180
401.01	PLUG	STEEL GD 5.8
401.04	PIN	ST.ST. 302
401.05	PIN	"
401.20	STUD	STEEL GD 8.8
401.21	NUT	" " 8
404.00	GLAND PACKING	LATTYTEX 2773
405.00	LANTERN RING	BRONZE BS1400 PB1
406.00	GLAND	BS970 070M20
409.00	GLAND RING	BS4360 GD43A
414.00	'O' RING SEAL	NITRILE RUBBER
420.00	MECHANICAL SEAL ASS'Y	
500.01	FLUSH LINE ASS'Y	

ISSUE	DATE	INITIAL	ZONE	DESCRIPTION OF ALTERATION
A	25/6/2002	KV		GENERAL UPDATE

DRAWN BY CPS	
DATE 08/04/98	
AGREED FOR MFG.	
DATE	
DRAWN SCALE 1	

BASED ON DRAWING No.

PROJECTION - THIRD ANGLE (I.S.O. 128)

CLIENT AND ORDER No.
FACTORY

SUBJECT: STD. SECTION
LNN SPLIT CASING PUMP

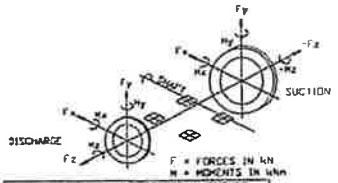
INGERSOLL-DRESSER PUMPS (UK) LTD
NEWARK, ENGLAND

DRAWING NUMBER C751/006
SHEET 2 OF 3

GS-001587

FOUNDATION BOLTS AND CONNECTING PIPING MUST NOT BE FIXED RIGIDLY UNTIL MACHINE IS IN PLACE.

WHEN EXPANSION JOINTS ARE USED IN THE DISCHARGE AND/OR SUCTION PIPING SUITABLY SIZED PIPE ANCHORS OR TIE RODS MUST BE INSTALLED BETWEEN THE EXPANSION JOINT AND THE PUMP PROPER. THESE MEASURES ARE REQUIRED TO PREVENT THE TRANSMISSION OF EXCESSIVE HYDRAULIC FORCES TO THE PUMP.



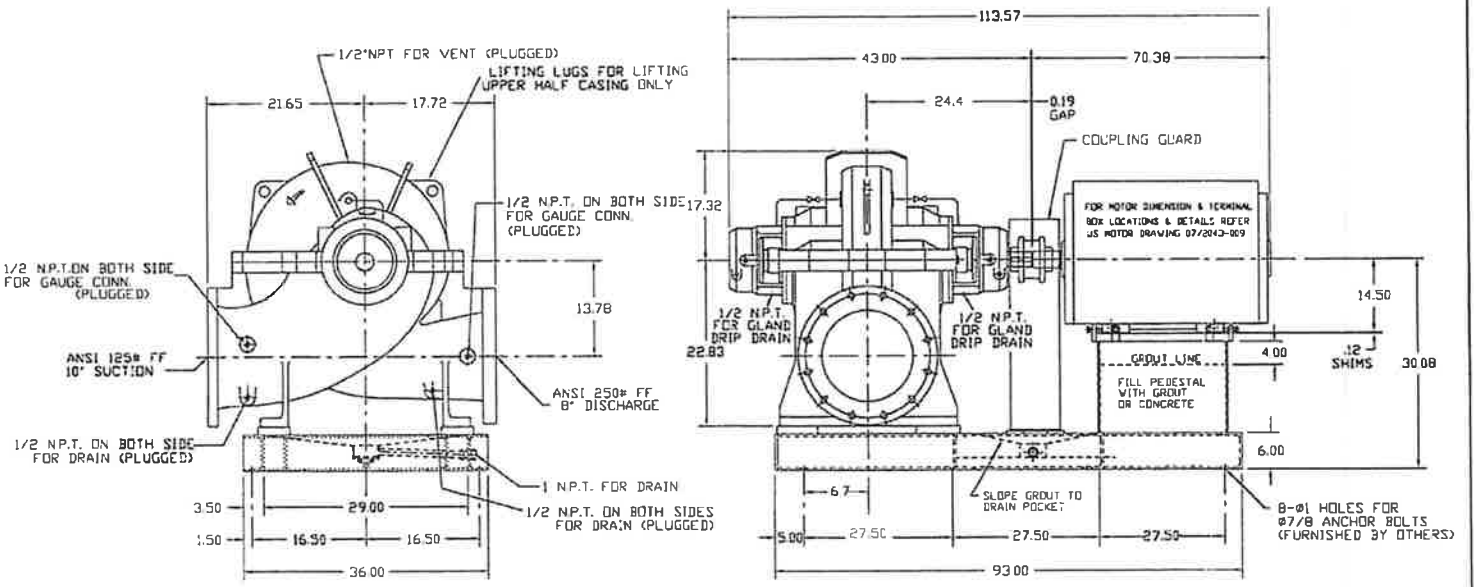
MAXIMUM ALLOWABLE FORCES & MOMENTS						
BRANCH	Mx	My	Mz	Fx	Fy	Fz
SUCTION	502	380	244	534	445	668
DISCHARGE	353	258	176	378	312	498

APPROX WEIGHTS-LBS.	
PUMP (DRY)	1700
MOTOR	5200
COUPLING	93
BASEPLATE	950
TOTAL	7943

DRIVER DATA		
MANUFACTURER		FRAME
US MOTORS		5809ML
HORSEPOWER	RPM	PHASE/HERTZ/VOLTS
400	1800	3/60/4160
ENCLOSURE	FURNISHED BY	
TEFC	FLOWSERVE	
COUPLING		
FALK 1100T-10		
PUMP SHAFTING SEAL	PUMP BEARING LUBRICATION	
FLOWSERVE TYPE RD	GREASE	

BASEPLATES ARE FABRICATED STEEL TO ASTM A-36.

CLOCKWISE ROTATION VIEWING FROM COUPLING END- PER HI



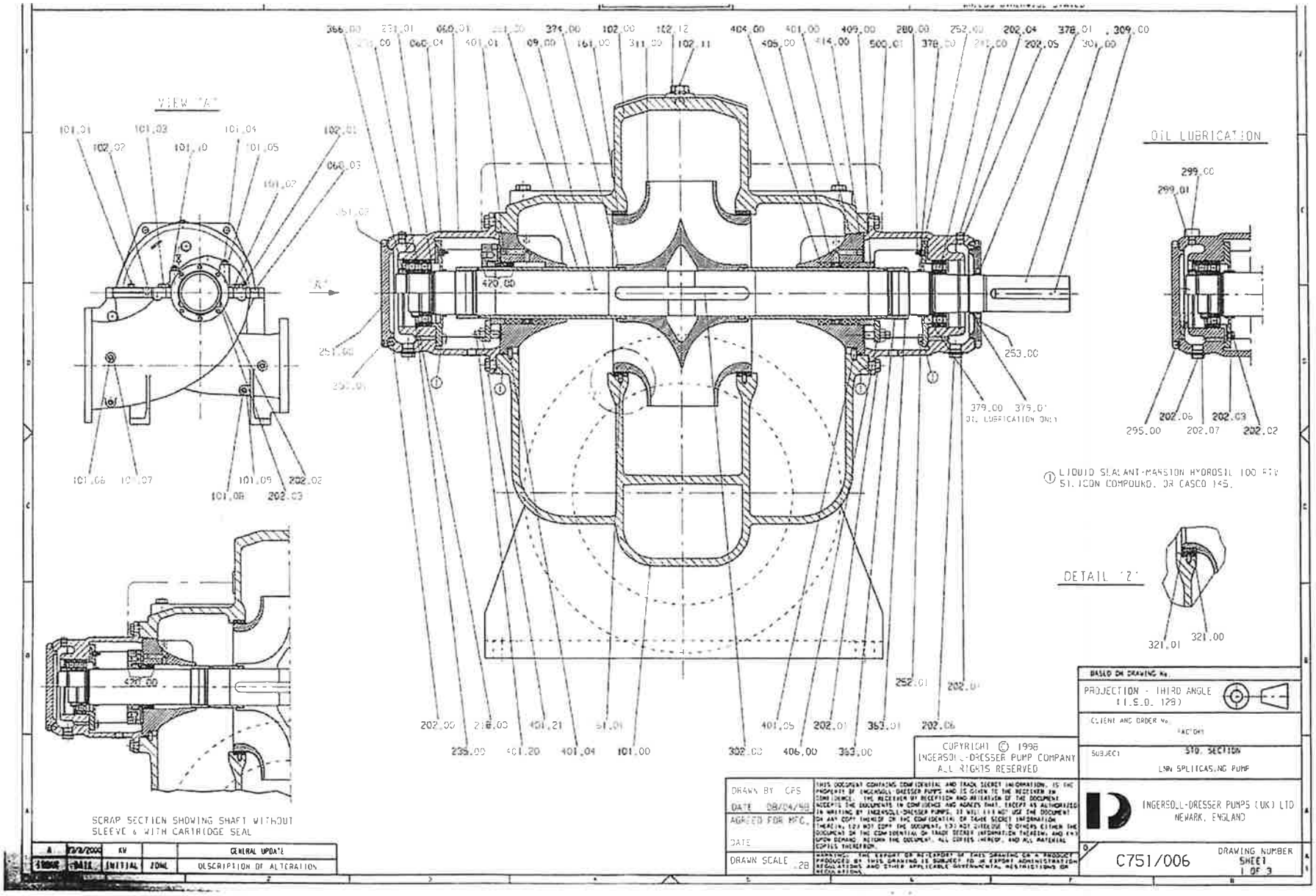
CORRECT FOR CUSTOMER'S ORDER 69221-11212
CUSTOMER BEERS CONSTRUCTION / ROCKDALE COUNTY WTP
DISTRICT OFFICE ORDER 047-82233 WORKS ORDER S-001587
CERTIFIED BY AMB! DATE 01/03/01

ALL DIMENSIONS ARE IN INCHES
TOLERANCE±0.12

B | BY: AS , DATE:2/24/01
SUCTION FLANGE WAS 250# RATING

PROJECT - ROCKDALE WATER TREATMENT PLANT
CAPACITY: 3300 GPM, HEAD:360 FT
TAG NO: P-B-1, P-B-2

3440
CAD DWG.-NO MANUAL CHANGES PERMITTED
200LNN600 PUMP ELEVATION
TARENTOWN, MARYLAND FLOWSERVE
SHEET S-001587 DATE 01/03/01 SCALE N.T.S.
DRAWN AS | CHECKED | APPROVED | GS001587 | B


VIEW 'A'
OIL LUBRICATION
DETAIL '2'
SCRAP SECTION SHOWING SHAFT WITHOUT SLEEVE & WITH CARTRIDGE SEAL
① LIQUID SEALANT-MANSION HYDROSIL 100 RTV SILICON COMPOUND, OR CASCO 145.
OIL LUBRICATION ONLY
COPYRIGHT © 1998 INGERSOLL-DRESSER PUMP COMPANY ALL RIGHTS RESERVED
BASED ON DRAWING No.
PROJECTION - THIRD ANGLE (I.S.O. 128)
CLIENT AND ORDER No.
FACTORY
SUBJECT
STD. SECTION
LNN SPLITCASE PUMP
DRAWN BY CPS
DATE 08/04/98
AGREED FOR MFG.
DATE
DRAWN SCALE .28
INGERSOLL-DRESSER PUMPS (UK) LTD NEWARK, ENGLAND
C751/006
DRAWING NUMBER
SHEET 1 OF 3
A 23/2/2000 KV GENERAL UPDATE
ISSUE DATE INITIAL ZONE DESCRIPTION OF ALTERATION

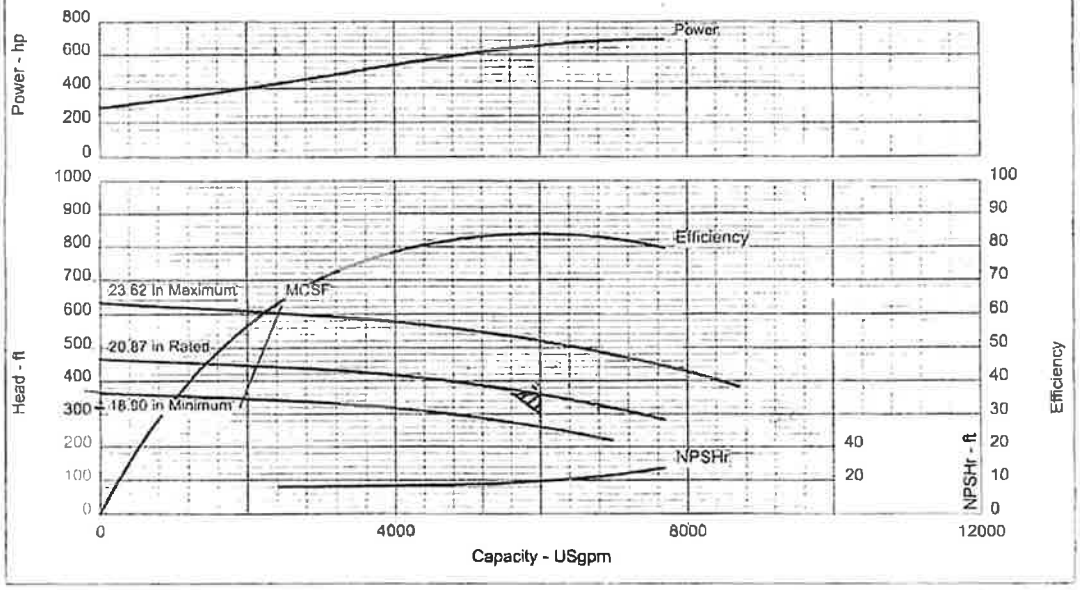
Customer :
Item number : P-8-3,4,5
Service : finished water high cap.
Vendor reference : 2035-W0000
Date : January 22, 2001

Ingersoll-Dresser Pumps

Capacity : 6000.0 USgpm
Head : 360.00 ft
Specific gravity : 1.000
Pump speed : 1775 rpm

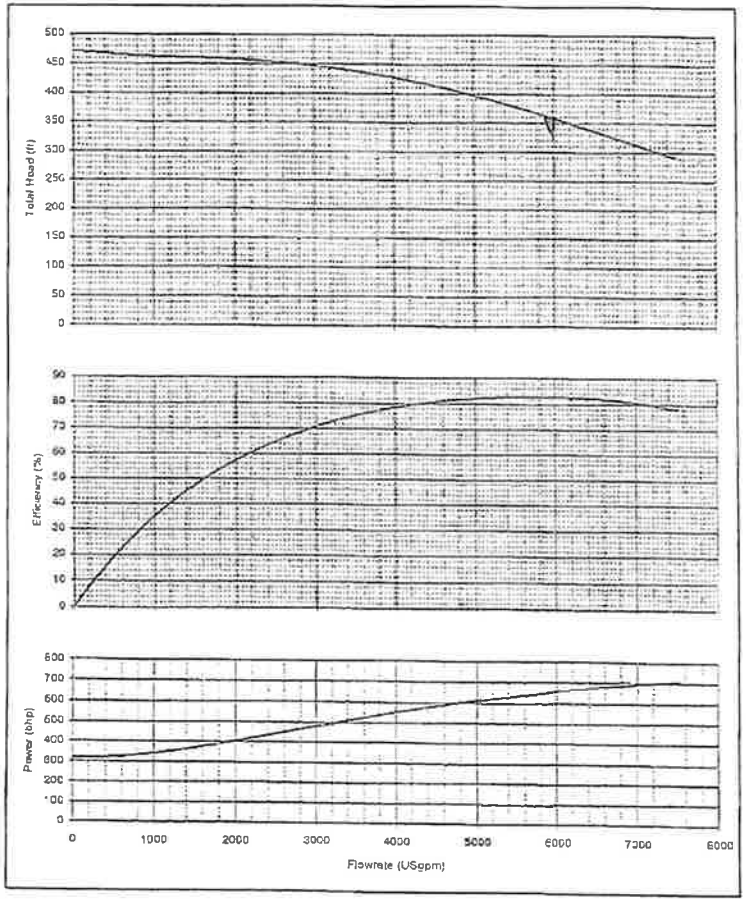
Pump size & type : 300-LNN-600
Based on curve no. : 901R1-BB
Number of stages : 1

CURVES ARE APPROXIMATE. PUMP IS GUARANTEED FOR DUTY SET UP CONDITIONS, CAPACITY, HEAD AND EFFICIENCY



FLOWSERVE PUMP DIVISION Newark Operations		PERFORMANCE TEST CURVE	
Customer	I.D.P. TANEYTOWN 7179.	Order No.	G415642/0010
Customer Order No.	PO70032	Serial No.	415642-0010-02
Customer Item No.	P-8-4	Pump Size	3DDLNN600

DUTY CONDITIONS					
Flowrate	6000 Usgpm	Total Head	350 ft	Speed	1775 rpm
Specific Gravity	1.00	Efficiency	83.7 %	Impeller Diameter	19.88 in



FLOWSERVE PUMP DIVISION Newark Operations		PERFORMANCE TEST CERTIFICATE	
Customer	I.D.P. TANEYTOWN 7175.	Order No.	G415642/0010
Customer Order No.	PO70032	Serial No.	415642-0010-02
Customer Item No.	P-8-6	Pump Size	300LNN600

DUTY CONDITIONS							
Flowrate	6000 USgpm	Total Head	360 ft	Speed	1775 rpm		
Specific Gravity	1.00	Efficiency	83.7 %	Impeller Diameter	19.88 in		

MOTOR DATA							
Contract / Test	Test Motor						
Manufacturer	BROOK	Serial No. GH 017049			Frame Size 7-AD355M		
Rated Power	315 kW	Amps	492 A	Voltage	415 V	Cycles	50 Hz

FIXED TEST DATA			
Gauge Height Correction	0.85 m		
Diameter at Suction Tapping	350 mm	Diameter at Discharge Tapping	300 mm

TEST RESULTS											
READING	UNITS	1	2	3	4	5	6	7	8	9	10
INPUT DATA											
Flowrate	m^3/h	1250	1124	997.5	747	497	249	0			
Suction Head	m	-2.8	-2.6	-2.48	-2.15	-1.95	-1.8	-1.8			
Discharge Head	m	43	49.5	54.6	64.2	71.2	72.7	75			
Speed	rpm	1299	1299	1300	1301	1303	1304	1304			
Amps	A	0	0	0	0	0	0	0			
Volts	V	0	0	0	0	0	0	0			
Motor Power Input	kW	206.59	199.93	192.32	169.66	142.15	108.27	93.632			
CALCULATED DATA											
Vel Head Correction	m	0.57	0.46	0.36	0.20	0.09	0.02	0.00			
Pump Total Head	m	47.22	53.41	58.29	67.40	74.09	75.37	77.66			
Motor Power Output	kW	206.6	199.9	192.3	169.9	142.2	108.3	93.9			
CALCULATED DATA CORRECTED TO 1775 rpm S.G.= 1.00											
Flowrate	USgpm	7520	6762	5997	4487	2981	1492	0			
Pump Total Head	ft	289	327	357	412	451	458	472			
Power Absorbed	bhp	706.8	684.0	656.5	578.5	481.9	366.2	317.7			
Pump Efficiency	%	77.9	81.8	82.4	80.8	70.6	47.2	0.0			
Overall Efficiency	%	77.9	81.8	82.4	80.8	70.6	47.2	0.0			

COMMENTS INVERTER DRIVEN TEST RIG

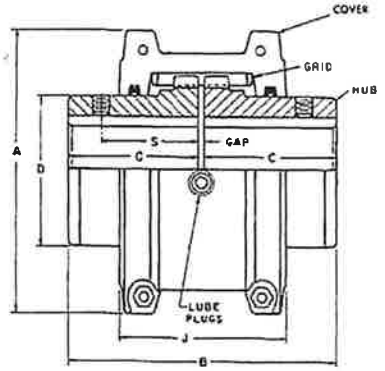
Tested by : S.CLARK Approved by : Date: 29/05/2001

Witnessed by : For :

FALK
a good name in industry

Horizontal/Vertical Steelflex Couplings with Straight Bores • Dimensions

Type T10 • Sizes 1020 thru 1140 (Page 1 of 1)



SIZE *	Torque Rating (lb-in.)	Allow. Speed rpm	Max† Bore (Sq. Key)	Min Bore ø	Cplg. Wt. With Min Bore-lb	Lube Wt. lb	DIMENSIONS – Inches A	B	C	D	J	S	Gap
1020T	422	4500	1.125	.500	4.2	.06	4.00	3.88	1.88	1.56	2.62	1.54	.125
1030T	1,200	4500	1.375	.590	5.7	.09	4.38	3.88	1.88	1.94	2.69	1.54	.125
1040T	2,000	4500	1.625	.560	7.4	.12	4.62	4.12	2.00	2.25	2.75	1.58	.125
1050T	3,500	4500	1.875	.500	12	.15	5.44	4.88	2.38	2.62	3.12	1.76	.125
1060T	5,500	4350	2.125	.750	16	.19	5.94	5.12	2.50	3.00	3.62	2.06	.125
1070T	8,000	4175	2.500	.750	28	.25	6.38	6.12	3.00	3.44	3.75	2.12	.125
1080T	16,500	3600	3.000	1.062	39	.38	7.62	7.12	3.50	4.12	4.56	2.54	.125
1090T	30,000	3600	3.500	1.062	56	.56	8.38	7.88	3.88	4.88	4.81	2.82	.125
1100T	50,500	2440	4.000	1.625	93	.94	9.88	9.69	4.75	5.59	6.12	...	.188
1110T	75,000	3250	4.500	1.625	120	1.12	10.62	10.19	5.00	6.31	6.36	...	.188
1120T	110,000	2025	5.000	2.375	179	1.62	12.12	12.00	5.88	7.06	7.54	...	.250
1130T	160,000	1800	6.000	2.625	266	2.0	13.62	13.00	6.38	8.56	7.68	...	.250
1140T	230,000	1650	7.250‡	2.625	392	2.5	15.12	14.75	7.25	10.00	7.92	...	.250

* Dimensions are for reference only and are subject to change without notice unless certified.

† Maximum bores are LESS than shown above for hubs with an INTERFERENCE FIT and a set screw OVER the keyway. Refer to Manual 427-105 for details. For the above Max Bores, Sizes 1020 thru 1090 will be furnished for CLEARANCE FIT with a set screw OVER the keyway. Sizes 1100 and larger will be furnished for INTERFERENCE FIT without set screw. Falk standards apply unless otherwise specified.

‡ Maximum bore is for hub with keyway for rectangular key.

ø Maximum bore is the smallest bore to which a RSB (rough stock bore) hub can be bored. Depending upon coupling size, rough stock bore hubs have only a blind centering hole or a small through hole that will permit remachining of the hubs to the minimum bores specified. RSB hubs are not drilled and tapped for set screws.

SIZE & TYPE	ONE HUB Bore	Keyway	Overhang	Fitted To	Fitted By	OTHER HUB Bore	Keyway	Overhang	Fitted To	Fitted By

PRELIMINARY CERTIFIED PRINT OF FALK COUPLING FOR ..... CO.

DRAWN	DATE		
CHECKED	NO. REQ'D.		
DRAWING NO	FOR UNIT ON M.O.		
	R.O.		
	COUPLING M.O.		

How To Use This Manual

This manual provides detailed instructions on maintenance, lubrication, installation, and parts identification. Use the table of contents below to locate required information.

Table of Contents

CAREFULLY FOLLOW THE INSTRUCTIONS IN THIS MANUAL FOR OPTIMUM PERFORMANCE AND TROUBLE FREE SERVICE.

INTRODUCTION

This manual applies to Sizes 1020T thru 1140T and 20T thru 140T10 Falk Steelflex Tapered Grid Couplings. Unless otherwise stated, information for Sizes 1020T thru 1140T applies to Sizes 20T thru 140T respectively, e.g. 1020T = 20T, 1100T = 100T, etc. These couplings are designed to operate in either the horizontal or vertical position without modification. Beginning in 1994, these couplings are being supplied with one set of inch series fasteners and one set of metric fasteners. Use either set of fasteners, depending on your preference. Refer to Page 6 for part interchangeability.

The performance and life of the couplings depend largely upon how you install and service them.

CAUTION: *Consult applicable local and national safety codes for proper guarding of rotating members. Observe all safety rules when installing or servicing couplings.*

WARNING: *Lockout starting switch of prime mover and remove all external loads from drive before installing or servicing couplings.*

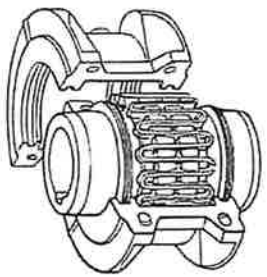
LUBE FITTINGS

Cover holes have 1/8 NPT lube holes. Use a standard grease gun and lube fitting as instructed on Page 4.

LIMITED END FLOAT

When electric motors, generators, engines, compressors and other machines are fitted with sleeve or straight roller bearings, limited axial end float kits are recommended for protecting the bearings. Falk Steelflex couplings are easily modified to limit end float; refer to Manual 428-820 for instructions.

TYPE T10 STEELFLEX COUPLING



LUBRICATION

Adequate lubrication is essential for satisfactory operation. Page 2 provides a list of typical lubricants and specifications for general purpose and long term greases. Because of its superior lubricating characteristics and low centrifuge properties, Falk Long Term Grease (LTG) is highly recommended. Sizes 1020T to 1090T10 are furnished with a pre-measured amount of grease for each coupling. The grease can be ordered for larger size couplings.

The use of general purpose grease requires re-lubrication of the coupling at least annually.

Long Term Grease (LTG)

The high centrifugal forces encountered in couplings separate the base oil and thickener of general purpose greases. Heavy thickener, which has no lubrication qualities, accumulates in the gap-groove area of Steelflex couplings resulting in premature hub or grid failure unless periodic lubrication cycles are maintained.

Falk Long Term Grease (LTG) was developed specifically for couplings. It resists separation of the oil and thickener and is an extreme pressure grease.

Steelflex couplings initially lubricated with LTG will not require re-lubrication until the connected equipment is stopped for servicing. If a coupling leaks grease, is exposed to extreme temperatures, excessive moisture, or experiences frequent reversals, more frequent lubrication may be required.

Although LTG grease is compatible with most other coupling greases, the mixing of greases may dilute the benefits of LTG.

USDA Approval

LTG has the United States Department of Agriculture Food Safety & Inspection Service approval for applications where there is no possibility of contact with edible products. (H-2 ratings).

CAUTION: Do not use LTG in bearings.

The Falk Corporation, a Sundstrand Company. PO Box 492, Zip 53201-0492
3001 W. Canal St., Zip 53208-4200, Milwaukee, WI USA Telephone: 414-342-3131
Fax: 414-937-4259 e-mail: falkinfo@falkcorp.com web: www.falkcorp.com

428-110
March 1998
Supersedes 1-94

Specifications — Falk LTG

The values shown are typical and slight variations are permissible.

AMBIENT TEMPERATURE RANGE — -20°F (-29°C) to 250°F (121°C). Min. Pump = 20° F (-7° C).

MINIMUM BASE OIL VISCOSITY — 3300SSU (715cST) @ 100°F (38°C).

THICKENER — Lithium & soap/polymer.

CENTRIFUGE SEPARATION CHARACTERISTICS — ASTM #D4425 (Centrifuge Test) — K36 = 2/24 max., very high resistance to centrifuging.

NLGI GRADE (ASTM D-217) — 1/2

MINIMUM DROPPING POINT — with 60 stroke worked penetration value in the range of 320 to 365 — 350°F (177°C) min.

MINIMUM TIMKEN O.K. LOAD — 40 lbs.

ADDITIVES — Rust and oxidation inhibitors that do not corrode steel or swell or deteriorate synthetic seals.

Packaging

14 oz. (0,4 kg.) CARTRIDGES — Individual or case lots of 10 or 60.

35 lb. (16 kg.)PAIL, 120 lb. (54 kg.) KEG & 400 lb. (181 kg) DRUMS.

General Purpose Grease

Annual Lubrication — The following specifications and lubricants for general purpose grease apply to Falk Steelflex couplings that are lubricated annually and operate within ambient temperatures of 0°F to 150°F (-18°C to 66°C). For temperatures beyond this range (see Table 1), consult the Factory.

If a coupling leaks grease, is exposed to extreme temperatures, excessive moisture or experiences frequent reversals, more frequent lubrication may be required.

Specifications — General Purpose Coupling Lubricants

The values shown are typical and slight variations are permissible.

DROPPING POINT — 300°F (149°C) or higher.

CONSISTENCY — NLGI No. 2 with 60 stroke worked penetration value in the range of 250 to 300.

SEPARATION AND RESISTANCE — Low oil separation rate and high resistance to separation from centrifuging.

LIQUID CONSTITUENT — Possess good lubricating properties equivalent to a high quality, well refined petroleum oil.

INACTIVE — Must not corrode steel or cause swelling or deterioration of synthetic seals.

CLEAN — Free from foreign inclusions.

General Purpose Greases Meeting Falk Specifications

Lubricants listed below are typical products only and should not be construed as exclusive recommendations.

TABLE 1 — General Purpose Greases *

Ambient Temperature Range	0°F to 150°F (-18°C to 66°C)	-30°F to 100°F (-34°C to 38°C)
Manufacturer	Lubricant †	Lubricant †
Amoco Oil Co.	Amolith Grease #2	Amolith Grease #2
BP Oil Co.	Energrease LS-EP2	Energrease LS-EP1
Chevron U.S.A. Inc.	Dura-Lith EP2	Dura-Lith EP1
Citgo Petroleum Corp.	Premium Lithium Grease EP2	Premium Lithium Grease EP1
Conoco Inc.	EP Conolith Grease #2	EP Conolith Grease #2
Exxon Company, USA	Unirex N2	Unirex N2
E.F. Houghton & Co.	Cosmolube 2	Cosmolube 1
Imperial Oil Ltd.	Unirex N2L	Unirex N2L
Kendall Refining Co.	Lithium Grease L421	Lithium Grease L421
Keystone Div. (Pennwalt/ Lyondell Petrochemical (ARCO)	61 EP-2 Litholine H EP 2 Grease	61 EP-1 Litholine H EP 2 Grease
Mobil Oil Corp. Pamo-Canada Products	Mobilux EP111 Multipurpose EP2	Mobilith AW1 Multipurpose EP1
Phillips 66 Co.	Philube Blue EP	Philube Blue EP
Shell Oil Co.	Alvania Grease 2	Alvania Grease 2
Shell Canada Ltd.	Alvania Grease 2	Alvania Grease 2
Sun Oil Co.	Ultra Prestige 2EP	Ultra Prestige 2EP
Texaco Lubricants	Starplex HD2	Multifak EP2
Unocal 76 (East & West)	Unoba EP2	Unoba EP2
Valvoline Oil Co.	Multilube Lithium EP Grease	

* Grease application or re-lubrication should be done at temperatures above 20°F (-7°C). If grease must be applied below 20°F (-7°C), consult The Falk Corporation.

† Lubricants listed may not be suitable for use in the food processing industry; check with lube manufacturer for approved lubricants.

INSTALLATION OF TYPE T10 STEELFLEX TAPERED GRID COUPLINGS

Installation

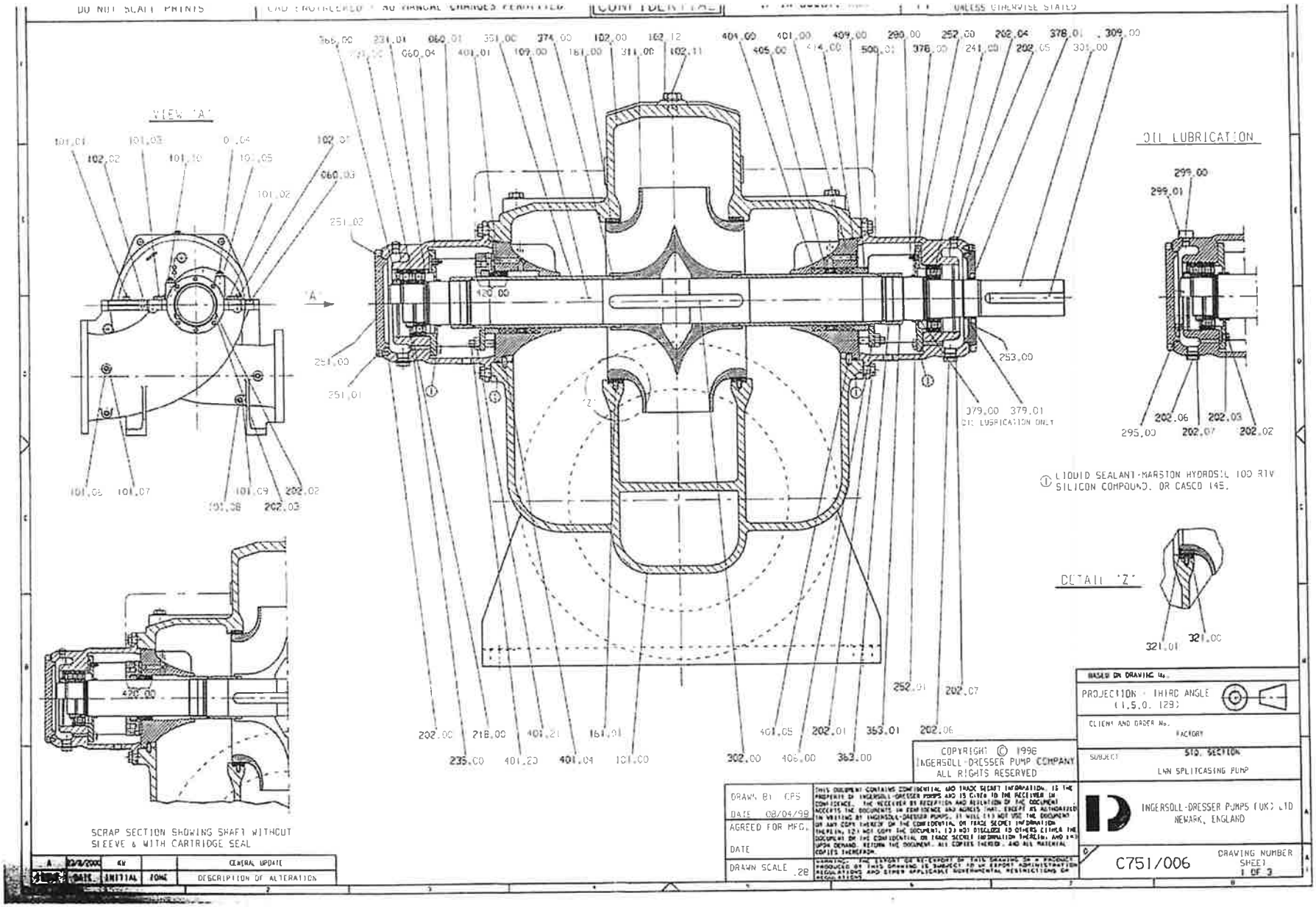
Only standard mechanics tools, wrenches, a straight edge and feeler gauges are required to install Falk Steelflex couplings. Coupling Sizes 1020T thru 1090T are generally furnished for CLEARANCE FIT with setscrew over the keyway. Sizes 1100T and larger are furnished for an INTERFERENCE FIT without a setscrew.

CLEARANCE FIT HUBS — Clean all parts using a non-flammable solvent. Check hubs, shafts and keyways for burrs. Do not heat clearance fit hubs. Install keys, mount hubs with flange face flush with shaft ends or as otherwise specified and tighten setscrews.

INTERFERENCE FIT HUBS — Furnished without setscrews. Heat hubs to a maximum of 275°F (135°C) using an oven, torch, induction heater or an oil bath. To prevent seal damage, DO NOT heat hubs beyond a maximum temperature of 400°F (205°C).

When an oxy-acetylene or blow torch is used, use an excess acetylene mixture. Mark hubs near the center of their length in several places on hub body with a temperature sensitive crayon, 275°F (135°C) melt temperature. Direct flame towards hub bore using constant motion to avoid overheating an area.

The Falk Corporation, a Sundstrand Company, P.O. Box 492, Zip 53201-0492
3001 W. Canal St., Zip 53208-4200, Milwaukee, WI USA Telephone: 414-342-3131
Fax: 414-937-4359 e-mail: falkinfo@falkcorp.com web: www.falkcorp.com


DO NOT SCALE PRINTS
CAD ENGINEERED - NO MANUAL CHANGES PERMITTED
CONFIDENTIAL
UNLESS OTHERWISE STATED
VIEW 'A'
OIL LUBRICATION
DETAIL 'Z'
SCRAP SECTION SHOWING SHAFT WITHOUT SLEEVE & WITH CARTRIDGE SEAL
① LIQUID SEALANT - MARSTON HYDROSIL 100 RTV SILICON COMPOUND. OR CASCO 145.
OIL LUBRICATION ONLY
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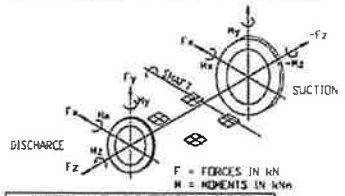
BASED ON DRAWING No.
PROJECTION - THIRD ANGLE (I.S.O. 128)
CLIENT AND ORDER No. FACTORY
SUBJECT STD. SECTION
LNN SPLITCASING PUMP
INGERSOLL-DRESSER PUMPS (UK) LTD NEWARK, ENGLAND
DRAWN BY CPS
DATE 08/04/98
AGREED FOR MFG.
DATE
DRAWN SCALE .28
C751/006
DRAWING NUMBER
SHEET 1 OF 3
A 03/8/2000 KN GENERAL UPDATE
DATE INITIAL ZONE DESCRIPTION OF ALTERATION

GS-001588

FOUNDATION BOLTS AND CONNECTING PIPING MUST NOT BE FIXED RIGIDLY UNTIL MACHINE IS IN PLACE.

WHEN EXPANSION JOINTS ARE USED IN THE DISCHARGE AND/OR SUCTION PIPING SUITABLY SIZED PIPE ANCHORS OR TIE RODS MUST BE INSTALLED BETWEEN THE EXPANSION JOINT AND THE PUMP PROPER. THESE MEASURES ARE REQUIRED TO PREVENT THE TRANSMISSION OF EXCESSIVE HYDRAULIC FORCES TO THE PUMP.



MAXIMUM ALLOWABLE FORCES & MOMENTS

BRANCH	Mx	My	Mz	Fx	Fy	Fz
SUCTION	6.37	4.75	3.12	7.12	5.79	8.90
DISCHARGE	6.10	4.61	2.98	6.68	5.34	8.01

APPROX WEIGHTS-LBS.	
PUMP (DRY)	2800
MOTOR	5700
COUPLING	93
BASEPLATE	1050
TOTAL	9643

DRIVER DATA

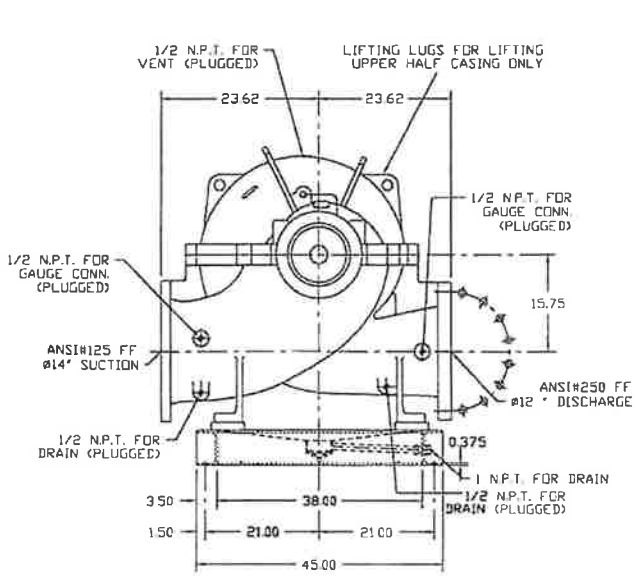
MANUFACTURER: US MOTORS		FRAME: 5811ML
HORSEPOWER: 700	RPM: 1800	PHASE/HERTZ/VOLTS: 3/60/4160
ENCLOSURE: TEFC	FURNISHED BY: FLOWSERVE	

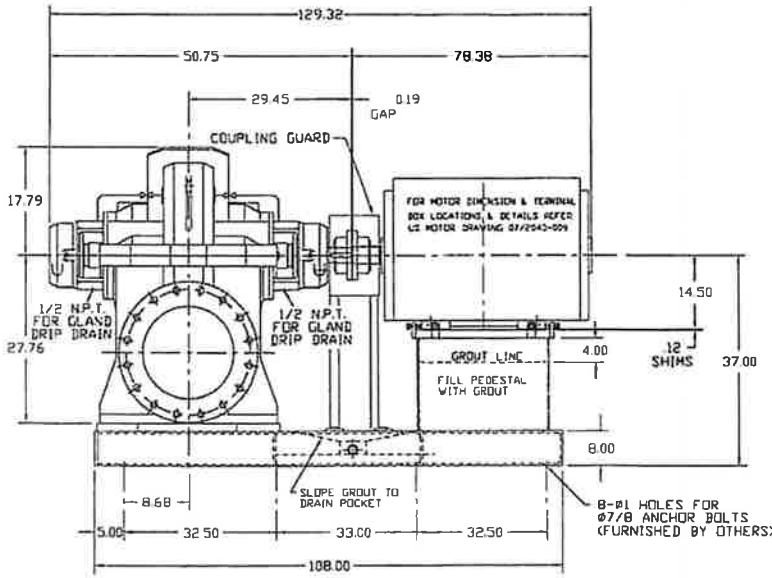
COUPLING: FALK 1100T-10

PUMP STUFFING BOX SEAL	PUMP BEARING LUBRICATION
FLOWSERVE TYPE RD	GREASE

BASEPLATES ARE FABRICATED STEEL TO ASTM A-36.

CLOCKWISE ROTATION VIEWING FROM COUPLING END- PER HI





CORRECT FOR CUSTOMER'S ORDER 69221-11212
CUSTOMER HEERS CONSTRUCTION / ROCKDALE COUNTY WTP
DISTRICT OFFICE ORDER 047-82233 WORKS ORDER S-001588
CERTIFIED BY AWB DATE 01/03/01

ALL DIMENSIONS ARE IN INCHES
TOLERANCE ±0.12

B | BY: AS , DATE: 2/24/01
SUCTION FLANGE WAS 250# RATING

PROJECT - ROCKDALE WATER TREATMENT PLANT
CAPACITY: 6000 GPM, HEAD: 360 FT
TAG NO: P-8-3, P-8-4, P-8-5

3440

CAD DWG.-NO MANUAL CHANGES PERMITTED

300LNN600 PUMP ELEVATION

FLOWSERVE

DRAWN	CHECKED	APPROVED	DRAWING NO.	
AS			GS001588	B

A | B | C | D | E | F | G | H | J | K

REF. No.	DESCRIPTION	MATERIAL
060.01	NAMEPLATE	ST.ST.
060.03	NAMEPLATE	BRASS
060.04	DRIVE SCREW	ST.ST.
101.00	CASING LOWER HALF	BS1452 GD250
101.01	SCREW	STEEL GD 8.8
101.02	SCREW	" " 8
101.03	SCREW	" " 8.8
101.04	STUD	" " 8.8
101.05	NUT	" " 8
101.06	PLUG	" " 5.8
101.07	WASHER	COPPER
101.08	PLUG	STEEL GD 5.8
101.09	WASHER	COPPER
101.10	STUD	STEEL GD 8.8
102.00	CASING UPPER HALF	BS1452 GD250
102.01	FORCING SCREW	STEEL GD 8.8
102.02	LOCATING DOWEL	BS970 070M20
102.11	PLUG	" " 5.8
102.12	WASHER	COPPER
109.00	GASKET	KLINGERSIL C4200
161.00	CASING RING	BRONZE BS1400 PB1
161.01	PIN	ST.ST. GD302
202.00	BEARING HOUSING	BS1452 GD180
202.01	SETSCREW	STEEL GD 8.8
202.02	PLUG	STEEL GD 5.8

REF. No.	DESCRIPTION	MATERIAL
202.03	WASHER	COPPER
202.04	PLUG	STEEL GD 5.8
202.05	WASHER	COPPER
202.06	PLUG	STEEL GD 5.8
202.07	WASHER	COPPER
216.00	THRUST WASHER	BS970 070M20
231.00	RADIAL BALL BEARING	STEEL
231.01	SHIM SET	M.STEEL
235.00	CIRCLIP	SPRING STEEL
241.00	RADIAL BALL BEARING	STEEL
251.00	END COVER	BS1452 GD180
251.01	CAPSCREW	SIST 316
251.02	O'RING	NITRILE
252.00	BEARING COVER	BS1452 GD180
252.01	SETSCREW	STEEL GD 8.8
253.00	END COVER D.E.	BS1452 GD180
280.00	GREASE NIPPLE	PLATED STEEL
295.00	CONSTANT LEVEL OILER	STELL/GLASS
299.00	BREATHER	PLATED STEEL
299.01	REDUCING BUSH	STEEL
301.00	SHAFT	BS970 080M40
302.00	KEY	"
309.00	KEY	% "
311.00	IMPELLER	10 TIN/BRONZE

REF. No.	DESCRIPTION	MATERIAL
321.00	WEAR RING	BRONZE BS1400 PB1
321.01	LOCKING SCREW	ST.ST. 316
351.00	SLEEVE	BRONZE BS1400 PB1
363.00	SHAFT NUT	"
363.01	LOCKING SCREW	ST.ST. 316
366.00	LOCKNUT	STEEL ZINC PLATED
374.00	'O' RING SEAL	NITRILE RUBBER
378.00	'V' RING SEAL	"
378.01	'V' RING SEAL	"
379.00	'V' RING SEAL (PERFORATED)	"
379.01	'V' RING SEAL (PERFORATED)	"
401.00	STUFFING BOX HOUSING	BS1452 180
401.01	PLUG	STEEL GD 5.8
401.04	PIN	ST.ST. 302
401.05	PIN	"
401.20	STUD	STEEL GD 8.8
401.21	NUT	" " 8
404.00	GLAND PACKING	LATTYTEX 2773
405.00	LANTERN RING	BRONZE BS1400 PB1
406.00	GLAND	BS970 070M20
409.00	GLAND RING	BS4360 GD43A
414.00	'O' RING SEAL	NITRILE RUBBER
420.00	MECHANICAL SEAL ASS'Y	
500.01	FLUSH LINE ASS'Y	

ISSUE	DATE	INITIAL	ZONE	DESCRIPTION OF ALTERATION
A	20/8/98	KS		GENERAL UPDATE

BASED ON DRAWING No.

PROJECTION - THIRD ANGLE (I.S.O. 128)

CLIENT AND ORDER No.

FACTORY

SUBJECT STD. SECTION

LNN SPLIT CASING PUMP

DRAWN BY CPS

DATE 08/04/98

AGREED FOR MFG.

DATE

DRAWN SCALE 1

INGERSOLL-DRESSER PUMPS (UK) LTD
NEWARK, ENGLAND

0

C751/006

DRAWING NUMBER
SHEET 2 OF 3

DO NOT SCALE PRINTS | CAD ENGINEERED - NO MANUAL CHANGES PERMITTED | CONFIDENTIAL | IF IN DOUBT, ASK | ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED

REF. No.	DESCRIPTION
060.01	NAMEPLATE
060.03	NAMEPLATE
060.04	DRIVE SCREW
100.00	CASING LOWER HALF
101.01	SCREW
101.02	SCREW
101.03	SCREW
101.04	STUD
101.05	NUT
101.06	PLUG
101.07	WASHER
101.08	PLUG
101.09	WASHER
101.10	STUD
102.00	CASING UPPER HALF
102.01	FORCING SCREW
102.02	LOCATING DOWEL
102.11	PLUG
102.12	WASHER
109.00	GASKET
161.00	CASING RING
161.01	PIN
202.00	BEARING HOUSING
202.01	SETSCREW
202.02	PLUG

REF. No.	DESCRIPTION
202.03	WASHER
202.04	PLUG
202.05	WASHER
202.06	PLUG
202.07	WASHER
218.00	THRUST WASHER
231.00	RADIAL BALL BEARING
231.01	SHIM SET
235.00	CIRCLIP
241.00	RADIAL BALL BEARING
251.00	END COVER
251.01	CAPSCREW
251.02	O'RING
252.00	BEARING COVER
252.01	SETSCREW
253.00	END COVER D.E.
280.00	GREASE NIPPLE
296.00	CONSTANT LEVEL OILER
299.00	BREATHER
299.01	REDUCING BUSH
301.00	SHAFT
302.00	KEY
309.00	KEY
311.00	IMPELLER

REF. No.	DESCRIPTION
321.00	WEAR RING
321.01	LOCKING SCREW
351.00	SLEEVE
363.00	SHAFT NUT
363.01	LOCKING SCREW
366.00	LOCKNUT
374.00	'O' RING SEAL
378.00	'V' RING SEAL
378.01	'V' RING SEAL
379.00	'V' RING SEAL (PERFORATED)
379.01	'V' RING SEAL (PERFORATED)
401.00	STUFFING BOX HOUSING
401.01	PLUG
401.04	PIN
401.05	PIN
401.20	STUD
401.21	NUT
404.00	GLAND PACKING
405.00	LANTERN RING
406.00	GLAND
409.00	GLAND RING
414.00	'O' RING SEAL
420.00	MECHANICAL SEAL ASS'Y
500.01	FLUSH LINE ASS'Y

REV	DATE	INITIAL	ZONE	DESCRIPTION OF ALTERATION
R	25/8/2000	RV		GENERAL UPDATE

BASED ON DRAWING No.

PROJECTION - THIRD ANGLE (I.S.O. 128)

CLIENT AND ORDER No.
FACTORY

SUBJECT: STD. SECTION
LNN SPLIT CASING PUMP

DRAWN BY CPS
DATE 19980408
AGREED FOR MFG.
DATE
DRAWN SCALE 1

INGERSOLL-DRESSER PUMPS (UK) LTD
NEWARK, ENGLAND

C751/006

DRAWING NUMBER SHEET 3 OF 3