طرح نگهداشت و افزایش تولید ۲۷ مخزن

DATASHEET (W/DRAWING) FOR AUXILIARY MOTORS

نگهداشت و افزایش تولید میدان نفتی بینک

V01	Oct. 2023	IFR	Havayar Co.	M.Fakharian	S. Faramarzpour	
V00	Jul. 2023	IFR	Havayar Co.	M.Fakharian	A.M.Mohseni	
Rev.	**Date**	**Purpose of Issue/Status**	**Prepared by:**	**Checked by:**	**Approved by:**	**CLIENT Approval**

Status:

IFA: Issued for Approval
IFR: Issued for Review
IFI: Issued for Information
AFC: Approved for Construction

پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه
BK	GCS	HY	120	EL	DS	0002	V01

REVISION RECORD SHEET

PAGE	V00	V01	V02	V03	V04
1	X	X			
2	X	X			
3	X	X			
4	X	X			
5	X	X			
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PAGE	V00	V01	V02	V03	V04
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BARRING DEVICE MOTOR

M-102A/B/C

Data Sheets for LV Induction Motors			
Item	**Category**	**Required Specification**	**Vendor Data**
1	Driven Machine	Electrical Motor	Electrical Motor
2	Driven Machine Tag No.	-	C-2101A/B/C & C-2102A/B/C
3	Manufacturer	By Vendor	HYOSUNG
4	Manufacturer's Number / Type	By Vendor	SR23006 / OPT
5	Manufacturing Standard	IEC 60034 & IPS-M-EL-131(2)	IEC 60034 & IPS-M-EL-131(2)
6	Location	[X] Outdoor (Under Shelter) [ ] Indoor	Outdoor
7	Area Classification	Acc. to requisition data	Zone 2 IIB T3
8	Ambient Temperature	5 to +55°C	5 to +55°C
9	Relative Humidity	100 %	100%
10	Dust	[X] Yes [ ] No	Yes
11	Corrosion	[X] Yes [ ] No	Yes
12	Elevation	12.5m Above Sea Level	12.5m Above Sea Level
13	Quantity	Acc. To Load List (BK-GCS-PEDCO-120-EL-LI-0001)	3
14	Tag Number	Acc. To Load List (BK-GCS-PEDCO-120-EL-LI-0001)	M-102A/B/C
15	Motor Type	Asynchronous, Squirrel Cage	Asynchronous, Squirrel Cage
16	Mounting	[ ] Horizontal [ ] Vertical	Horizontal
17	Rotor Construction	[ ] Brazed Copper Bars [ ] Aluminum Die Cast	Aluminum Die Cast
18	Frame Material	Steel Sheet or Cast Iron	Cast Iron
19	Rotor Cage Material	By Vendor	Aluminum Die Cast
20	Cooling Method	IC411 According to IPS-M-EL-131(2)	IC411
21	Ingress Protection Degree for Motor	IP 54	IP 55
22	Ingress Protection Degree for Terminal Box	IP 55	IP 55
23	Explosion Protection of Motor	N/A for Safe Area Zone 2, IIB, T3	Ex db IIB T4 Gb
24	Explosion Protection of Terminal Box	N/A for Safe Area Zone 2, IIB, T3	Ex db IIB T4 Gb
25	Ex. Certificate Authority/Certificate No.	By Vendor	SIRA 15ATEX1064X
26	Driven Machine Shaft Power Requirement (P_{mp})	As Per Related Mechanical Data sheet (to be Specified by Vendor)	1.2KW
27	De-Rating Factor due to Ambient Temperature (K_t)	Vendor Shall Advise	1=De-Rating 0% at 55°C
28	De-Rating Factor Due to Altitude (K_a)	1	1=De-Rating 0% at 12.5m
29	Design margin (K_m)	Acc. to IPS Standard (Note 1)	1.25

Data Sheets for LV Induction Motors			
Item	**Category**	**Required Specification**	**Vendor Data**
30	Motor Shaft Power Requirement @ Site $^{condition\ (=Km\ X\ P_{mp})}$	By Vendor	1.5KW
31	Standard Rated Motor Output $=Km\ X\ P_{mp} / (K_a\ K_t)$	By Vendor	1.5KW
32	Frame Size	By Vendor	112M
33	Frame Earth Boss	External	M6
34	Rated Voltage	400 V ±10%	400 V ±10%
35	Rated Frequency	50 Hz ±5%	50 Hz ±5%
36	Protection Devices	Switch-Fuse	Yes
37	Neutral Earthing System	TNS	Yes
38	Voltage During Motor Start	80% Un	80% Un
39	Synchronous Speed	By Vendor	1500
40	Full Load Speed [RPM]	By Vendor	1455
41	Over Speed Capability	By Vendor	150%
42	Number of Poles	By Vendor	4
43	Starting Method	Direct on Line	Direct on Line
44	Direction of Rotation (Viewed from coupling end)	Shall be Proposed by MFR Based on Driven Load Rotation of Direction	[ ] CW [X] CCW [ ] Unidirectional [ ] Bidirectional
45	Stator Winding Connection	Delta	Delta
46	Location of Terminal Box (Viewed from DE)	[ ] Right [ ] Left	Left
47	Insulation Class	Class F	Class F
48	Class of Temperature Rise	Class B	Class B
49	Max. Permissible Starting Time [s]	By Vendor	15s
50	Accelerating Time DOL starting, at 100% U_n [s]	By Vendor	0.2sec
51	Accelerating Time DOL starting, at 80% U_n [s]	By Vendor	0.4sec
52	Starting Torque at 100% U_n [N.m]	By Vendor	25.9
53	Starting Torque at 80% U_n [N.m]	By Vendor	16.6
54	Maximum Torque [N.m]	By Vendor	33.1
55	Pull-Up Torque	By Vendor	23.7
56	Locked Rotor Torque	By Vendor	25.9
57	Rated Torque [N.m]	By Vendor	14.4
58	Rated Current [A]	By Vendor	4.8

Data Sheets for LV Induction Motors			
Item	**Category**	**Required Specification**	**Vendor Data**
59	Max Starting Current	By Vendor	33.6
60	No Load Current [A]	By Vendor	2.3
61	Locked Rotor Current [A]	<7In	700%
62	Locked Rotor Power Factor [A]	By Vendor	46.30%
63	Torque-Speed Class	Shall be Selected Based on Driven Load Torque Requirement	[ ] A [v] B [ ] C [ ] D
64	Duty Cycle	S1	S1
65	Current at ½ Rated Load	By Vendor	3.2
66	Current at ¾ Rated load	By Vendor	4.0
67	Current at Rated Load	By Vendor	4.8
68	Starting Power Factor	By Vendor	46.30%
69	Power Factor at ½ Rated Load	By Vendor	59
70	Power Factor at ¾ Rated load	By Vendor	69
71	Power Factor at Rated Load	By Vendor	76
72	Efficiency at ½ Rated Load	By Vendor	83.7
73	Efficiency at ¾ Rated Load	By Vendor	85.7
74	Efficiency at Rated Load	By Vendor	86.7
75	No Load Losses	By Vendor	81W
76	Stall Time (Hot/Cold) (Sec)	By Vendor	15s / 35s
77	Transient Reactance (X'd)	By Vendor	None
78	Sub - Transient Reactance (X"d)	By Vendor	None
79	Acceleration Time At 80% Un (Sec)	By Vendor	None
80	Bearing (DE)		
	Type (Detail Description by Vendor)	Anti Friction (Ball Bearing)	Anti Friction (Ball Bearing)
	Manufacturer	By Vendor	Later
	Minimum Life Without Load	Minimum 40000 Hours	Minimum 40000 Hours
	Minimum Life With Load	Minimum 32000 Hours	Load info. Be needed
	Lubrication	Grease	Grease
	Cooling Water/ Oil Capacity	N/A	N/A
	Permissible Trust Force [N]	By Vendor	Later
81	Bearing (NDE)		
	Type (Detail Description by Vendor)	Anti friction (ball bearing)	Anti Friction (Ball Bearing)
	Manufacturer	By Vendor	Later

Data Sheets for LV Induction Motors			
Item	**Category**	**Required Specification**	**Vendor Data**
	Minimum Life Without Load	Minimum 40000 Hours	Minimum 40000 Hours
	Minimum Life With Load	Minimum 32000 Hours	Load info. Be needed
	Lubrication	Grease	Grease
	Cooling Water/ Oil Capacity	N/A	None
	Permissible Trust Force [N]	By Vendor	Later
	Space Heater	Not Required	None
	Space Heater Voltage [V]	230VAC, 50Hz, 1Ph	None
	Space Heater Power [W]	By Vendor	None
82	Temp. Detector (Winding/Bearing)	By Vendor	None
83	Terminal Boxes	[X] Power Terminal Box [X] Space heater (if required)	Power Terminal Box
84	Main Power Cable Specification & Size & Orientation	According to (BK-GCS-PEDCO-120-EL-CN-0003)	Not Motor Vendor scope
85	Motor Weight (Net/Shipped)	By Vendor	66 kgf
86	Rotor Moment of Inertia	By Vendor	0.312 kg-m2
87	Method of Cable Entry	[X] Cable Gland [ ] Sealing Gasket	Cable Gland
88	Cable Gland Hub of Main Terminal Box	By Vendor	1-M25x1.5
89	Cable Gland Entry for aux. Terminal Box (if applicable)	1 X M25 (if Required)	None
90	Short Circuit Capability of Terminal Box	30 kA for 0.2 S	None
91	Sound Level at 1 distance meter From Motor	Max. 85 dB(A)	Max. 85 dB(A)
92	Finish Color	Manufacturer Standard	RAL7047 (LIGHT GREY, ENAMEL)
93	Load Torque/Slip, Current/Slip Curves	By Vendor	Refer to document 1STF0238444-L1-0001
94	Motor Torque/Slip, Current/Slip Curves	By Vendor	Refer to document 1STF0238444-L1-0001
95	Time - Current Heating (Thermal Limit) Curve	By Vendor	Refer to document 1TLF0238444-L1-0001
96	Motor Thermal Capacity Data	By Vendor	Refer to document 1TLF0238444-L1-0001
97	Installation, Operation & Maintenance Instruction	By Vendor	Refer to document Instruction Manual
98	Spare Parts List for Two Years Operation	By Vendor	None
99	Commissioning Spare Part List	By Vendor	None
100	Dimensional Outline Drawing	By Vendor	Refer to document ES1AS64655/ES1B100912
101	Certified Type Test Report & Written Statement	By Vendor	After manufacturing the motor, it will be submitted.
102	Certified Conformity for EX Type Motors	By Vendor	Refer to document Certification
103	Deviation List (if Any)	By Vendor	None

Data Sheets for LV Induction Motors			
Item	**Category**	**Required Specification**	**Vendor Data**
104	Test & Inspection	Factory Routine Test Report Shall be Submitted	

DE: Drive End
NDE: Non Drive End CW: Clockwise
CCW: Counter Clockwise
Note 1: IPS design margin is defined in accordance with standard output power rating of motor:

	Standard Output Power Rating	Design margin
1	Up to 22kW	1.25
2	from 22kW to 55kW	1.15
3	Above 55kW	1.10

Note 2: The following values are default unless otherwise specified during finalization of motors:

	Standard Output Power Rating	Cable Size	Gland Size
1	5.5kW	3x6	M25
2	7.5kW	3x6	M25
3	15kW	3x16	M32
4	18.5kW	3x16	M32
5	30kW	3x50	M40
6	37kW	3x50	M40
7	45kW		M50
8	55kW	3x95	M50

HYOSUNG HEAVY INDUSTRIES

INDUCTION MOTOR DATA SHEET

PROJECT No.	F0238444-L1-0001
HS No.	HLA020106014870
L-SPEC No.	DSML21159F020H

SHEET 1 OF 1	CUSTOMER :		
FOR APPROVAL	JOB No. :	N/A	ITEM No. :
SERVICE : N/A	SITE :	효성강전_광신기계공업_UAE PJT_220220	QUANTITY 3 SETS

GENERAL DATA

FRAME No.	112M
TYPE	EF
ENCLOSURE	TE
COOLING METHOD	FC(IC411)
INSULATION CLASS	F CLASS
TEMP. RISE AT FULL LOAD	
RES. METHOD	65 K (at S.F:1.0)
RATING	S1
LOCATION	OUTDOOR
ALTITUDE	LESS THAN 1030 m
HUMIDITY	LESS THAN 80 %
AMBIENT TEMP.	55 ℃
EXPLOSION PROOF TYPE	Ex db IIB T4 Gb
MOUNTING	B3
BEARING TYPE	ANTI-FRICTION
NDE/DE BRG. No.	6205ZZ / 6206ZZ
BRG. LUBRICATION	N/A
PROTECTION GRADE	IP55
SERVICE FACTOR	1.0
DRIVE	DIRECT COUPLED
SHAFT	
EXTENSION	SINGLE
EXTERNAL THRUST	N/A
NOISE LEVEL(MEAN VALUE AT 1m FROM MOTOR)	
NO-LOAD	STANDARD
VIBRATION	2.8 mm/s (r.m.s)
NUMBER OF CONSECUTIVE STARTS	COLD : 2 / HOT : 1 (4P)
ROTATION(VIEWED FROM DE)	C.C.W

PERFORMANCE DATA

OUTPUT	2.2	kW
POLES	4	P
ROTOR TYPE	SQUIRREL CAGE	
STARTING METHOD	DIRECT ON LINE	
PHASE	3	PHASE
FREQUENCY	50	Hz
SPEED (AT FULL LOAD)	1455	r/min
PRIMARY		
VOLTAGE	400	V
NO LOAD CURRENT	2.3	A
FULL LOAD CURRENT	4.8	A
LOCKED-ROTOR CURRENT	700	%
EFFICIENCY		
AT 1/2 LOAD	83.7	%
AT 3/4 LOAD	85.7	%
AT FULL LOAD	86.7	%
POWER FACTOR		
AT 1/2 LOAD	59.0	%
AT 3/4 LOAD	69.0	%
AT FULL LOAD	76.0	%
TORQUE		
FULL LOAD	1.47	kg-m
	14.4	N-m
LOCKED ROTOR	180	%
BREAKDOWN	230	%
MOTOR GD^2	0.078	$kg\text{-}m^2$
MAX LOAD GD^2 AT MOTOR SHAFT	6.2	$kg\text{-}m^2$
MOTOR APPROX. WEIGHT	60	kg
PAINTING	RAL7047 (LIGHT GREY, ENAMEL)	

ACCESSORIES (OPTIONAL)

TEMPERATURE DETECTOR	
WINDING	NO
TYPE	N/A
BEARING	NO
TYPE	N/A
SPACE HEATER	NO
RATING	N/A

APPLICATION STANDARDS
IEC60034-1, ISO 3746

< NOTE > 1. THESE DATA ARE ONLY DESIGN VALUES AND SHALL BE GUARANTEED WITH TOLERANCE OF APPLICATION STANDARD.
2. EXCEPT FOR STATEMENTS SPECIFIED ON THIS SHEET, ANYTHING ELSE SHALL BE IN ACCORDANCE WITH MAKER'S STANDARD.
3. THE TEMPERATURE MEASURED AT BEARING HOUSING DOES NOT EXCEED 105℃.

SUBMITTAL DRAWINGS

OUTLINE DIMENSION	ES1AS64655
CONDUIT BOX & COVER	ES1B100912
SPEED-TORQUE & CURRENT CURVE	1STF0238444-L1-0001
THERMAL LIMIT & TIME-CURRENT CURVE	1TLF0238444-L1-0001
LOAD vs POWER FACTOR & EFFICIENCY	1PEF0238444-L1-0001

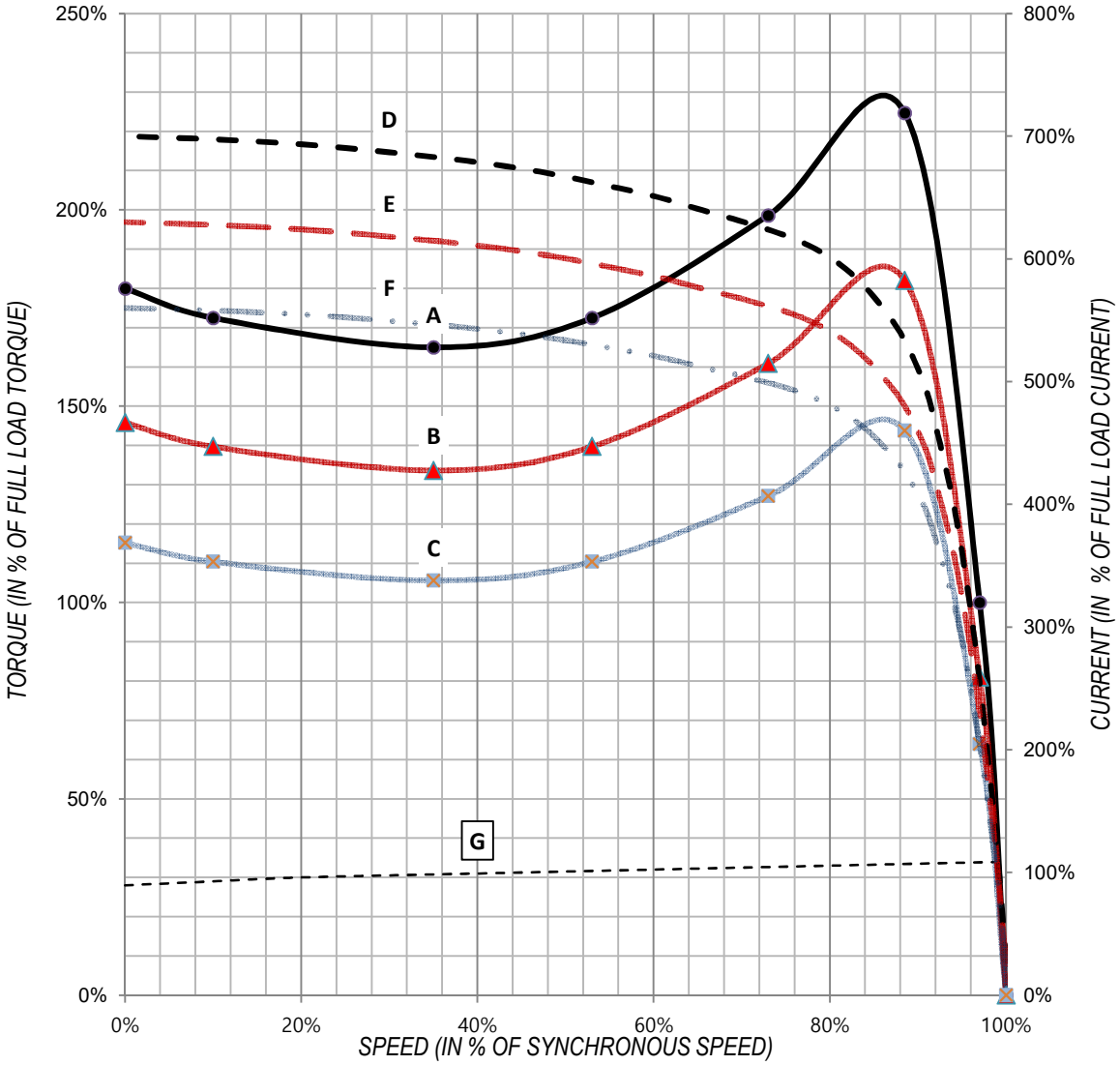
<REMARKS>
1. ABOVE ALL DATA ARE CALCULATED AT 100% VOLTAGE.
2. PREMIUM EFFICIENCY TYPE MOTOR

REV. NO	DATE	PREPARED	CHECKED	APPROVED
1	2023-06-27	M.S.KIM	D.H.OH	B.W.KO
0	2023-04-28	M.S.KIM	D.H.OH	B.W.KO

A4(210X297)

HYOSUNG HEAVY INDUSTRIES	SPEED - TORQUE & CURRENT CURVE	Curve No.
		1STF0238444-L1-0001

OUTPUT	2.2	kW	POLES	4	P
VOLTAGE	400	V	FREQUENCY	50	Hz
FULL LOAD TORQUE	1.47	kg·m	FULL LOAD CURRENT	4.8	A
LOCKED ROTOR TORQUE	180	%	LOCKED-ROTOR CURRENT	700	%
BREAKDOWN TORQUE	230	%	SPEED (at FULL LOAD)	1455	r/min
GD^2 of LOAD :	0.05	$kg \cdot m^2$	GD^2 of MOTOR	0.078	$kg \cdot m^2$

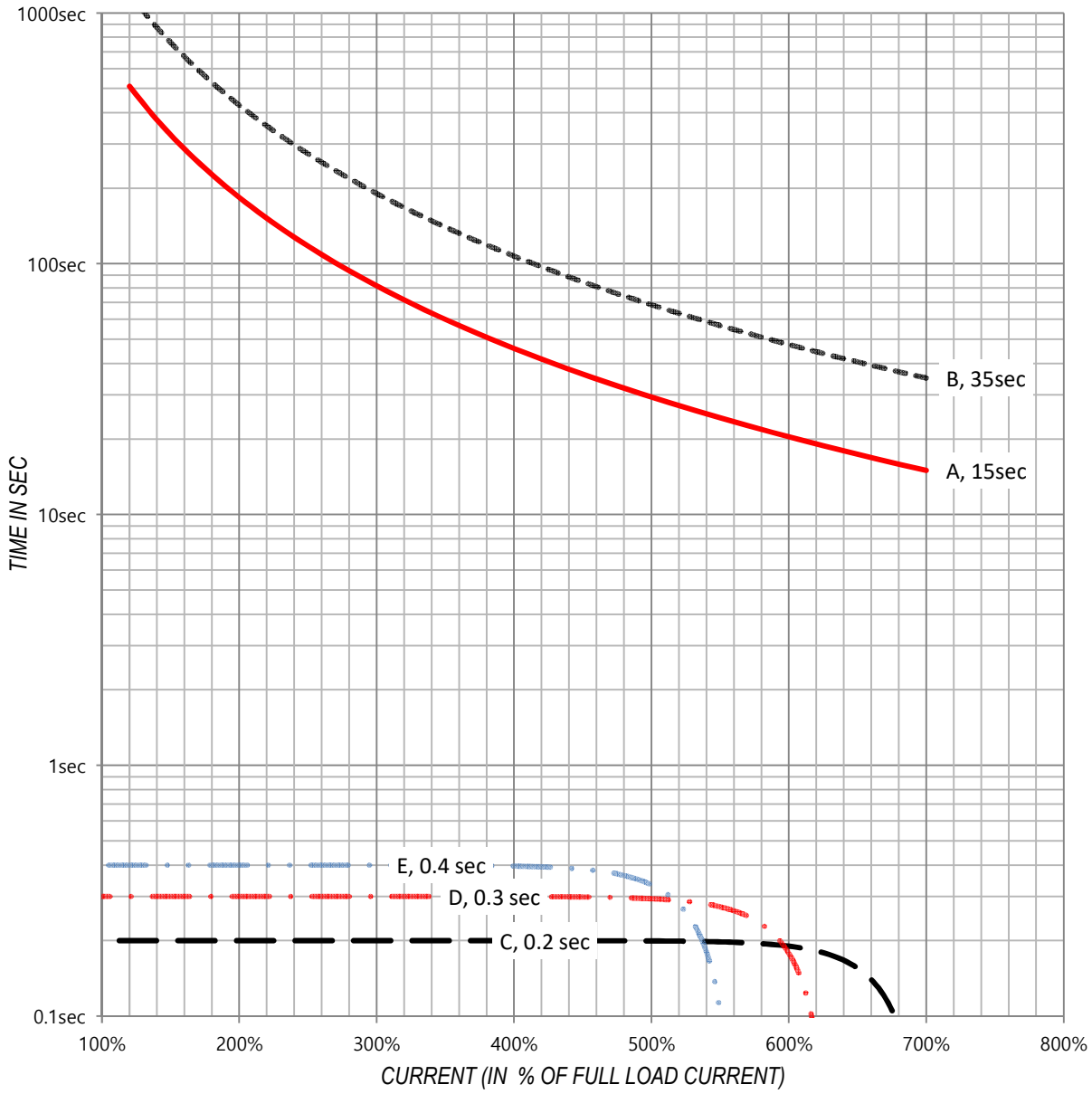


NOTE

A	: SPEED-TORQUE CURVE AT	100%	RATED VOLTAGE
B	: SPEED-TORQUE CURVE AT	90%	RATED VOLTAGE
C	: SPEED-TORQUE CURVE AT	80%	RATED VOLTAGE
D	: SPEED-CURRENT CURVE AT	100%	RATED VOLTAGE
E	: SPEED-CURRENT CURVE AT	90%	RATED VOLTAGE
F	: SPEED-CURRENT CURVE AT	80%	RATED VOLTAGE
G	: LOAD SPEED-TORQUE CURVE		

HYOSUNG HEAVY INDUSTRIES	THERMAL LIMIT & TIME - CURRENT CURVE	Curve No.
		1TLF0238444-L1-0001

OUTPUT	2.2	kW	POLES	4	P
VOLTAGE	400	V	FREQUENCY	50	Hz
FULL LOAD TORQUE	1.47	kg·m	FULL LOAD CURRENT	4.8	A
LOCKED ROTOR TORQUE	180	%	LOCKED-ROTOR CURRENT	700	%
BREAKDOWN TORQUE	230	%	SPEED (at FULL LOAD)	1455	r/min
GD^2 of LOAD :	0.05	$kg \cdot m^2$	GD^2 of MOTOR	0.078	$kg \cdot m^2$

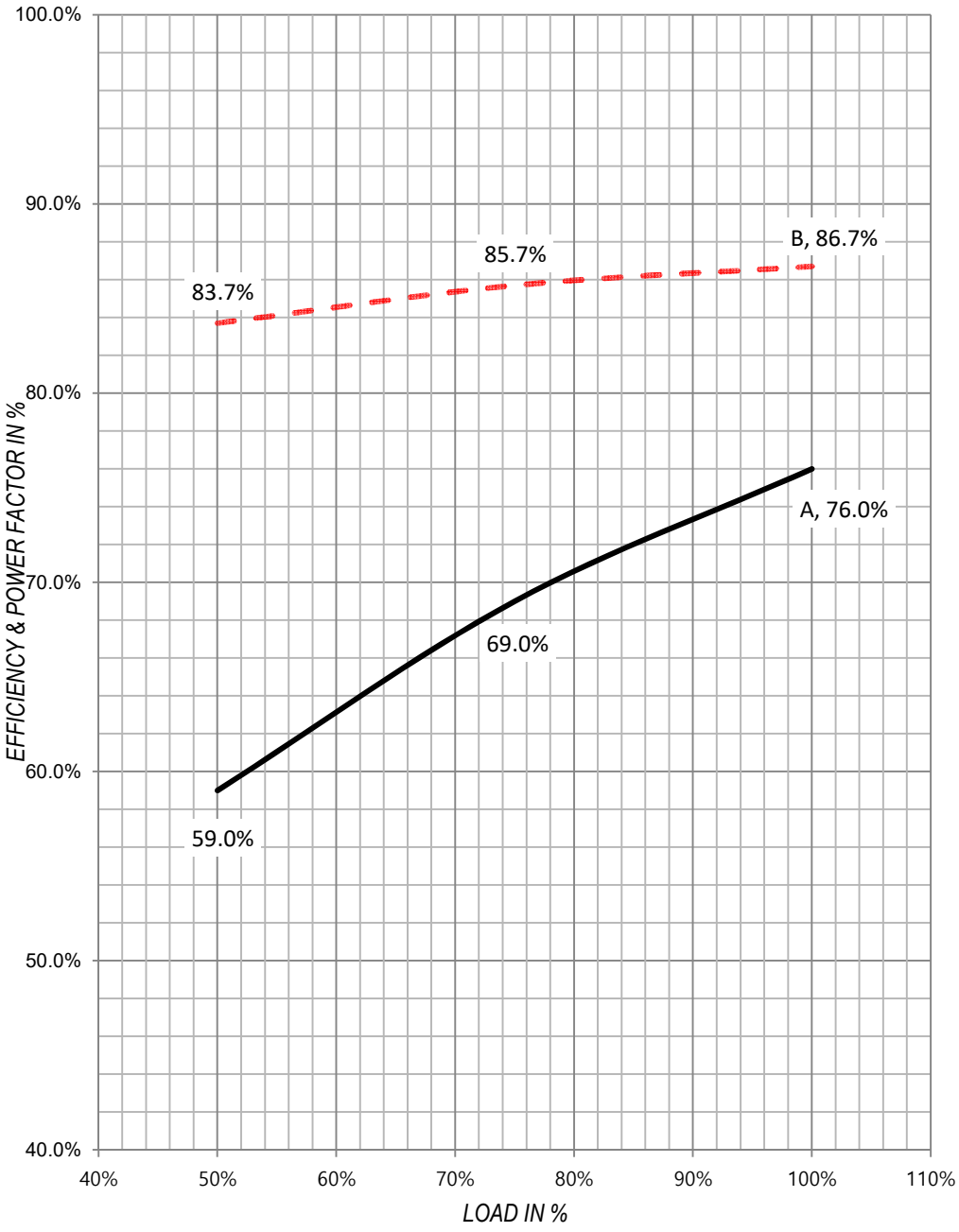


NOTE

- A : THERMAL LIMIT CURVE AT HOT CONDITION
- B : THERMAL LIMIT CURVE AT COLD CONDITION
- C : TIME-CURRENT CURVE AT 100% RATED VOLTAGE
- D : TIME-CURRENT CURVE AT 90% RATED VOLTAGE
- E : TIME-CURRENT CURVE AT 80% RATED VOLTAGE

HYOSUNG HEAVY INDUSTRIES	LOAD - POWER FACTOR & EFFICIENCY CURVE	Curve No.
		1PEF0238444-L1-0001

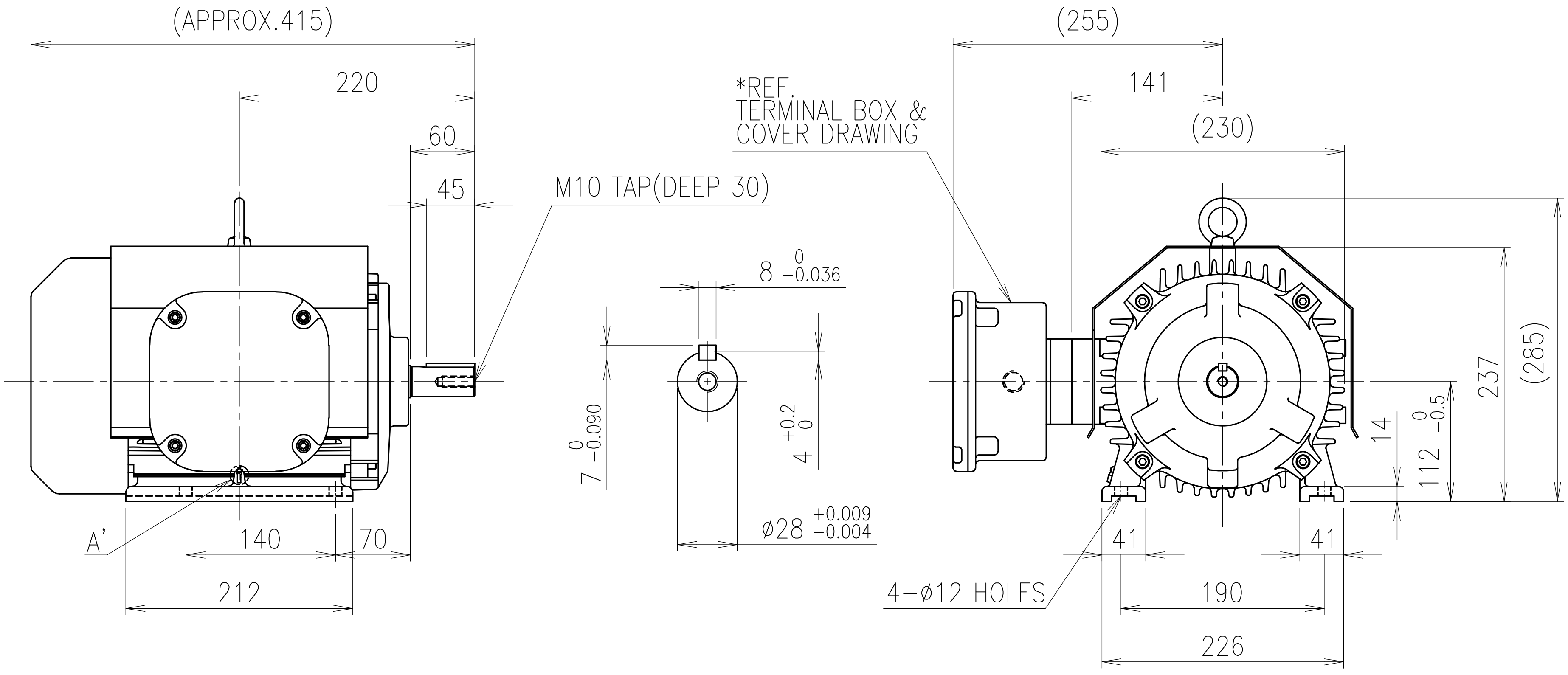
OUTPUT	2.2	kW	POLES	4	P
VOLTAGE	400	V	FREQUENCY	50	Hz
FULL LOAD TORQUE	1.47	kg·m	FULL LOAD CURRENT	4.8	A
LOCKED ROTOR TORQUE	180	%	LOCKED-ROTOR CURRENT	700	%
BREAKDOWN TORQUE	230	%	SPEED (at FULL LOAD)	1455	r/min
GD^2 of LOAD :	0.05	$kg \cdot m^2$	GD^2 of MOTOR	0.078	$kg \cdot m^2$

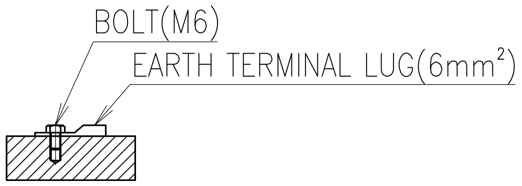


NOTE

A : LOAD - POWER FACTOR CURVE

B : LOAD - EFFICIENCY CURVE





DETAIL A'

<NOTE>

1) TOLERANCE OF HOLES CONFORMS TO H14 OF ISO 2768.

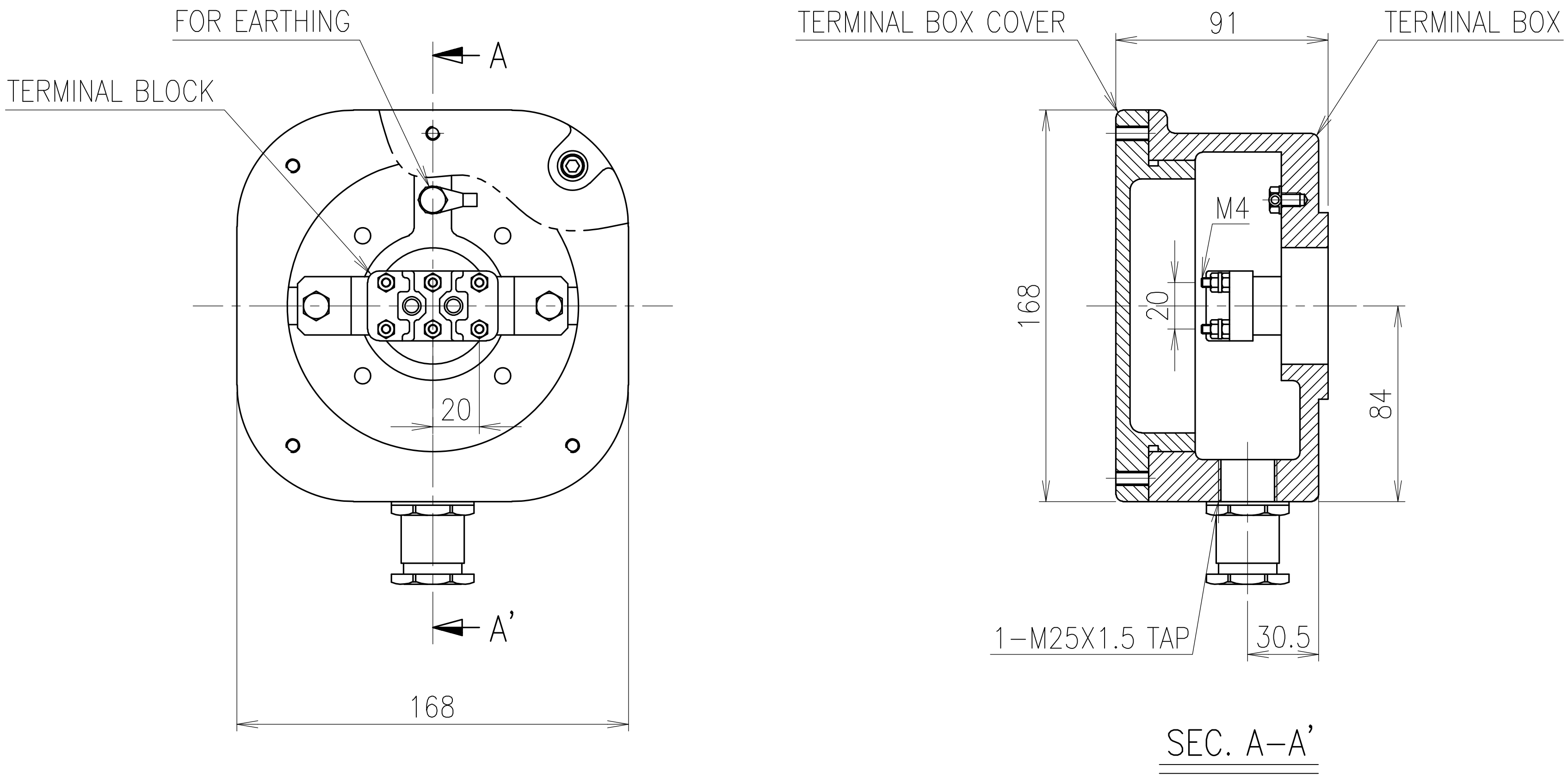
No.	DATE	DESCRIPTION of REVISION

A4(297X210mm) FORM CE-14-0100-4A4 2013.11.20

HYOSUNG HEAVY INDUSTRIES

DWG NAME	저압 유도전동기 외형도 OUTLINE DIMENSIONS				
DWG No.	ES1AS64655			UNIT	mm
				SCALE	1:6
DESIGNED	CHECKED	REVIEWED	APPROVED	DATE	2021-11-11
2021.11.10 SOON UEI LEE	2021.11.29 JUN HO CHA		2021.11.29 TAE HYUN KIM	REVISION No.	00
				THIRD ANGLE PROJECTION	
REF. No.	−				Ⓒ

TYPE A.C MOTOR 112M



No.	DATE	DESCRIPTION of REVISION
1	20.10.29	Terminal box cover shape changed

DWG NAME	저압 유도전동기 단자박스외형도 TERMINAL BOX DRAWING				
DWG No.	ES1B100912			UNIT	mm
				SCALE	1:3
DESIGNED	CHECKED	REVIEWED	APPROVED	DATE	2020-10-29
2020.10.20 MIN KYEONG MOON	2020.10.29 JU HWAN SHIN		2020.10.29 TAE HYUN KIM	REVISION No.	01
				THIRD ANGLE PROJECTION	
REF. No.	–				(C)

A4(297X210mm)

FORM CE-14-0100-4A4 2013.11.20

HYOSUNG

TYPE A.C MOTOR 132

LUBRICATOR MOTOR

(M-101A/B/C)

Data Sheets for LV Induction Motors			
Item	**Category**	**Required Specification**	**Vendor Data**
1	Driven Machine	Electrical Motor	Electrical Motor
2	Driven Machine Tag No.	-	C-2101A/B/C & C-2102A/B/C
3	Manufacturer	By Vendor	HYOSUNG
4	Manufacturer's Number / Type	By Vendor	SR23006 / OPT
5	Manufacturing Standard	IEC 60034 & IPS-M-EL-131(2)	IEC 60034 & IPS-M-EL-131(2)
6	Location	[X] Outdoor (Under Shelter) [ ] Indoor	Outdoor
7	Area Classification	Acc. to requisition data	Zone 2 IIB T3
8	Ambient Temperature	5 to +55°C	5 to +55°C
9	Relative Humidity	100 %	100
10	Dust	[X] Yes [ ] No	Yes
11	Corrosion	[X] Yes [ ] No	Yes
12	Elevation	12.5m Above Sea Level	12.5m Above Sea Level
13	Quantity	Acc. To Load List (BK-GCS-PEDCO-120-EL-LI-0001)	3
14	Tag Number	Acc. To Load List (BK-GCS-PEDCO-120-EL-LI-0001)	M-101A/B/C
15	Motor Type	Asynchronous, Squirrel Cage	Asynchronous, Squirrel Cage
16	Mounting	[ ] Horizontal [ ] Vertical	Vertical
17	Rotor Construction	[ ] Brazed Copper Bars [ ] Aluminum Die Cast	Aluminum Die Cast
18	Frame Material	Steel Sheet or Cast Iron	Cast Iron
19	Rotor Cage Material	By Vendor	Aluminum Die Cast
20	Cooling Method	IC411 According to IPS-M-EL-131(2)	IC411
21	Ingress Protection Degree for Motor	IP 54	IP 55
22	Ingress Protection Degree for Terminal Box	IP 55	IP 55
23	Explosion Protection of Motor	N/A for Safe Area Zone 2, IIB, T3	Ex db IIB T4 Gb
24	Explosion Protection of Terminal Box	N/A for Safe Area Zone 2, IIB, T3	Ex db IIB T4 Gb
25	Ex. Certificate Authority/Certificate No.	By Vendor	SIRA 15ATEX1064X
26	Driven Machine Shaft Power Requirement (P_{mp})	As Per Related Mechanical Data sheet (to be Specified by Vendor)	0.07KW
27	De-Rating Factor due to Ambient Temperature (K_t)	Vendor Shall Advise	1=De-Rating 0% at 55°C
28	De-Rating Factor Due to Altitude (K_a)	1	1=De-Rating 0% at 12.5m
29	Design margin (K_m)	Acc. to IPS Standard (Note 1)	1.25

Data Sheets for LV Induction Motors			
Item	**Category**	**Required Specification**	**Vendor Data**
30	Motor Shaft Power Requirement @ Site $^{condition (=Km \times P_{mp})}$	By Vendor	0.0875KW
31	Standard Rated Motor Output $=Km \times P_{mp} / (K_a K_t)$	By Vendor	0.0875KW
32	Frame Size	By Vendor	80M
33	Frame Earth Boss	External	M6
34	Rated Voltage	400 V ±10%	400 V ±10%
35	Rated Frequency	50 Hz ±5%	50 Hz ±5%
36	Protection Devices	Switch-Fuse	Yes
37	Neutral Earthing System	TNS	Yes
38	Voltage During Motor Start	80% Un	80% Un
39	Synchronous Speed	By Vendor	1500
40	Full Load Speed [RPM]	By Vendor	1440
41	Over Speed Capability	By Vendor	150%
42	Number of Poles	By Vendor	4
43	Starting Method	Direct on Line	Direct on Line
44	Direction of Rotation (Viewed from coupling end)	Shall be Proposed by MFR Based on Driven Load Rotation of Direction	[ ] CW [X] CCW [ ] Unidirectional [ ] Bidirectional
45	Stator Winding Connection	Delta	Delta
46	Location of Terminal Box (Viewed from DE)	[ ] Right [ ] Left	Left
47	Insulation Class	Class F	Class F
48	Class of Temperature Rise	Class B	Class B
49	Max. Permissible Starting Time [s]	By Vendor	17s
50	Accelerating Time DOL starting, at 100% U_n [s]	By Vendor	0.2sec
51	Accelerating Time DOL starting, at 80% U_n [s]	By Vendor	0.4sec
52	Starting Torque at 100% U_n [N.m]	By Vendor	4.4
53	Starting Torque at 80% U_n [N.m]	By Vendor	2.8
54	Maximum Torque [N.m]	By Vendor	5.7
55	Pull-Up Torque	By Vendor	4
56	Locked Rotor Torque	By Vendor	4.4
57	Rated Torque [N.m]	By Vendor	2.6
58	Rated Current [A]	By Vendor	1

Data Sheets for LV Induction Motors			
Item	**Category**	**Required Specification**	**Vendor Data**
59	Max Starting Current	By Vendor	6
60	No Load Current [A]	By Vendor	0.5
61	Locked Rotor Current [A]	$^{<7}I_n$	600%
62	Locked Rotor Power Factor [A]	By Vendor	62.30%
63	Torque-Speed Class	Shall be Selected Based on Driven Load Torque Requirement	[ ] A [v] B [ ] C [ ] D
64	Duty Cycle	S1	S1
65	Current at ½ Rated Load	By Vendor	0.6
66	Current at ¾ Rated load	By Vendor	0.8
67	Current at Rated Load	By Vendor	1
68	Starting Power Factor	By Vendor	62.30%
69	Power Factor at ½ Rated Load	By Vendor	60
70	Power Factor at ¾ Rated load	By Vendor	70
71	Power Factor at Rated Load	By Vendor	75
72	Efficiency at ½ Rated Load	By Vendor	75
73	Efficiency at ¾ Rated Load	By Vendor	77
74	Efficiency at Rated Load	By Vendor	78
75	No Load Losses	By Vendor	26W
76	Stall Time (Hot/Cold) (Sec)	By Vendor	17s / 24s
77	Transient Reactance (X'd)	By Vendor	None
78	Sub - Transient Reactance (X"d)	By Vendor	None
79	Acceleration Time At 80% Un (Sec)	By Vendor	None
80	Bearing (DE)		
	Type (Detail Description by Vendor)	Anti Friction (Ball Bearing)	Anti Friction (Ball Bearing)
	Manufacturer	By Vendor	Later
	Minimum Life Without Load	Minimum 40000 Hours	Minimum 40000 Hours
	Minimum Life With Load	Minimum 32000 Hours	Load info. Be needed
	Lubrication	Grease	Grease
	Cooling Water/ Oil Capacity	N/A	N/A
	Permissible Trust Force [N]	By Vendor	Later
81	Bearing (NDE)		
	Type (Detail Description by Vendor)	Anti friction (ball bearing)	Anti Friction (Ball Bearing)
	Manufacturer	By Vendor	Later

Data Sheets for LV Induction Motors			
Item	**Category**	**Required Specification**	**Vendor Data**
	Minimum Life Without Load	Minimum 40000 Hours	Minimum 40000 Hours
	Minimum Life With Load	Minimum 32000 Hours	Load info. Be needed
	Lubrication	Grease	Grease
	Cooling Water/ Oil Capacity	N/A	None
	Permissible Trust Force [N]	By Vendor	Later
	Space Heater	Not Required	None
	Space Heater Voltage [V]	230VAC, 50Hz, 1Ph	None
	Space Heater Power [W]	By Vendor	None
82	Temp. Detector (Winding/Bearing)	By Vendor	None
83	Terminal Boxes	[X] Power Terminal Box [X] Space heater (if required)	Power Terminal Box
84	Main Power Cable Specification & Size & Orientation	According to (BK-GCS-PEDCO-120-EL-CN-0003)	Not Motor Vendor scope
85	Motor Weight (Net/Shipped)	By Vendor	34 kgf
86	Rotor Moment of Inertia	By Vendor	0.048 kg-m2
87	Method of Cable Entry	[X] Cable Gland [ ] Sealing Gasket	Cable Gland
88	Cable Gland Hub of Main Terminal Box	By Vendor	1-M25x1.5
89	Cable Gland Entry for aux. Terminal Box (if applicable)	1 X M25 (if Required)	None
90	Short Circuit Capability of Terminal Box	30 kA for 0.2 S	None
91	Sound Level at 1 distance meter From Motor	Max. 85 dB(A)	Max. 85 dB(A)
92	Finish Color	Manufacturer Standard	RAL7047 (LIGHT GREY, ENAMEL)
93	Load Torque/Slip, Current/Slip Curves	By Vendor	Refer to document 1STF0238444-L1-0002
94	Motor Torque/Slip, Current/Slip Curves	By Vendor	Refer to document 1STF0238444-L1-0002
95	Time - Current Heating (Thermal Limit) Curve	By Vendor	Refer to document 1TLF0238444-L1-0002
96	Motor Thermal Capacity Data	By Vendor	Refer to document 1TLF0238444-L1-0002
97	Installation, Operation & Maintenance Instruction	By Vendor	Refer to document Instruction Manual
98	Spare Parts List for Two Years Operation	By Vendor	None
99	Commissioning Spare Part List	By Vendor	None
100	Dimensional Outline Drawing	By Vendor	Refer to document ES1A126004 / ES1B100912
101	Certified Type Test Report & Written Statement	By Vendor	After manufacturing the motor, it will be submitted.
102	Certified Conformity for EX Type Motors	By Vendor	Refer to document Certification
103	Deviation List (if Any)	By Vendor	None

Data Sheets for LV Induction Motors			
Item	**Category**	**Required Specification**	**Vendor Data**
104	Test & Inspection	Factory Routine Test Report Shall be Submitted	

DE: Drive End

NDE: Non Drive End CW: Clockwise

CCW: Counter Clockwise

Note 1: IPS design margin is defined in accordance with standard output power rating of motor:

	Standard Output Power Rating	Design margin
1	Up to 22kW	1.25
2	from 22kW to 55kW	1.15
3	Above 55kW	1.10

Note 2: The following values are default unless otherwise specified during finalization of motors:

	Standard Output Power Rating	Cable Size	Gland Size
1	5.5kW	3x6	M25
2	7.5kW	3x6	M25
3	15kW	3x16	M32
4	18.5kW	3x16	M32
5	30kW	3x50	M40
6	37kW	3x50	M40
7	45kW		M50
8	55kW	3x95	M50

HYOSUNG HEAVY INDUSTRIES

INDUCTION MOTOR DATA SHEET

PROJECT No.	F0238444-L1-0002
HS No.	HLA020106014871
L-SPEC No.	DSML21444F020M

SHEET 1 OF 1	CUSTOMER :	
FOR APPROVAL	JOB No. : N/A	ITEM No. :
SERVICE : N/A	SITE : 효성강전_광신기계공업_UAE PJT_220220	QUANTITY 3 SETS

GENERAL DATA

FRAME No.	80M
TYPE	EF-F
ENCLOSURE	TE
COOLING METHOD	FC(IC411)
INSULATION CLASS	F CLASS
TEMP. RISE AT FULL LOAD	
RES. METHOD	65 K (at S.F:1.0)
RATING	S1
LOCATION	OUTDOOR
ALTITUDE	LESS THAN 1030 m
HUMIDITY	LESS THAN 80 %
AMBIENT TEMP.	55 ℃
EXPLOSION PROOF TYPE	Ex db IIB T4 Gb
MOUNTING	V1
BEARING TYPE	ANTI-FRICTION
NDE/DE BRG. No.	6203ZZ / 6204ZZ
BRG. LUBRICATION	N/A
PROTECTION GRADE	IP55
SERVICE FACTOR	1.0
DRIVE	DIRECT COUPLED
SHAFT	
EXTENSION	SINGLE
EXTERNAL THRUST	N/A
NOISE LEVEL(MEAN VALUE AT 1m FROM MOTOR)	
NO-LOAD	STANDARD
VIBRATION	2.8 mm/s (r.m.s)
NUMBER OF CONSECUTIVE STARTS	COLD : 2 / HOT : 1 (4P)
ROTATION(VIEWED FROM DE)	C.C.W

PERFORMANCE DATA

OUTPUT	0.4 kW
POLES	4 P
ROTOR TYPE	SQUIRREL CAGE
STARTING METHOD	DIRECT ON LINE
PHASE	3 PHASE
FREQUENCY	50 Hz
SPEED (AT FULL LOAD)	1440 r/min
PRIMARY	
VOLTAGE	400 V
NO LOAD CURRENT	0.5 A
FULL LOAD CURRENT	1.0 A
LOCKED-ROTOR CURRENT	600 %
EFFICIENCY	
AT 1/2 LOAD	75.0 %
AT 3/4 LOAD	77.0 %
AT FULL LOAD	78.0 %
POWER FACTOR	
AT 1/2 LOAD	60.0 %
AT 3/4 LOAD	70.0 %
AT FULL LOAD	75.0 %
TORQUE	
FULL LOAD	0.27 kg-m
	2.6 N-m
LOCKED ROTOR	170 %
BREAKDOWN	220 %
MOTOR GD^2	0.012 $kg\text{-}m^2$
MAX LOAD GD^2 AT MOTOR SHAFT	1.7 $kg\text{-}m^2$
MOTOR APPROX. WEIGHT	34 kg
PAINTING	RAL7047 (LIGHT GREY, ENAMEL)

ACCESSORIES (OPTIONAL)

TEMPERATURE DETECTOR	
WINDING	NO
TYPE	N/A
BEARING	NO
TYPE	N/A
SPACE HEATER	NO
RATING	N/A

APPLICATION STANDARDS
IEC60034-1, ISO 3746

< NOTE > 1. THESE DATA ARE ONLY DESIGN VALUES AND SHALL BE GUARANTEED WITH TOLERANCE OF APPLICATION STANDARD.
2. EXCEPT FOR STATEMENTS SPECIFIED ON THIS SHEET, ANYTHING ELSE SHALL BE IN ACCORDANCE WITH MAKER'S STANDARD.
3. THE TEMPERATURE MEASURED AT BEARING HOUSING DOES NOT EXCEED 105℃.

SUBMITTAL DRAWINGS

OUTLINE DIMENSION	ES1A126004
CONDUIT BOX & COVER	ES1B100912
SPEED-TORQUE & CURRENT CURVE	1STF0238444-L1-0002
THERMAL LIMIT & TIME-CURRENT CURVE	1TLF0238444-L1-0002
LOAD vs POWER FACTOR & EFFICIENCY	1PEF0238444-L1-0002

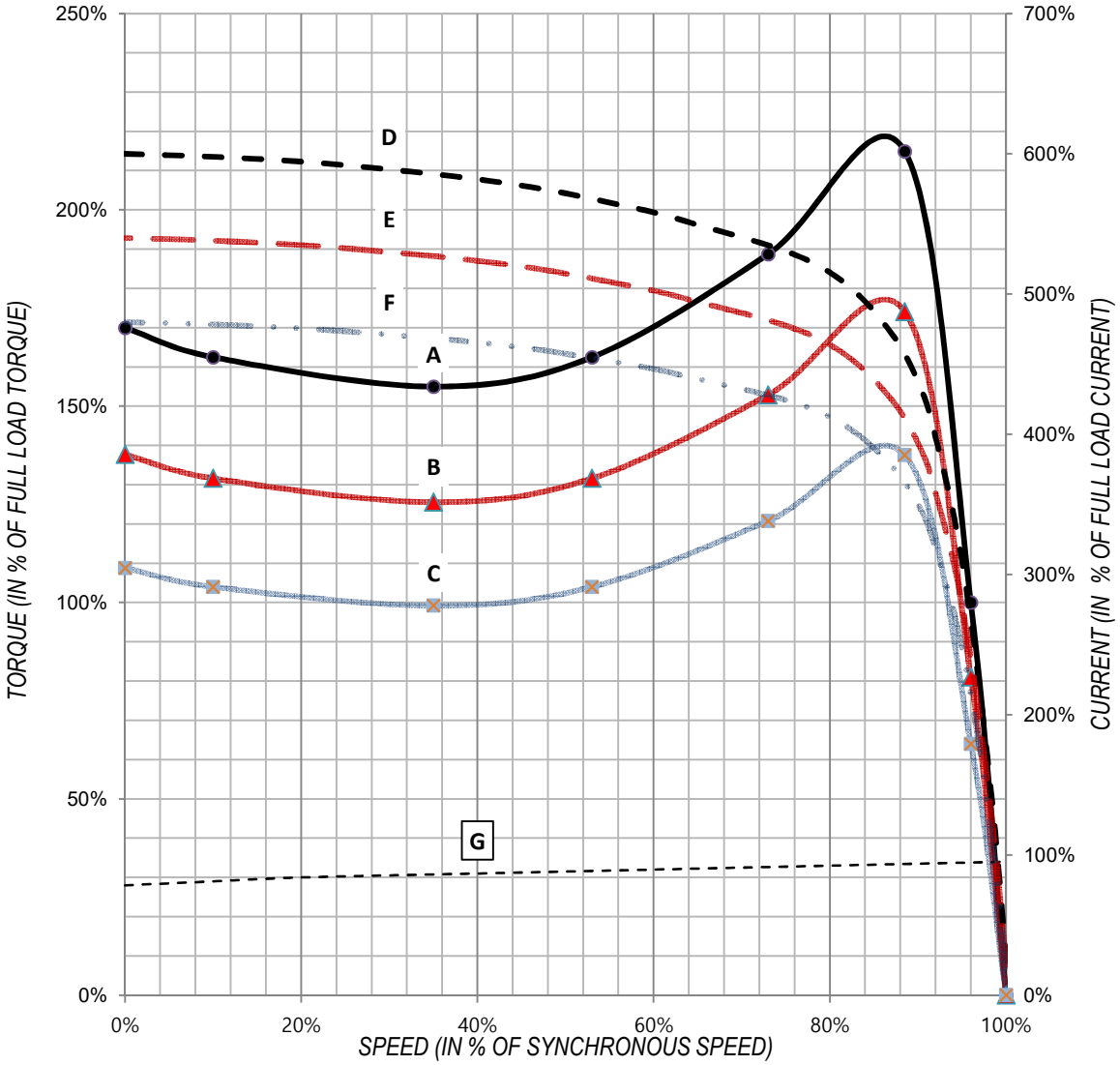
<REMARKS>
1. ABOVE ALL DATA ARE CALCULATED AT 100% VOLTAGE.
2. PREMIUM EFFICIENCY TYPE MOTOR

REV. NO	DATE	PREPARED	CHECKED	APPROVED
0	2023-04-28	M.S.KIM	D.H.OH	B.W.KO

A4(210X297)

HYOSUNG HEAVY INDUSTRIES	SPEED - TORQUE & CURRENT CURVE	Curve No.
		1STF0238444-L1-0002

OUTPUT	0.4	kW	POLES	4	P
VOLTAGE	400	V	FREQUENCY	50	Hz
FULL LOAD TORQUE	0.27	kg·m	FULL LOAD CURRENT	1.0	A
LOCKED ROTOR TORQUE	170	%	LOCKED-ROTOR CURRENT	600	%
BREAKDOWN TORQUE	220	%	SPEED (at FULL LOAD)	1440	r/min
GD^2 of LOAD :	0.01	$kg \cdot m^2$	GD^2 of MOTOR	0.012	$kg \cdot m^2$

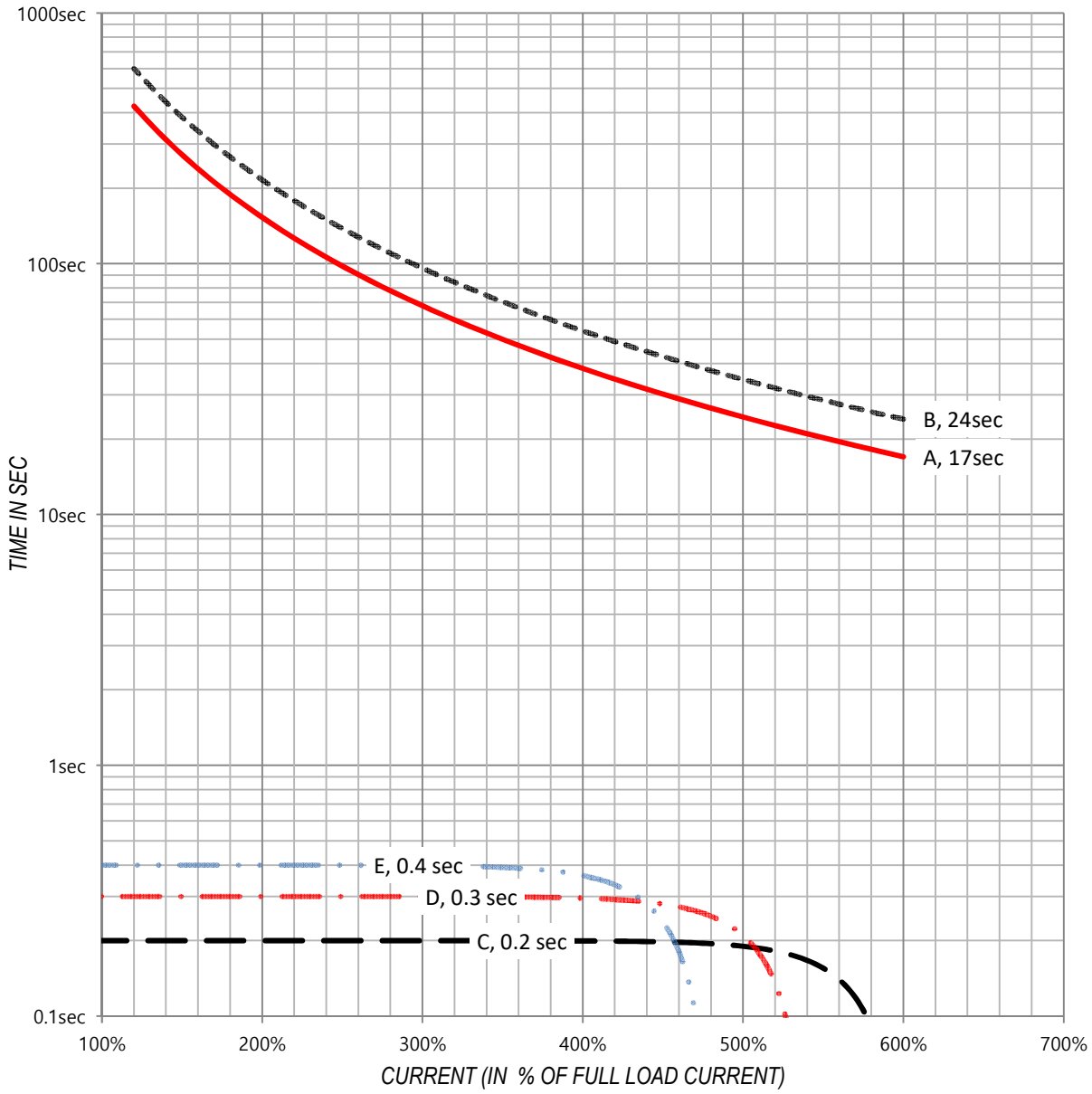


NOTE

A	: SPEED-TORQUE CURVE AT	100%	RATED VOLTAGE
B	: SPEED-TORQUE CURVE AT	90%	RATED VOLTAGE
C	: SPEED-TORQUE CURVE AT	80%	RATED VOLTAGE
D	: SPEED-CURRENT CURVE AT	100%	RATED VOLTAGE
E	: SPEED-CURRENT CURVE AT	90%	RATED VOLTAGE
F	: SPEED-CURRENT CURVE AT	80%	RATED VOLTAGE
G	: LOAD SPEED-TORQUE CURVE		

HYOSUNG HEAVY INDUSTRIES	THERMAL LIMIT & TIME - CURRENT CURVE	Curve No.
		1TLF0238444-L1-0002

OUTPUT	0.4	kW	POLES	4	P
VOLTAGE	400	V	FREQUENCY	50	Hz
FULL LOAD TORQUE	0.27	kg·m	FULL LOAD CURRENT	1.0	A
LOCKED ROTOR TORQUE	170	%	LOCKED-ROTOR CURRENT	600	%
BREAKDOWN TORQUE	220	%	SPEED (at FULL LOAD)	1440	r/min
GD^2 of LOAD :	0.01	$kg \cdot m^2$	GD^2 of MOTOR	0.012	$kg \cdot m^2$

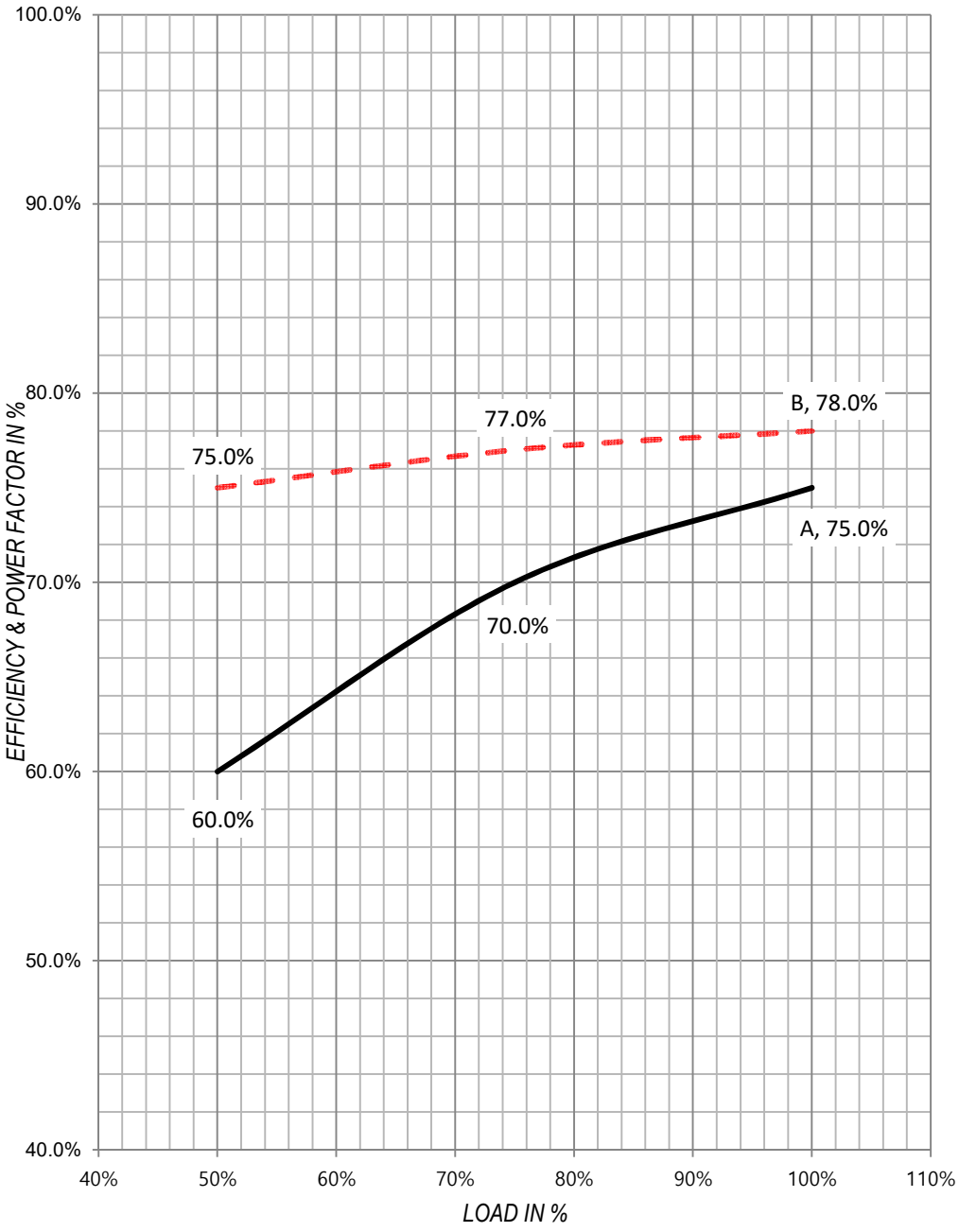


NOTE

- A : THERMAL LIMIT CURVE AT HOT CONDITION
- B : THERMAL LIMIT CURVE AT COLD CONDITION
- C : TIME-CURRENT CURVE AT 100% RATED VOLTAGE
- D : TIME-CURRENT CURVE AT 90% RATED VOLTAGE
- E : TIME-CURRENT CURVE AT 80% RATED VOLTAGE

HYOSUNG HEAVY INDUSTRIES	LOAD - POWER FACTOR & EFFICIENCY CURVE	Curve No.
		1PEF0238444-L1-0002

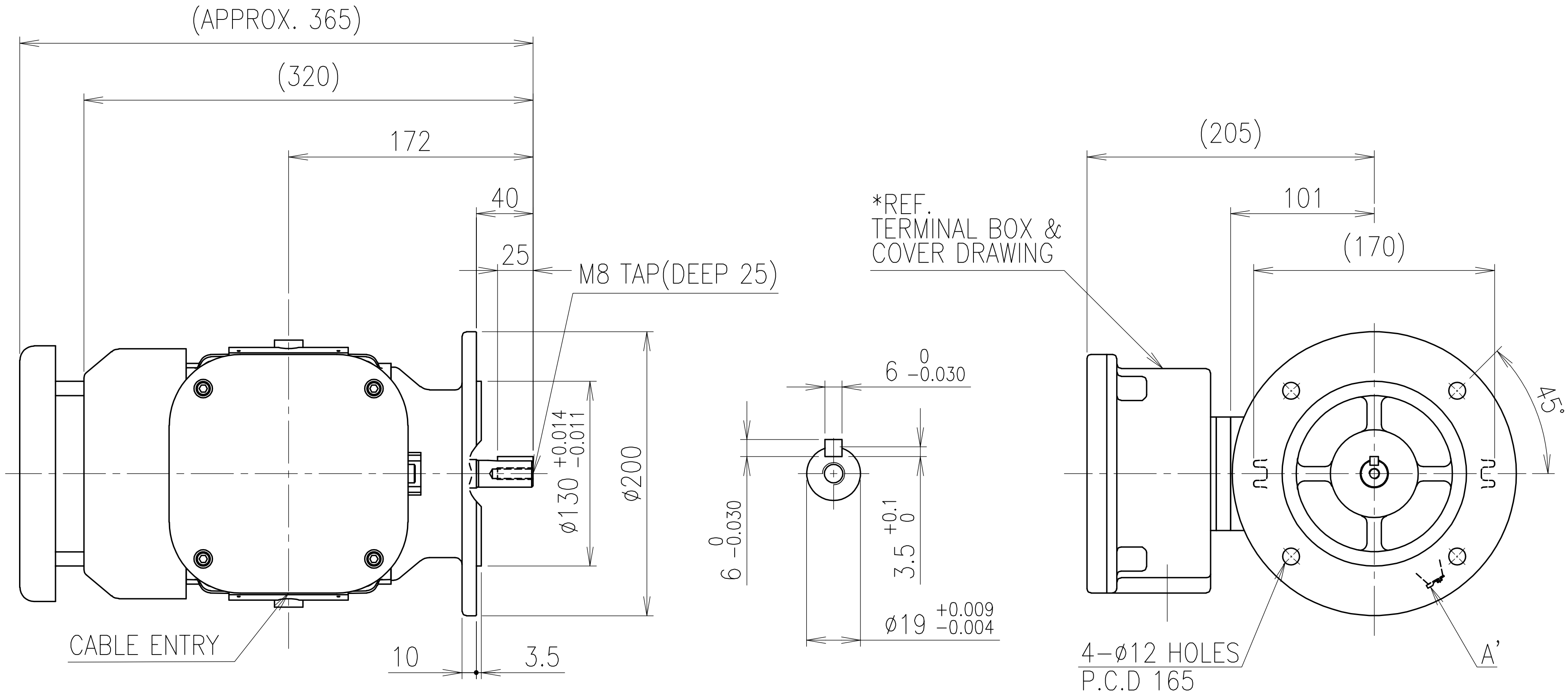
OUTPUT	0.4	kW	POLES	4	P
VOLTAGE	400	V	FREQUENCY	50	Hz
FULL LOAD TORQUE	0.27	kg·m	FULL LOAD CURRENT	1.0	A
LOCKED ROTOR TORQUE	170	%	LOCKED-ROTOR CURRENT	600	%
BREAKDOWN TORQUE	220	%	SPEED (at FULL LOAD)	1440	r/min
GD^2 of LOAD :	0.01	$kg \cdot m^2$	GD^2 of MOTOR	0.012	$kg \cdot m^2$

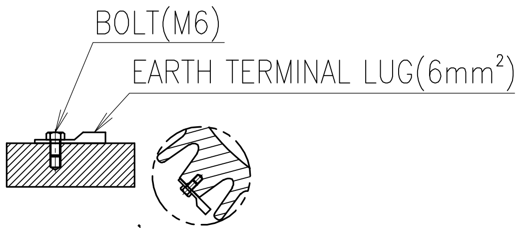


NOTE

A : LOAD - POWER FACTOR CURVE

B : LOAD - EFFICIENCY CURVE





DETAIL A'

<NOTE>

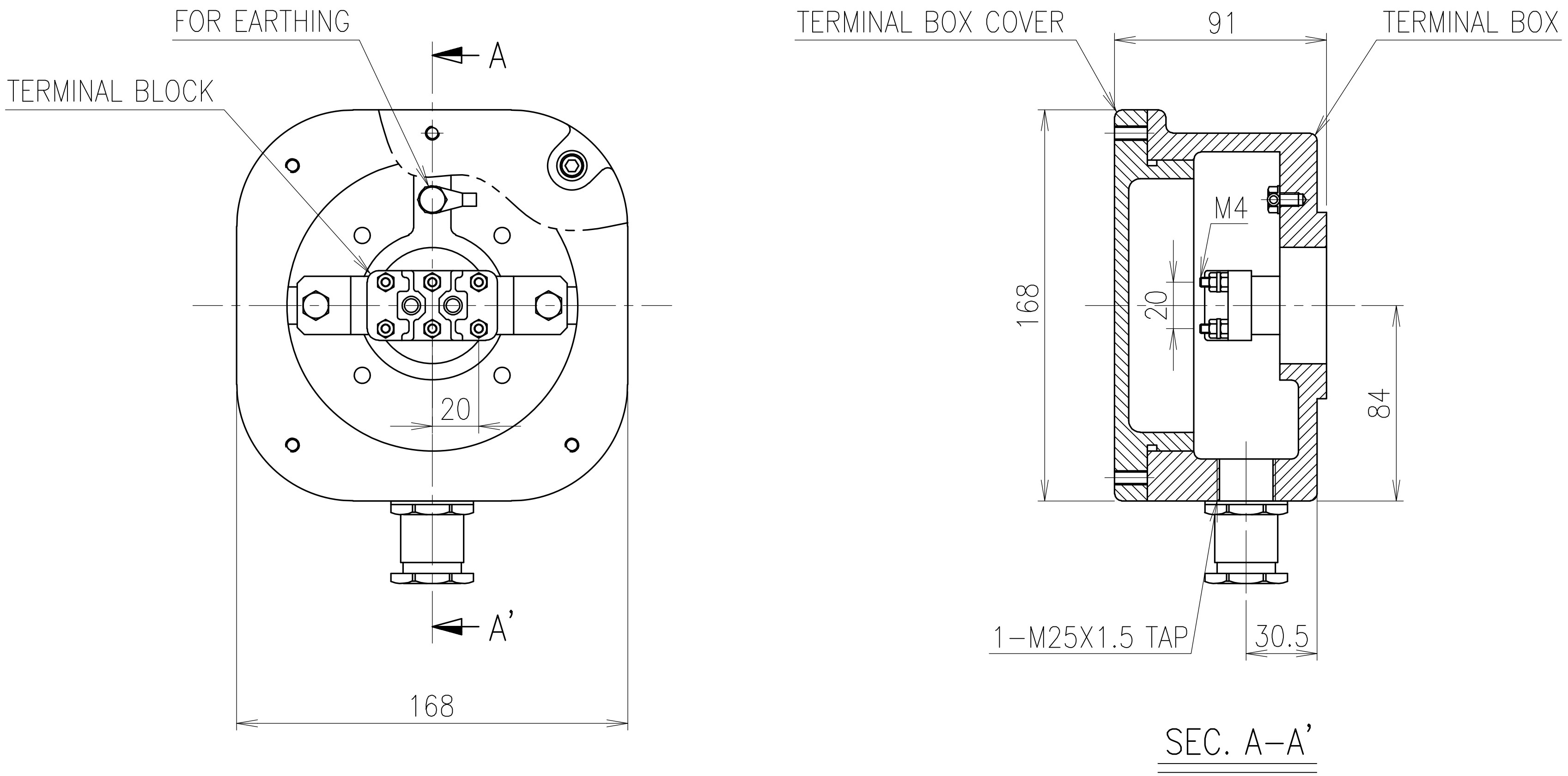
1) TOLERANCE OF HOLES CONFORMS TO H14 OF ISO 2768.

DWG NAME	저압 유도전동기 외형도 OUTLINE DIMENSIONS
DWG No.	ES1A126004
UNIT	mm
SCALE	1:4.5
DESIGNED / CHECKED / REVIEWED / APPROVED	
DATE	2020−06−15
REVISION No.	00
	THIRD ANGLE PROJECTION
TYPE	A.C MOTOR 80M
REF. No.	−

No.	DATE	DESCRIPTION of REVISION

A4(297X210mm) FORM CE−14−0100−4A4 2013.11.20

HYOSUNG HEAVY INDUSTRIES



No.	DATE	DESCRIPTION of REVISION
1	20.10.29	Terminal box cover shape changed

DWG NAME	저압 유도전동기 단자박스외형도 TERMINAL BOX DRAWING		
DWG No.	ES1B100912	UNIT	mm
		SCALE	1:3

DESIGNED	CHECKED	REVIEWED	APPROVED	DATE	2020-10-29
2020.10.20 MIN KYEONG MOON	2020.10.29 JU HWAN SHIN		2020.10.29 TAE HYUN KIM	REVISION No.	01
				THIRD ANGLE PROJECTION	

A4(297X210mm) FORM CE-14-0100-4A4 2013.11.20

HYOSUNG

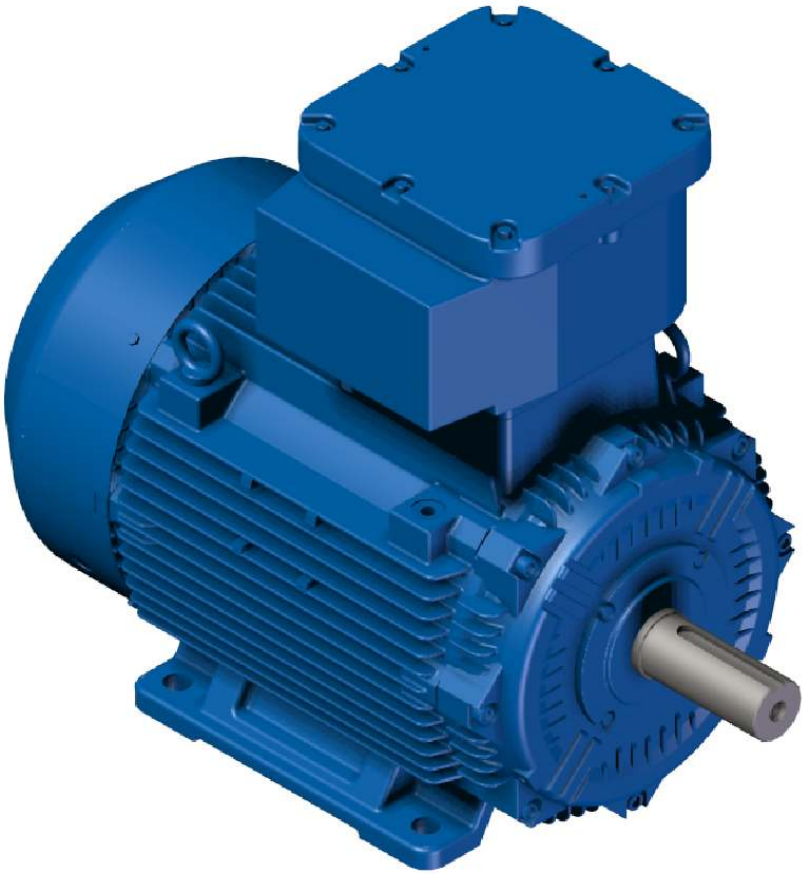
TYPE A.C MOTOR 132

REF. No. –

INSTRUCTION MANUAL

Instruction Manual for ED type

(Low Voltage Induction Motor for Hazardous Areas)



주식회사 효성 / 중공업부문
HYOSUNG CORPORATION

Contents

Safety Guidance for Explosion proof

Induction Motor Operation Manual

1. Safety Guidance for Explosion Proof

1.1 Introduction

This instruction must be followed to ensure safe and proper installation, operation and maintenance of the explosion proof motor. They should be brought to the attention of anyone who installs, operates or maintains the motor or associated equipment. Ignore these instructions may be invalidate all applicable warranties. As explosion proof motors are constructed with special materials and technologies that comply with the legal regulations concerning potentially explosive atmospheres, a wrong connection or a minor modification of the motor destroys the compliance with security regulations. The rules concerning explosion proof apparatus must be observed unconditionally. Note that our motors are approved for a specific group of hazardous and temperature classes.

1.2 Protection Type (Applicble Zone)

- Flameproof enclosure : **Ex d (Zone1, Zone2)**

1.3 Conformity

Motor designed for explosive atmospheres must also coform to one or more of following European or IEC standard for the protection type.

- IEC 60079-0, Ed6 General requirements concerning electrical apparatus for
  EN 60079-0 (2011) explosive gas atmospheres
- IEC 60079-1, Ed6 Standard for flameproof “d” protection
  EN 60079-1 (2007)

1.4 Installation and Start Up

- Electric data of the motor, valid for the rated power, can be found on the nameplate.
- It is the responsibility of the user to ensure that the motor nameplate voltage and frequency are the same as the mains supply.
- Connection to the mains supply should only be executed by a recognized professional, respecting local demands and regulations. The connection of the wires must be done as described in the connection diagram usually located on frame.
- To guarantee the explosion proof protection, certified explosion proof cable glands with sealing joints

adapted to the cable diameters, must be used. The motor will lose its explosion proof characteristic If the cable and gland are not fitted correctly. If a spare opening for a cable gland isn't used, only the use of a certified explosion proof plug retains the explosion proof characteristics.
It may be necessary to open the terminal box for connecting the motor. When re-mounting the cover, only use the original screws. Firstly tighten all screws by hand before applying the full torque. Then tighten the screws until the spring ring is flat.

- When installing the motor, always connect the earth, using earthing screw in the terminal box or on the motor frame.

- The heating must be switched off before the motor is switched on. The heating may only be operated when the motor is switched off and is to be locked against the main circuit. During motor operation the heating must not be switched on.The Heating data for voltage and current is indicated on the additional plate attached to the motor.

- The maximum ambient temperature must not exceed the given value that is indicated on the nameplate and in the motor certificate.

- The maximum Surface temperature of equipment be lower than the ignition temperature of the gas or dust present in the hazardous area.

Temperature Class	T3	T4	T5	T6
Maximumsurface temperature	200°C	135°C	100°C	85°C

*The manufacturer cannot be held responsible for damage due to incorrect installation or use.

1.5 Repair

The explosion proof motor must not be opened while the motor is energized. Qualified persons only may do repair or service of the motor. When disassembling is needed, disassemble after the motor has cooled down fully, or disassemble it in non-hazardous area. If the customer himself carries out the operation, he must observe the valid standards. If a repairer treats the motor, he has to hand a certificate of conformity to the user.

2. Danger, Warning, Caution

On these instructions, the words, “danger“, “warning”, and “caution” are indicated to highlight the key sentences in accordance with safety practices. The definition of “danger“, “warning”, and “caution” are explained as follows:

Failure to follow the instruction can lead to a dangerous situation which may cause a death or serious injury.

Failure to follow the instruction may cause a death or serious injury.

Failure to follow the instruction may cause a serious / minor injury or damage on properties.

3. Safety Notice

DANGER

- Physical contact to high voltage or a rotating part of the motor may cause a death or a serious injury.
- Read this manual carefully before installation, maintenance and repairing.
- Do not contact an electric part before you are sure that power is not connected. Make sure to cut off power before maintenance or repairing.
- Refer to the National Electrical Code Handbook codes before inserting the plug.

DANGER

- Use the appropriate explosion-proof Motor in explosive area. Using non-explosion-proof electric motor can cause serious damage.
- Do not modify Motor's parts to use. If taken, personal injury or substantial property damage will result.
- Use the power cable that meets the standard. Using inappropriate cable may cause an electric shock or fire.

CAUTION

- Turn off the switch when electricity failed. As the power is restored, the motor will automatically be operated.
- Tighten the shaft key before supplying the power. If loosened, personal injury may occur.
- Do not lift the entire motor with the motor part lifting ring, and do not lift the machine with the motor lifting ring. Failure to follow this warning may result in a serious injury.
- Care must be taken to avoid the physical damage.
- Wear appropriate protective gears for installation, maintenance or repairing. You can be injured by the motor parts.
- Install aspirator and vent for cooling at a distance of 30cm from the wall. If not, it may cause

burn down by cooling failure.

To prevent incidental accident, appropriate safeguard against danger or harm for children or unqualified person.

NOTICE

- Inappropriate mechanical layout or weak mounting structure may cause vibration or mechanical damage during the operation.
- Excessive voltage variation (±10%) and frequency variation (±5%) may cause shortage of torque or over-heating condition.
- If you operate the general-type motor by using the inverter-type's one, it will easily breakdown due to insulation or cooling failure. Select the appropriate-type of motor.
- Do not exceed appropriate voltage rate. Please follow the prescription strictly specified on the nameplate.
- Driving-type of motor should be selected by considering the load trait. Inappropriate starting method may cause an incapable start due to a low torque.
- If you use belt-type driving motor, choose the pulley according to the International standard, such as KS or IEC. Especially, care should be taken in accordance with belt's tension and pulley's parallelism. In addition, for all the belt-type driving motor, make sure that installation of protective net should be made to prevent any probable physical injuries.
- Do not connect with a belt-type between the 2P-type of high speed motor and direct motor. It can cause the incident due to its cutting shaft.
- Motor's insulation resistance should be thoroughly inspected and cleaned to restore to a "best" condition.
- Excessive or low grease and oil may cause a damage of bearings and the motor.
- Pay attention that no contaminant is included in grease or oil.
- Use the designated grease and oil. Unauthorized grease or oil may reduce life of bearing and cause an overheat damage.
- Shut off the power supply if motor does not start operating within 15 seconds as of inserting the plug. In this situation, unnecessary flow of electricity may cause serious damage to motor. Call the Hyosung Technician Division refers to further inquires.
- Operating the motor at the load that exceeds the allowed moment of inertia of the standard motor may shorten the life of the motor due to an electric shock. Contact the Hyosung Technician Division if the allowed moment of inertia is exceeded.
- Do not repair or alter the motor at you own discretion. A shortened life or accident may occur.

- Use the water with the designated water quality, flow, pressure and temperature only for water-cooling motors. Or overheat or rust may occur.

NOTICE

- When a water-cooling motor is not in operation, drain water from the pipe. Water remained in the pipe may cause a freezing or rust.
- Use the oil with the designated flow, pressure and temperature when using a lubrication device. Using unauthorized oil may cause a damage of bearings.
- Use the appropriate lifting equipment when lifting a heavy part to prevent an accident.
- Y-△ starting motor must be started with Y and operated with △. Continuing operation with Y may cause drop of voltage, overload and overheat.
- Operating a general motor designed for continuous operation (S1) under the operation condition of S3 or higher, the motor can be damaged due to an electric, mechanical and thermal impact. The motor must be operated not more than 5 times a day, 2 COLD and 1 HOT. Contact the Hyosung Technician Division for information on frequent operation.
- Avoid exposure to high noise for a long time. Working near the high-noise motor and machines may damage the hearing capability. Make sure to wear the appropriate protective gear.
- Use the motor with the appropriate protection grade. The motor with inadequate protection grade may be damaged due to foreign substances.
- Use the standard motor at the temperature range of -20℃ ~ 40℃. Operating a motor out of the designated temperature range may cause deterioration of lubricating capability of bearing and overheating of winding. Contact the Hyosung Technician Division if you need to use the motor out of the designated temperature range.
- Waste from the motor must be handed as general industrial waste. Leaving the parts outdoor or failure to handling as industrial waste may cause a pollution.
- Keep the motor free from dust, oil or grease. Insufficient ventilation may cause a fire.
- Check the rotating direction before operating the motor. Reverse operation may damage the motor due to deteriorated cooling capability.
- Apply heat to the coupling for installation or disassembly. Hold the pulley with a jockey before applying heat.
- Apply heat evenly, and take out the coupling. Excessive force may damage the bearing and the shaft.

1. Outline

These instructions must be followed to ensure safe and proper installation, operation and maintenance of the motor. They should be brought to the attention of anyone who installs, operates or maintains this motor. Ignoring the instruction may invalidate the warranty.

2. Inspection, Transportation and Storage

2.1 Inspection

(1) Care is taken at the factory to assure that the motor arrives at its destination in first class condition

(2) Examine the outside of the motor carefully for damage, with particular attention to output, pole, voltage, conduit box, fans, and covers. Should further information be desired or should particular problems arise, the matter should be referred to the local Hyosung Sales Office.

2.2 Transportation

Make sure to use the lifting equipment when lifting a motor with the lifting equipment. Be careful not to make damage on the key parts including the shaft when transporting the motor.

⚠ CAUTION

■ Do not lift the entire motor with the motor part lifting ring, and do not lift the machine with the motor lifting ring. Otherwise, it can cause serious injuries due to its fall.

⚠ NOTICE

◆ Use an appropriate lifting equipment to prevent an accident.

2.3 Storage

The motor should be kept in the place that has no vibration, has small temperature change, and is clean, dry and well-ventilated. In case it needs to be kept for over 3 months, please do the followings:

(1) 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 cranked megger of not over 500 volts is the most convenient and safest method.

◇ Standard = Rated voltage (KV) + 1 MΩ or higher (40℃) <Refer to 4.1 (2) Insulation resistance.>

(2) Inspect the rust preventive coating on all external machined surfaces, including shaft extension. If necessary, recoat the surfaces with a rust preventive paint.

(3) Grease the bearings annually.

(4) In case of not using the motor for over 3 months under the circumstance it is mounted, cover the whole motor with a water-proof cover, put desiccants into it, and seal it if the place for storage has

high humidity and is likely to be attacked by water or foreign materials. Regularly exchange the desiccants.

NOTICE

◆ Motor's insulation resistance should be thoroughly inspected and cleaned to restore to a "best" condition.

3. Installation

3.1 Installation location

(1) ExnA type is allowed to be used in the hazardous area corresponding to zone2.

(2) Exd type is allowed to be used in the hazardous area corresponding to zone1 and zone2.

(3) Normal ambient temperatures should not exceed 40℃ (marine standard -20 or +40℃) if standard performance is to be achieved.(The motor designed and manufactured depending on customer demands can be operated above 40℃. Refer to technical document.) Check that the motor has sufficient airflow. Ensure that no nearby equipment, surfaces or direct sunshine, radiate additional heat to the motor. For more information about higher ambient temperatures and cooling, contact to the Hyosung Technician Office.

(4) The location should be clean, dry, well ventilated, properly drained, and provide accessibility for inspection, lubrication and maintenance. The location should also provide adequate space for motor removal without shifting the driven unit.

DANGER

● Use the appropriate explosion-proof Motor in explosive area. Using non-explosion-proof electric motor can cause serious damage.

CAUTION

■ Install aspirator and vent for cooling at a distance of 30cm from the wall. If not, it may cause burn down by cooling failure.

NOTICE

◆ Use the standard motor at the temperature range of -20℃ ~ 40℃. Operating a motor out of the designated temperature range may cause deterioration of lubricating capability of bearing and overheating of winding. Contact the Hyosung Technician Division if you need to use the motor out of the designated temperature range.

3.2 Foundation and installation

(1) Lay the foundation and bury the foundation bolt based on the installation specifications, and minimize subsidence of ground and eccentricity due to lapse of time.

(2) Level the base after the concrete is completely hardened, fastening the liners on both sides of the base bolt. The level must be within 0.05mm for 1m.

DANGER

- Use the power cable that meets the standard. Using an inappropriate cable may cause an electric shock or fire.
- Refer to the National Electrical Code Handbook codes before inserting the plug.

CAUTION

- To prevent incidental accident, appropriate safeguard against danger or harm for children or unqualified person.

NOTICE

- Use the motor with the appropriate protection grade. The motor with inadequate protection grade may be damaged due to foreign substances.

(3) Refer to technical document for cable entry information of motor terminal box.

3.3 Assembling coupling

Inspect the shaft surface and inner diameter of the coupling before assembling the coupling. Apply the coupling to make the gap within 0.2 - 0.3 mm. The coupling must be balanced before assembly, and make sure to rotate the shaft while the coupling is cooling down to prevent heat pressure and the bending moment.

3.4 Load connection

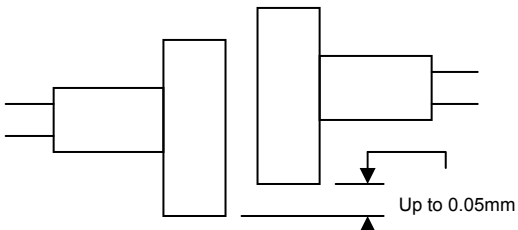
(1) Direct connection

(A) The tolerance of height of the shaft center and the levelness between the motor and the load must be not higher than 0.05mm.

(B) The shaft alignment can be checked with the dial gauge. After installation, rotate the rotor slowly by 90°, record the value, and insert the adequate material between the motor bottom and the base to adjust the deviation.

(C) A large shaft alignment error may cause a vibration or damage of bearings. The higher the highly operating motor, the error must be lowered.

(D) Refer to the following drawings for details.



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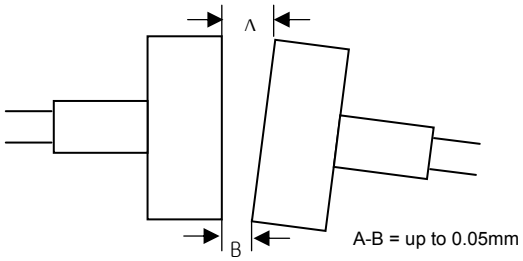

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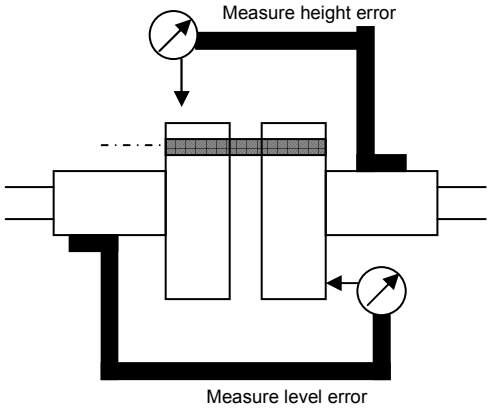
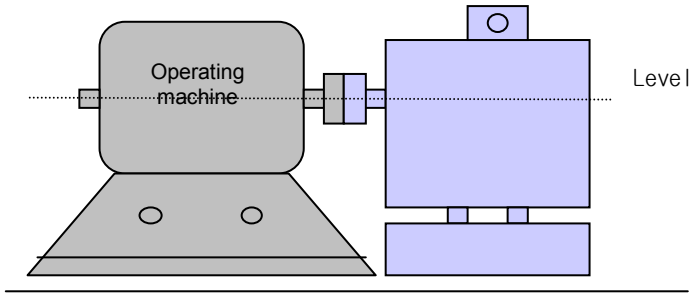


< Measure right angle and level >



< Direct connection >

(2) Belt-type connection

(A) First, paralleling motor's shaft with that of load, ensure that both side of center of the pulley be in a straight line, be verticality maintained. If the center of the pulley is not kept in a straight line, motor may fail to start.

(B) When mounting a coupling on the shaft, lubricate, press, and lightly hit it.

(C) Refer to the KS and IEC standard guideline for selecting pulley & V-belt. Be sure proper installation for Belt's tension & pulley's diameter with following KS or IEC standards guideline, improper installation may impact on horizontality of bearing and shaft strength. If you have any question, please contact to the Hyosung Technical Team.

Note. Minimum pitch diameter of pulley at V-belt operation

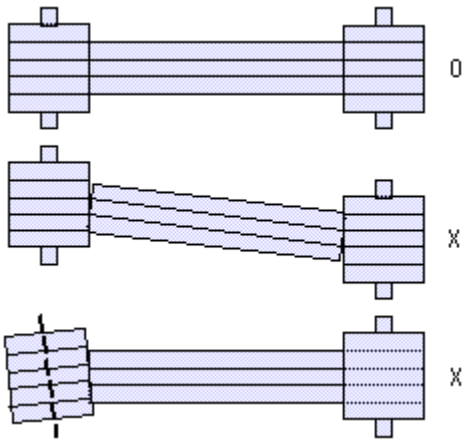
$D \geq 2.5 \times (2T / F) \times 10^3$

Where, D: minimum pulley pitch diameter (mm)

2.5: Belt tension factor

F: Radial force (N)

T: Rated torque (Nm)



< Belt-type connecton >

⚠ CAUTION

■ Wear appropriate protective gears for installation, maintenance or repairing. You can be injured by the motor parts.

⚠ NOTICE

◆ Poor mechanical alignment and weak connection may lead to vibration or mechanical damage during the operation.

◆ If you use belt-type driving motor, choose the pulley with following the KS or IEC. Standard guideline. Especially, be sure to consider the belt's tension and pulley's parallelism. In addition, for all the belt-type driving motor, Make sure to install a protective device to prevent any physical injuries.

◆ Do not connect with a belt-type between the 2P-type of high speed motor and direct motor. It can cause the incident due to its cutting shaft.

3.5 Caution for installation

(1) The lifting equipment of the motor is designed for the motor, and therefore, must be used for moving the motor only.

(2) Be careful not to give an influence to the bearing. Since the key is already installed, mount the pulley or coupling as it is. If you need to push in the key further, support the bottom of the shaft with a wooden support to protect the shaft. Impact to the shaft may cause strange tone due to a damage of bearing or bending of shaft.

(3) Since the coupling contacts the end of the shaft, it must be fixed accurately and firmly so that no hammering out occurs during the operation. Hammering may cause a bending of the shaft. When you remove a hardened coupling, you should apply heat and use a coupling puller.

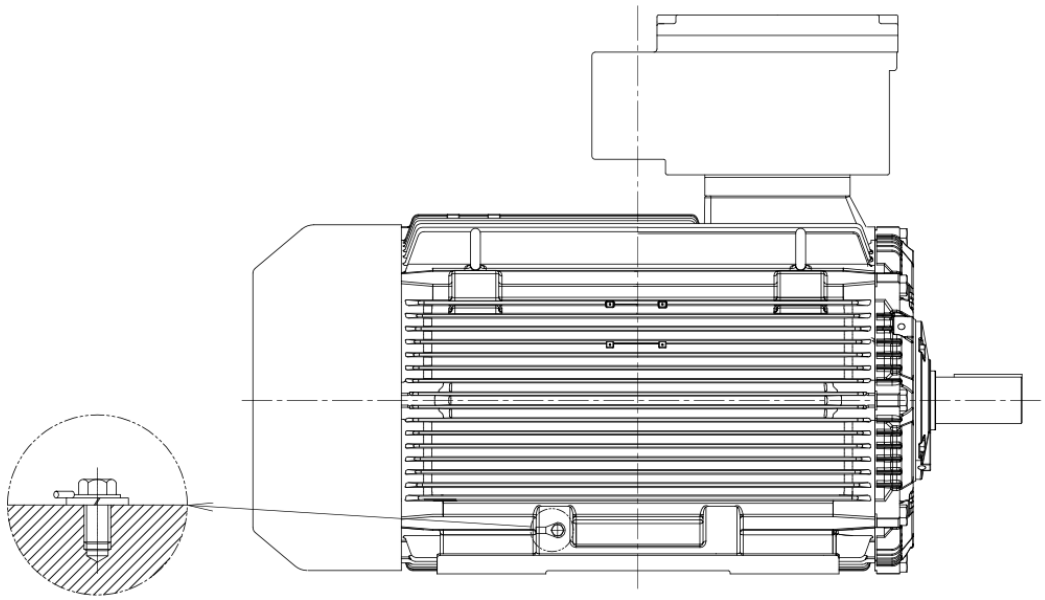
⚠ NOTICE

◆ Apply heat to the coupling for installation or disassembly. Hold the pulley with a jockey before applying heat. Apply heat evenly, and take out the coupling. Excessive force may damage the bearing and the shaft.

4. Earth Pad

4.1 Frame

(1) Location

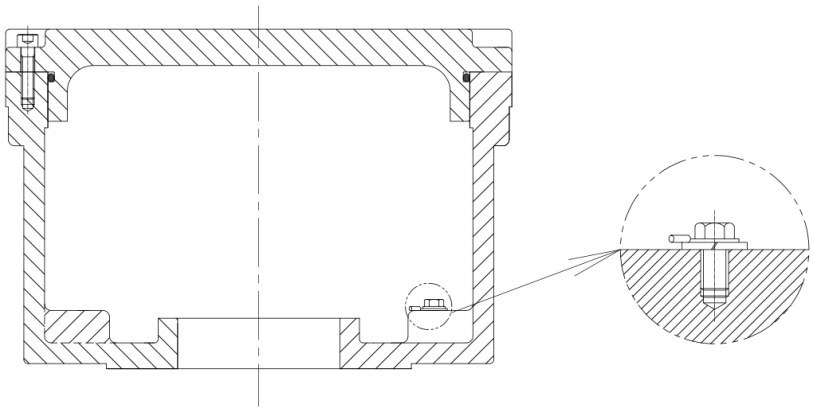


(2) Method of joint

-Insult the earth line directly to pad and fasten the upper steal with two hexagon bolt.

4.2 Terminal box

(1) Location



(2) Method of joint

-Combine the earth line using the terminal lug to the pad with hexagon bolt.

5. Test Operating

5.1 Check points before test operating

(1) Check the wire connection

(A) Control circuit, overload protection device and grounding of the motor shall comply with the related electricity laws.

(B) The motor shall be grounded, and the winding and power supply shall be consistent with the figures specified on the nameplate. If the voltage and frequency of power supply are within the following range, the motor will run differently from the characteristics on the nameplate:

-. If the voltage fluctuates within ±10% of the figures on the nameplate

-. If the frequency fluctuates within ±5% of the figures on the nameplate

-. If the frequency fluctuates within ±5%, and at the same time, the voltage fluctuates within ±10% of the figures on the nameplate

DANGER

- Physical contact to high voltage or a rotating part of the motor may cause a death or a serious injury. Read this manual carefully before installation, maintenance and repairing.
- Do not contact an electric part before you are sure that power is not connected. Make sure to cut off power before maintenance or repairing.
- Refer to the National Electrical Code Handbook codes before inserting the plug

NOTICE

◆ Excessive voltage variation and frequency variation of input power on motor may cause shortage of torque or over-heating.

(2) Insulation resistance check

Insulation resistance of stator winding must be more than standard measured by 500w MEGGER tester. Usually, it does not matter if it is over 10 ㏁at the normal temperature(15℃). If insulation resistance measured as low, you must dry the motor before testing operation, so ensure the proper insulation resistance. If there is a space heater, dry the motor until the insulation resistance becomes regulated.

◇ Rated voltage ≤ 690V : 5 MΩ (25℃)

◇ Rated voltage ≥ 690V : 100MΩ (25℃)

5.2 Preparation for test operating

(1) Check if bolts and nuts are loose, if there is dirt, if a connector is loose during storage or transportation.

(2) Feed appropriate amount of oil or grease through the oil input or grease nipple to each bearing part.

(3) Check the alignment of shaft of the motor.

(4) Checkpoints before operation:

- (A) Does the rotor rotate smoothly?
- (B) Is the lubricant appropriate?
- (C) Are there missing bolts?
- (D) Is coolant sufficient?
- (E) Do the machines and protective devices work properly?
- (F) Is the insulation resistance including the lead above the standard?
- (G) Does the motor support emergency stop?
- (H) Is the contact system established?
- (I) Are there an appropriate number of operating staffs? (Number of staffs and capability)
- (J) Is the voltage appropriate?
- (K) Is the past test operating result checked?

You may operate the motor if the above check points are appropriate.

5.3 Cautions during test operating

(1) Perform the test operating to the direction specified on the motor without load.

(2) The bearing temperature at normal operation status must not exceed 95℃.

(3) Monitor the bearing temperature for at least 2 hours after starting the motor. If the temperature rises too steeply, or vibration or noise is too high, stop the motor immediately and check the cause in reference to the “Motor troubleshooting chart”. If there is no trouble, connect the load and check the operation status.

(4) Check points for test operating:

- (A) Does the rotor rotate properly?
- (B) Is there a strange noise or irregular noise?
- (C) Is there a strange smell?
- (D) Are operating time and current appropriate?
- (E) Does the sleeve bearing rotate at the magnetic center?
- (F) Does the sleeve bearing provide good oiling rotation?
- (G) Is the oil pressure of the oil pressure pump at the shaft end appropriate?

(H) Is there a problem at the shaft end? (Strange noise, overheat, strange smell, etc.)
(I) Do inhalation / exhaustion device operate normally?
(J) Is vibration within the controlled value?
(K) Is there a problem in the system?
(L) Does the motor run normally when compared with other operation characteristics?

Correct the problem, check the status and start operation if any one of the above check points is not satisfactory.

5.4 End of test operating

You can continue operation when the motor does not generate any abnormal noise or excessive vibration after normal rotation, and stop the motor if the winding temperature and the bearing temperature are within the specified temperature range (after approx. 3-4 hours after starting the motor).

5.5 Cautions after test operating

Repeated test operating may result in overheat and damage of the motor. If you need to repeat test operating, you need to give sufficient time between the test operatings.

⚠ NOTICE

- ◆ Operating a general motor designed for continuous operation (S1) under the operation condition of S3 or higher, the motor can be damaged due to an electric, mechanical and thermal impact. The motor must be operated not more than 5 times a day, 2 COLD and 1 HOT. Contact the Hyosung Technician Division for information on frequent operation.
- ◆ Operating the motor at the load that exceeds the allowed moment of inertia of the standard motor may shorten the life of the motor due to an electric shock. Contact the Hyosung Technician Division if the allowed moment of inertia is exceeded.
- ◆ Select an appropriate starting method depending on the load characteristics. In appropriate starting method may cause an incapable start due to a low torque.

6. Winding and Bearing Temperature

	ALARM POINT (Alarm)		TRIP POINT (Trip)		Remarks
	B-type temp rise	F-type temp rise	B-type temp rise	F-type temp rise	
Winding temp	130℃	150℃	140℃	160℃	
Bearing temp	90℃		95℃		

7. Maintenance and Inspection

You need to observe the operation and other states of the motor every day, and check the following points according to the routine inspection plan:

◇ Cleaning status ◇ Insulation and winding

◇ Lubrication and bearing ◇ Vibration

7.1 Cleaning

It is important to keep the motor clean to prevent a trouble. Make sure to keep the machine and the surrounding parts clean against dust, oil and other substances which may come in through the ventilation hole or during the operation.

⚠ NOTICE

◆ Excessive or low grease and oil may cause a damage of bearings and the motor. Pay attention that no contaminant is included in grease or oil.

7.2 Humidity

Open the drain plug and remove condensed water periodically. Always operate the space heater if the motor is not in use for a long time.

7.3 Maintenance of Stator Winding

(1) Insulation capability of the winding becomes deteriorated due to electric, mechanical and environmental stress as time flows.
Deteriorated insulation layer may easily absorb humidity, and this situation becomes evident when dust is accumulated on the surface. Deteriorated insulation resistance or leakage current may cause a tracking, and even a damage of insulation. To prevent this accident, you need to check the dust and humidity of the insulator and take the appropriate action through a routine diagnosis.

(2) For the insulation resistance with the earth, you need to measure the insulation resistance between the motor terminal and the earth periodically.
You need to check the insulation resistance before you restart the motor since a motor easily absorbs humidity while the motor is stopped. You need to consider the change of insulation resistance, as well as, the resistance.

(3) The resistance value must be higher than the value calculated with the following formula, and must be substantially lowered from the previous measurement.
◇ Standard resistance = Rated voltage (KV) + at least 1 MΩ (40℃)

(4) Check the dust, oil, carbon dust and salt when inspecting the surface insulation resistance. If a damage is found, measure the insulation resistance of the winding surface and check if the value is 10MΩ or higher.

(5) Check the insulation resistance mainly on the dusted part of the winding at the pitch of approx. 10-15. If the insulation resistance to the earth or the surface insulation resistance is out of the controlled standard, you should clean, dry, paint and apply varnish. Even if the insulation resistance is within the controlled standard, when damage is found through the appearance inspection, you should clean the surface of winding with air blow or a dry cloth.

(6) If a tracking is found on the winding surface and the insulation resistance is deteriorated again, please contact Hyosung for expert's analysis. The insulated winding must be kept clean against dust, oil, metal dust or other dirt.
You can manage the cleaning status with the following methods:

(A) Vacuum cleaning
You may vacuum dust or other dirt. The vacuum cleaner sucks in dust and dirt without damaging the insulation or other parts.

(B) Compressed air cleaning
Air blower is convenient for removing dust and dirt in the air duct or between the windings. You should use dried air and the air pressure must not be too high.

(C) Solvent cleaning
Oil and grease make the insulation deteriorated and dusted, and obstruct smooth ventilation, and therefore, you should wipe off with a cloth. Solvent has a low ignition point and hazardous to human body. If the winding moves or the varnish is deteriorated, you should apply varnish again.

7.4 Maintenance of Rotor Bar

The rotor bar and end ring of the rotor of a squirrel cage 3-p induction motor are subject for the thermal stress caused by temperature rise during operation, the electromagnetic force caused by magnetic flux and current, and the centrifugal force caused by rotation. Therefore, a gap occurs between the rotor bar and the slot, and this gap, when grown, generates an electronic tone from vibrating rotor bar or a cut of rotor bar. Therefore, if a change or looseness of a rotor bar is found during the routine inspection, you should inject epoxy resin through the slot to prevent vibration and movement of the rotor bar. Contact the Hyosung Technician Division for detailed inspection method. You should inspect the rotor bar every 4 years. You should pull out the rotor and inspect each part of the rotor bar.

7.5 Reoiling

Excessive oil or grease causes a leakage and overheat of bearing. Therefore, you should maintain the

adequate level of oil. Lubricant also protects the bearing from water, oil and rust. Make sure to keep the inlets clean and pay attention that no dirt is incoming with relubrication.

When using a high-pressure feeder, be careful of excessive lubrication. Sufficient rust-resisting grease is fed to the ball bearing at the factory.

(1) How to apply oil and grease

(A) Stop the motor and cool down sufficiently.

(B) Clean the lubricating part.

(C) Remove hardened oil and grease from the lubrication inlets.

(D) Feed grease slowly by operating the compressed oil feeder.

(E) Idle the motor for about 10 minutes so that the excessive grease is completely leaked out.

(F) If the motor has a long grease pipe, clean the pipe thoroughly before lubrication.

(G) If it is necessary to feed oil during the operation, be careful that you should not feed excessive oil. Idle the motor for about 10 minutes as the lubrication plug is open (grease using motor).

Note. If contamination is severe or the temperature is excessively high, you should open the bearing housing and check the grease status once a year or at every 5000 hours. If the grease is deteriorated or contaminated, you should clean the bearing housing and replace grease.

⚠ NOTICE

- ◆ Excessive or low grease and oil may cause a damage of bearings and the motor. Pay attention that no contaminant is included in grease or oil.
- ◆ Use the designated grease and oil. Unauthorized grease or oil may reduce life of bearing and cause an overheat damage.

7.6 Maintenance of grease

(1) Standard grease feeding cycle for ball bearing

(A) The following tables are based on the standard bearing and ALVANIA #2 grease.

(B) Standard for ball bearing is applied to the 73-series bearing.

(C) Grease feeding cycle for outdoor motor must be 1/1.2 times of the standard value.

(D) If different feeding cycles are set for the same motor, the shorter cycle must be applied.

(E) The values are based on the ambient temperature of 40℃, and the standard for outdoor type is applied if the ambient temperature is 40℃～50℃.

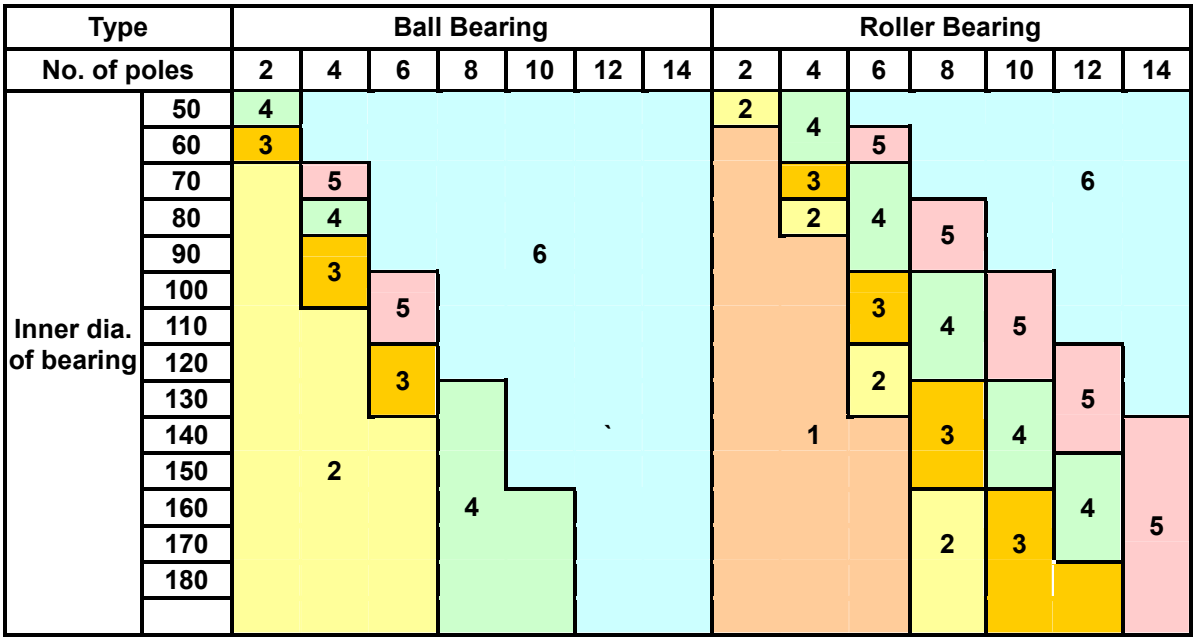
(F) If the ambient temperature is 50℃ or higher, the feeding cycle is reduced by half at every 15℃.

(G) Bearing operation temperature

For universal grease: 40℃ ≤ T ≤ 120℃

For widely used grease: 40℃ ≤ T ≤ 140℃

(1) Grease feeding cycle <Unit: months>



(2) Amount of grease applied

Inner dia. of bearing	Amount (gram)	Initial amount (gram)	
	Standard bearing structure	Roller	Ball
50	65	60	150
60	95	95	210
70	140	150	310
80	160	230	450
90	160	310	600
100	160	440	800
110	160	580	1010
120	160	690	1320
130	160	970	1660
140	160	1160	1980
150	160	1350	2320

7.7 Management of bearing

For a motor stored for months, you should check the rotation status of the motor right after installation, and noise and temperature rise during operation. You should use proper amount of oil or grease so that it can obtain sufficient lubricating effects for the bearing. Lubrication cycle must be determined based on size, speed and operating conditions of the bearing.

(1) BALL bearing sound

You can check the problems of bearing based on the sound of the roll bearing.

(A) Normal sound

A continuous sound (shh- sound, wind sound) is generated as the balls roll on the inner race and the outer race regardless of the rpm.

(B) Normal sound (drop sound)

The drop sound is generated in the horizontal ball bearing as balls dropped from the bearing contact the retainer and the inner race. This sound is heard as rpm drops rather than during the operation. A loud sound may be generated when the bearing idles before it is stopped, but does not indicate a problem.

(C) Retainer sound

This irregular metallic sound is generated as the retainer, balls, inner race and outer race contact with each other regardless of rpm. It is often heard from the bearing with a large gap for high-speed machine.

This sound (Jrr- sound) can be reduced or disappeared as grease is fed. If the retainer sound grows again, you should check the bearing (worn retainer). This sound may not be completely disappeared.

(D) Creak sound

The creak sound is often heard from a roll bearing due to an irregular operation and in relation with the grease status and the gap. You can find the crack-sound preventive bearing, but it is not perfect. Unless the sound is accompanied with vibration, the bearing with this sound has no problem. Normally, this sound (Grr- sound) disappears as grease is fed. In this case, the bearing may be considered to be normal. Like the drop sound, it often grows as it idles with the bracket.

(E) Scratch sound

This sound is generated in proportion to the rpm when the outer/inner race or a ball is scratched or cracked. This sound is normally accompanied with a vibration, but can be easily detected as the cycle gets longer before the bearing is stopped. You can find a scratch by turning the rotor slowly with a hand.

(F) Foreign substance sound

This sound is generated due to a foreign substance inside the bearing. It has an irregular cycle

and volume. If you leave the bearing as it is without removing the cause, a scratch may occur in the bearing.

This sound (Pjj- sound) is often heard when the bearing is assembled in a dirty location.

7.8 Overhauling motor

(1) Checkpoints before disassembly

(A) Range of work (To which point will inspection be performed?)

(B) Process (Date of possible overhauling, estimated date of test operating, use of heavy machinery including cranes)

(C) Number of workers (workers qualified for the works)

(D) Work space and drawings (place with good ambient environment)

(E) Questions and unreasonable points

(F) Tools (general tools and special tools)

(G) Spare parts

(H) Lubricants

(I) Measures against rain and humidity

(J) Separation of pipe system for coolant and lubricant

(L) Power supply (Main power, heater power)

(K) Components

(L) Various standards and previous inspection data

(2) Disassembly and assembly work flow

The following procedure shows the general work procedure. You should perform each process thoroughly, and try your best to secure safety and protect devices. When overhauling two or more motors of a same kind, you should distinguish the part boxes to prevent mixing of parts. If a trouble is found in the measurement when compared with the controlled value, contact the Hyosung Technician Division.

(A) Separate power cable

(B) Measure insulation resistance, and winding resistance

(C) Centering (Center motor shaft and load shaft on the base)

(D) Move to the work stand

(E) Remove coupling

(F) Remove external fan cover

(G) Remove external fan

(H) Measure air gap

(I) Measure shaft concentricity

(J) Remove brackets
(L) Remove bearing parts
(K) Pull out rotor
(L) Check each part

CAUTION

■ Wear appropriate protective gears for installation, maintenance or repairing. You can be injured by the motor parts.

NOTICE

◆ Do not repair or alter the motor at you own discretion. A shortened life or accident may occur.

7.9 Handling waste

NOTICE

◆ Waste from the motor must be handled as general industrial waste. Leaving the parts outdoor or failure to handling as industrial waste may cause a pollution.

8. Routine Inspection and Maintenance

8.1 General rules for routine inspection

A routine inspection is performed for each part of the motor after pulling out the rotor. A routine inspection must be made for the motor of less than 3000KW every 6 years. The motor for middle inertia load (10 sec or longer operation time) must be inspected every 4 years.

8.2 Induction motor inspection standard

A : ○ daily inspection, B : ● weekly inspection, C : △ monthly inspection

D : ▲ overhaul (every 6 months ~ 2 years depending on the environment)

Part	Checkpoint	Classification				Details or parts of inspection	Method of inspection	Criteria
		A	B	C	D			
1. Bearing	Lubrication	○		△	▲	Flux	Check the flow with oil level gauge, flow meter, and sight flow.	The oil level must be within the indication line of the level gauge. However, check the oil level and indicator when the bearing is stopped.
		○		△	▲	Oil pressure	Use the oil pressure gauge at the bearing lubrication inlet or the lubrication system	±20% of the designated pressure. Normally, 0.8～2kg/cm^2
		○	●			Rotation of oil ring	Check through the inspection window	The oil ring must rotate smoothly at the same position. It is defective if it rotates unsmoothly or tilted.
		○	●	△	▲	Change of flux in the tank and deterioration	Check the decreased flux for a weak. Check the deposit on the bottom of the tank and discoloration of oil	Check the leakage from the cooler or pipes. If there is deposit on the bottom of the tank and the oil is discolored to brown, replace the oil.
				△	▲	Grease	Check the last feeding date, amount and grease nameplate	Feed grease to the cycle and amount specified on the nameplate.
	Leakage	○		△	▲	Coupling between shaft and bearing cap	Check with bear eyes or hand. Check the inside of sleeve ring and inside of the body.	Wipe stains and check the status. Take the action if oil is formed or dropped.
	Temp.	○		△	▲	Thermometer	Is the temperature is as usual? Check the temperature with hand if there is no thermometer.	The temperature must be 80℃ or lower.
	Endplay	○		△	▲	Shaking to the direction of the shaft	Check the range of shaking with bare eyes or hands, or a scale (make sure not to touch the rotating part). Check the compliance of the center indicator with the shaft indicator.	The shaft must not shake and touch the thrust surface of the metal, nor be overheated as it is bumped on the thrust surface. OK if it is ±1mm. (Applied to the shaft with the center indicator.)

Part	Checkpoint	Classification				Details or parts of inspection	Method of inspection	Criteria
		A	B	C	D			
	Sound	○		△	▲	Strange sound	Check with hands or the listening bar.	The stator and the rotor must not be touched with each other. There should not be strange sound from the roll bearing.
1. Bearing	Vibration	○		△	▲	Size and change of vibration	Check with hands. Use a vibration meter if the vibration is big.	You should check the reason for abnormal vibration or strange sound.
	Coolant			△	▲	Coolant pressure, drain temp., water supply temp.	Check the waterway and drain temp.	Check the coolant if the flux is low or the drain temp. is high.
	Metal				▲	Exfoliation, crack, metal wear, metal gap	Check with bare eyes. Thickness gauge	Overhaul the bearing metal every year. If the metal gap is more than twice of the designed gap, replace the metal with the spare part. Examine the cause for partial wear and take the action.
	Shaft				▲	Damage, streak (shaft journal)	Check with bare eyes and hands.	If the streak is felt with a finger nail, cut or grind the shaft. Contact the maker if there is a possibility of rust.
2. Stator and rotor	Temp.	○		△	▲	Core, winding	Read the flushed thermometer, or check with hands or bar thermometer.	The temperature must not exceed the value in Table 1. You should examine the cause and take the action. Check the cause if the temperature is not as usual.
		○				Inhalation, exhaustion	Read the exhaustion thermometer, or check with hands or bar thermometer. Check if you smell a strange smell.	The temperature must be as usual, and the air temperature must be 40℃ or lower. A special standard is applied if the temperature is 40℃ or higher.
	Load	○				Voltage, current	Read the voltage meter and the current meter every two hours.	The voltage must be within ±5% of the rated voltage, and the current should not be higher than the rated current. Contact the maker if you need to operate the motor with overcurrent.
	Winding			△	▲	Stator winding, rotor winding, space heater	Use the 1000V Megger for the machine of 1000V or higher. Or use the 500V Megger in other cases.	Measure at hot time in possible. Record the air temperature, humidity and the machine temperature.

Part	Checkpoint	Classification				Details or parts of inspection	Method of inspection	Criteria
		A	B	C	D			
	Stator				▲	Damage, stain, coupling status	Check with bare eyes, hands or spanner.	Remove the covers and check more closely than the monthly inspection. Remove dust. If the insulation resistance is lowered, clean, dry and apply varnish.
2. Stator and rotor	Rotor				▲	Band looseness, core looseness, rotor bar breakage, dust	Check with bare eyes, hands, or test hammer magnifier.	Check the looseness of the winding rotor banding with the test hammer, and rewinding if it is loose. Contact the maker if a crack is found at the welded part between the rotor bar and the resistance ring. Remove dust from the core duct. Check the deformation, discoloration or deterioration of other parts, and take the action.
3. Air filter		○		△		Blocking of filter	Check with bare eyes, or read the exhaustion temperature.	If the filter is blocked with dust, remove the filter and blow compressed air. Or beat with a wooden stick to remove dust.
4. Cooler		○		△		Flux and pressure	Check the flux at the water way, and read the water pressure meter.	Check the flux and if the flow is lower than usual.
		○		△		Drain temp.	Check the temperature at the water way.	If the drain temperature is high, there is a possibility of lack of coolant.
		○		△	▲	Water supply temp.	Read the thermometer on the water supply pipe wall.	The temperature of water supply should not be higher than the designated temperature.
5. Belt		○		△	▲	Belt tension	Check the belt tension and rocking status during the operation with hands.	The tension should be as usual. The belt should not touch the belt cover during the operation.
		○		△	▲	Damage	Check if the core is exposed as the surface rubber is worn.	Replace the belt if the core is loose.
6.Coupling				△	▲	Alignment check	Use the dial indicator.	① Compare the measurement with the previous record, and maintain the designated value. ② Surface error and circumference error must be within 0.05mm.

Part	Checkpoint	Classification				Details or parts of inspection	Method of inspection	Criteria
		A	B	C	D			
7. Slip ring	Current collection status	○		△	▲	Flame	Check the flame with bare eyes at the start and operation.	Continuous flames are not allowed even if they are small. There should be no flame if possible.
	Current collection part	○		△	▲	Flatness	Check the flatness with bare eyes or hands when the motor is stopped. Check if the frame is lost.	No perturbation groove to the direction of the circumference of 1mm or deeper is allowed. The current collection surface should not be damaged by flames.
				△		Film status	Check with bare eyes.	Brass yellow or dark brown glossy surface.
		○				Bad gas	Smell the gas.	Caution: Sulfurous acid gas, hydrogen sulfide, chlorine or other corrosive gas contained in the air may obstruct fine film.
		○	●	△		Carbon dust and cleanness	Check with bare eyes or hands. Remove dust.	Carbon dust may cause flashover during the operation.
8. Slip ring spiral groove	Contact status	○	●	△	▲	Temperature	Check the status with bare eyes.	Partial red or violet color indicates overheating during the operation.
		○		△	▲	Flatness	Check the contact surface with bare eyes.	Ruggedness of 0.5mm or deeper due to wear and loss of contact surface is not allowed. Correct the problem at the routine inspection.
		○			▲	Contact to stator	Check with bare eyes or ears. Check the contact between slider and shaft roller.	No sound should be generated by the shift roller touched by the slider during the operation.
9. Brush and brush holder	Vibration	○			▲	Vibration	Check the movement of brush during operation with bare eyes or hands.	There should be no strange vibration. Check the vibration with a hand between the insulation bars.
	Brush			△		Compliance	Grasp the spring of the brush, and move the brush up/down.	The brush must move smoothly. Carbon dust or small bits must not be attached.
		○	●	△	▲	Length	Check the status and size of wear.	Up to 3mm from the spring fastening tool. Be careful not to rub the slip ring with the fastening tool.

Part	Checkpoint	Classification				Details or parts of inspection	Method of inspection	Criteria
		A	B	C	D			
		○		△	▲	Discoloration	Check the color of the spring connection part.	Must be brass yellow or copper color. Red or violet indicates that the motor is overheated.
			●		▲	Spring	Check the spring terminal with hands.	Fasten the loose screws.
		○	●	△		Carbon dust	Check with bare eyes and hands.	Remove carbon dust as it causes an accident.
10. Others		○				Looseness of bolts and nuts	Check if the bolts and nuts are loose.	Fasten the loose bolts and nuts.
		○		△		Breaking sound	Check if a strange sound is generated from the inspection window, side plate, slip ring cover or the pipes.	If the noise is louder than usual, check with the vibration meter and the noise meter.

9. Motor Troubleshooting Chart

Symptom	Problem Cause	What to do
It is impossible or difficult to start the motor.	The fuse is cut.	Check the fuse capacity.
	The start torque is low.	Change the start method or increase the capacity.
	The voltage is too low.	Check if the voltage is consistent with the nameplate, and raise the voltage.
	The circuit is open, or the connection is imperfect.	Replace the fuse. Check the overload relay, starter and push button.
	The stator winding or the rotor winding is cut.	Check if the connection of the stator winding or the end ring of the rotor bar is
	The resistance of the winding is not correct.	Replace the poor resistance. Repair the open circuit.
The motor is overheated.	Overload	Reduce load.
	Ventilation is obstructed.	Clean dust or dirt from the ventilation
	P1 of the 3-pahse motor is open.	Check the connection.

	The stator coil is cut between the layers.		Repair the stator coil.
	The voltage is uneven.		Repair it in the grounding place.
	The coil is grounded.		Repair it in the grounding place.
	The voltage is too high or too low.		Correct the voltage.
The bearing is hot.	General	The shaft is bent.	Replace the shaft.
		The belt is too tight.	Adjust the belt tension.
		The pulley is too far from the bearing.	Move the pulley close to the bearing.
		The pulley diameter is too small.	Replace the pulley with the one with a larger diameter.
		The shaft is not in a straight.	Correct the shaft.
		The bearing is heated by external heat source.	Protect the bearing from the heat.

Symptom	Problem Cause		What to do
The bearing is hot.	Roll bearing	The grease is excessive or insufficient.	Add or reduce grease.
		The grease is deteriorated.	Wash the bearing and feed new grease.
		The thrust is too big.	Reduce thrust in the shaft side.
		The ball is broken or the race is rough.	Replace the bearing.
	Sleeve bearing	The oil groove is blocked by dust.	Feed new oil.
		The oil ring is bent or broken.	Replace the oil ring.
		The viscosity of oil is inappropriate.	Replace the oil with the one with appropriate viscosity.
		The oil lacks.	Stop the motor, and feed oil to the appropriate level.

		The thrust is too big.	Remove the thrust.
		The bearing is worn substantially.	Replace the bearing.
The noise is loud.	The shaft is not in a straight line.		Adjust the shaft.
	The base is weak.		Strengthen the base.
	The coupling or the geared equipment has a poor balance.		Adjust the balance of the driving device.
	The bearing is defective.		Replace the bearing.
	The 3-phase motor runs in 1-p.		Check if there is an open circuit.
	The end play is too big.		Check the bearing.

10. A/S Center Contact Information

10.1 A/S Center

Bupyeong TEL : 82-32-505-2765~8
FAX : 82-2-707-6111
Clover Service : 080-024-8282 (24 hours)
Changwon Office TEL : 82-55-268-9714
FAX : 82-55-268-9737

10.2 Sales Team

Agency Sales Team TEL : 82-2-707-6421~8
FAX : 82-2-714-8822
Rotary Machine Sales Team TEL : 82-2-707-6341,6322,6333,6338
FAX : 82-2-707-6446
Changwon Sales Team TEL : 82-55-268-9205~9208
FAX : 82-55-282-3287

10.3 Technical Division for Motor

Changwon Plant Motor Design Team
TEL : 82-55-279-7330~50,
FAX : 82-55-268-9695
Homepage : www.hyosung.com
www.hico.co.kr/electricmotor

Hyosung Corporation/Heavy Industries

HYOSUNG CORPORATION

- **Service Team**
  - Main Office TEL: 82-2-707-6557~8 FAX: 82-2-707-6111
  - Changwon OfficeTEL: 82-55-268-9714 FAX: 82-55-268-9737
  - Clover Service TEL: 080-024-8282
- **Sales Team**
  - Agency Sales Team TEL: 82-2-707-6421~8 FAX: 82-2-714-8822
  - Rotary Machine Sales Team TEL: 82-2-707-6331~5 FAX: 82-2-707-6446
  - Changwon Sales Team TEL: 82-55-268-9205~8 FAX: 82-55-282-3287
- **Technical Division for Motor**
  TEL: 82-55-279-7330~50 FAX: 82-55-268-9695
- **Homepage**
  - www.hyosung.com
  - www.hico.co.kr/electricmotor

CERTIFICATION

1 **EU-TYPE EXAMINATION CERTIFICATE**

2 Equipment intended for use in Potentially Explosive Atmospheres Directive 2014/34/EU

3 Certificate Number: **Sira 15ATEX1064X** Issue: **3**

4 Equipment: **Explosion Proof Induction Motors Model**
Series E******** (11 Digits for Flameproof)**
Series E******** (13 Digits for Dust)**

5 Applicant: **HYOSUNG CORPORATION**

6 Address: (Ungnam-dong), 244, Gongdan-ro, Seongsan-gu, Chang-won-si, Gyeongsangnam-do, Republic of Korea

7 This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Sira Certification Service, notified body number 0518 in accordance with Articles 17 and 21 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential reports listed in Section 14.2.

9 Compliance with the Essential Health and Safety Requirements, with the exception of those listed in the schedule to this certificate, has been assured by compliance with the following documents:

EN 60079-0:2012/A11:2013 EN 60079-1:2014 EN 60079-7:2007 EN 60079-31: 2014

The above list of documents may detail standards that do not appear on the UKAS Scope of Accreditation, but have been added through Sira's flexible scope of accreditation, which is available on request.

10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to Specific Conditions of Use identified in the schedule to this certificate.

11 This EU-Type Examination Certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment.

12 The marking of the equipment shall include the following:

Motor fitted with Increased Safety Terminal Box

II 2GD
Ex db e IIB T• Gb IP 54 - 66
Ex db e IIC T• Gb IP 54 - 66
Ex tb IIIC/IIIB T , °C Db IP 6X
Ta = -20°C ≤ Ta ≤ + 60°C

Motor fitted with Flameproof Terminal Box

II 2GD
Ex db IIB T• Gb IP 54 - 66
Ex db IIC T• Gb IP 54 - 66
Ex tb IIIC/IIIB T , C Db IP 6X
Ta = -20°C ≤ Ta ≤ + 60°C

• See table in product description for temperature class

, Maximum surface temperature will be assigned for each model number and frame size per Drawing ES1L100230.

NOTE: Equipment marked IIIC is suitable for applications requiring Group IIIA or Group IIIB equipment.

Project Number 70164160

C Ellaby
Deputy Certification Manager

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SCHEDULE

EU-TYPE EXAMINATION CERTIFICATE **Sira 15ATEX1064X**
Issue 3

13 **DESCRIPTION OF EQUIPMENT**

The E********** (11 digit for Ex d) and E********** (13 digit for Ex t) Range of Induction Motors comprise a cast iron frame with cast iron or steel spigot fitting end shields. The range consists of frame sizes from 71M to 315M (NEMA frame size 143T to 447T).

The motors are rated 690 V maximum, 50/60Hz, for use with or without Inverter Drives and with Class F or H insulation. The motors are available with 2 to 16 poles and can be supplied without terminal box.

Inverter Duty Ratings:
Constant Torque (CT) = 10:1 [5Hz to 60Hz] or 3:1 [16.7Hz to 60Hz]"
Variable Torque (VT) = 20:1 [2.5Hz to 60Hz]

The following types are available:

- Totally Enclosed, Fan Cooled (TEFC); Foot and/or Flange mount
- Totally Enclosed, Non-Ventilated (TENV) Foot and/or Flange Mount, Short Duty
- Totally Enclosed, Air Over (TEAO) Foot and/or Flange mount

The Drive and Non-drive end endshields are fastened to the frame with M6 to M24 steel Socket Head Cap Screws.

The rotor/shaft assembly passes through the end shields via roller or ball bearings.

The motor is provided with either an increased safety or flameproof terminal box fitted to the top or side of the motor via a compound filled feedthrough adapter assembly. The terminal box is made of cast iron or welded steel and is fastened to the adapter using M6 to M12 steel Socket Head Cap Screws with a bolt-on access cover to allow termination. The cover of the flameproof terminal box is fastened using M6 to M10 steel Hex Head Screws. The cover of the increased safety terminal box is fastened using M6 to M10 steel Socket Head Cap Screws.

For Inverter Duty ratings, the motor is provided with thermal protection devices in the stator winding. Connection to the thermal protection devices is made in the terminal compartment.

The duty type of motor is from S1 to S9 for TEFC and TEAO, S2 (30min.) for TENV

The motors within the range are listed in the table below:

Frame Size (NEMA Size)	Poles	Maximum Rating (kW) [50Hz/60Hz]	T Class	Minimum air flow (TEAO motors)
71M	2/4 and Double Speed	0.4/0.4	T4, T5 or T6	4.0
80M	2/4/6 and Double Speed	0.75/0.75	T4, T5 or T6	3.5
90L (143/145T)	2/4/6/8 and Double Speed	2.2/2.2	T4, T5 or T6	3.0
100L	2/4/6/8 and Double Speed	2.2/2.2	T4, T5 or T6	5.0
112M (182/184T)	2/4/6/8 and Double Speed	4/4	T4, T5 or T6	5.0
132S (213T)	2/4/6/8 and Double Speed	7.5/7.5	T4, T5 or T6	4.0
132M (215T)	2/4/6/8 and Double Speed	7.5/7.5	T4, T5 or T6	6.0
160M (254T)	2/4/6/8 and Double Speed	15/15	T4, T5 or T6	8.5
160L (256T)	2/4/6/8 and Double Speed	18.5/18.5	T4, T5 or T6	7.0
180M (284T)	2/4/6/8 and Double Speed	22/22	T4, T5 or T6	8.5

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SCHEDULE

EU-TYPE EXAMINATION CERTIFICATE **Sira 15ATEX1064X**
Issue 3

Frame Size (NEMA Size)	Poles	Maximum Rating (kW) [50Hz/60Hz]	T Class	Minimum air flow (TEAO motors)
180L (286T)	2/4/6/8 and Double Speed	30/30	T4, T5 or T6	10.5
200L (326T)	2/4/6/8 and Double Speed	37/45	T4, T5 or T6	12.0
225S (364T)	2/4/6/8 and Double Speed	45/55	T4, T5 or T6	9.0
250S (404T)	2/4/6/8 and Double Speed	55/75	T4, T5 or T6	11.5
250M (405T)	2/4/6/8 and Double Speed	75/90	T4, T5 or T6	12.5
280S (444T)	2/4/6/8 and Double Speed	90/110	T4, T5 or T6	10.5
280M (445T)	2/4/6/8 and Double Speed	110/132	T4, T5 or T6	13.5
280L (447T)	2/4/6/8 and Double Speed	160/200	T4, T5 or T6	9.5
315S	2/4/6/8 and Double Speed	132/160	T4, T5 or T6	10.5
315M	2/4/6/8 and Double Speed	160/200	T4, T5 or T6	9.5
315M	2/4/6/8 and Double Speed	200/-	T4	9.5

Notes: Temperature Code varies based on the Ambient Temperatures (40°C to 60°C), frequency and Inverter Duty Ratings.
Motors can be marked with a Temperature Code of T3 to relevant.
All motors are 690 V maximum, 50 or 60 Hz and 3600 rpm (max)
As for details of double speed motors, refer to drawing ES1L100169

Variation 1 - This variation introduced the following changes:

i. Following appropriate assessment to demonstrate compliance with the latest technical knowledge, EN 60079-31:2014 was added to the list of standards and EN 60079-0:2012 was replaced by EN 60079-0:2012/A11:2013, the markings in section 12 were updated accordingly.
ii. The following motor ratings, 0.75KW to 55KW, were added to the range.
iii. For clarity, the customer has requested the modification of the Motor Frame table listed on page 2 and 3 of the Certificate.

Variation 2 - This variation introduced the following changes:

i. Following appropriate assessment to demonstrate compliance with the latest technical knowledge, EN 60079-1:2007 was replaced by EN 60079-1:2014. The marking and Specific Condition of Use was amended accordingly and a new Specific Condition of Use was added.
ii. Product Description was altered to correct the word “adapter” to “frame” as per the customer’s request.

14 DESCRIPTIVE DOCUMENTS

14.1 Drawings

Refer to Certificate Annexe.

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14.2 **Associated Sira Reports and Certificate History**

Issue	Date	Report no.	Comment
0	28 August 2015	R70039471A	The release of the prime certificate.
1	04 September 2015	N.A.	The drawing list in Report R70039417A was modified after Issue 0 of the certificate was released; this was an editorial change that did not affect the product design but needed to be recognised in this Issue of the certificate.
2	20 March 2017	R70079416A	This Issue covers the following changes: • EC Type-Examination Certificate in accordance with 94/9/EC updated to EU Type-Examination Certificate in accordance with Directive 2014/34/EU. *(In accordance with Article 41 of Directive 2014/34/EU, EC Type-Examination Certificates referring to 94/9/EC that were in existence prior to the date of application of 2014/34/EU (20 April 2016) may be referenced as if they were issued in accordance with Directive 2014/34/EU. Variations to such EC Type-Examination Certificates may continue to bear the original certificate number issued prior to 20 April 2016.)* • The introduction of Variation 1.
3	02 January 2018	R70164160A	The introduction of Variation 2

15 **SPECIFIC CONDITIONS OF USE** (denoted by X after the certificate number)

15.1 The fasteners used for closing the flameproof enclosure shall be at least strength class 12.9.

15.2 TENV motors are only rated for short duty and shall not be operated for greater than 30 minutes.

15.3 The lengths of the flameproof joints are in parts longer and the gaps of the flameproof joints are in parts smaller than the values of table 2 and 3 of EN 60079-1:2014.

15.4 Appropriate ATEX certified cables and cable glands shall be used.

15.5 Refer to installation drawing “ES1L100230” for maximum surface temperature, model number and frame size for “tb” applications.

15.6 Flame-proof joints are not intended to be repaired.

16 **ESSENTIAL HEALTH AND SAFETY REQUIREMENTS OF ANNEX II** (EHSRs)

The relevant EHSRs that are not addressed by the standards listed in this certificate have been identified and individually assessed in the reports listed in Section 14.2.

17 **CONDITIONS OF MANUFACTURE**

17.1 The use of this certificate is subject to the Regulations Applicable to Holders of Sira Certificates.

17.2 Holders of EU-Type Examination Certificates are required to comply with the conformity to type requirements defined in Article 13 of Directive 2014/34/EU.

17.3 For motors with increased safety terminal boxes, an electrical strength test of (1000+ 2*U*)_2380 V maximum, rms shall be applied between Line and Ground for at least 60 s required by clause 6.1 of EN 60079-7, there shall be no breakdown.

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17.4 For Inverter Duty ratings, the motor shall be provided with thermal protection devices (Thermostat, Thermistor, RTD) in the stator winding.

17.5 For Totally Enclosed Air Over motors (TEAO), the minimum air flow is to be marked on the auxiliary nameplate mounted on motor enclosure or hood (fan cover).

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Certificate Annexe

Certificate Number: **Sira 15ATEX1064X**

Equipment: **Explosion Proof Induction Motors Model Series**
E******** (11 Digits for Flameproof)**
E******** (13 Digits for Dust)**

Applicant: **HYOSUNG CORPORATION**

Issue 0 (See Issue 1)

Issue 1 (With the exception of drawing ES1E100748, all other documents were introduced in Issue 0)

Drawing	Sheets	Rev.	Date (Sira Stamp)	Title
ES1E100630	1 of 1	0	08 Jul 15	Flame path joints and gaps drawing for IIB Ex d motor
ES1E100631	1 of 1	0	08 Jul 15	Flame path joints and gaps drawing for IIB Ex de motor
ES1E100632	1 of 1	0	08 Jul 15	Flame path joints and gaps drawing for IIC Ex d motor
ES1E100633	1 of 1	0	08 Jul 15	Flame path joints and gaps drawing for IIC Ex de motor
ES1E100546	1 of 1	0	08 Jul 15	FR.71M IIB Ex d motor schedule drawing
ES1E100547	1 of 1	0	08 Jul 15	FR.71M IIB Ex de motor schedule drawing
ES1E100548	1 of 1	0	08 Jul 15	FR.71M IIC Ex d motor schedule drawing
ES1E100549	1 of 1	0	08 Jul 15	FR.71M IIC Ex de motor schedule drawing
ES1E100550	1 of 1	0	08 Jul 15	FR.80M IIB Ex d motor schedule drawing
ES1E100551	1 of 1	0	08 Jul 15	FR.80M IIB Ex de motor schedule drawing
ES1E100552	1 of 1	0	08 Jul 15	FR.80M IIC Ex d motor schedule drawing
ES1E100553	1 of 1	0	08 Jul 15	FR.80M IIC Ex de motor schedule drawing
ES1E100554	1 of 1	0	08 Jul 15	FR.90L(143T,145T) IIB Ex d motor schedule drawing
ES1E100555	1 of 1	0	08 Jul 15	FR.90L(143T,145T) IIB Ex de motor schedule drawing
ES1E100556	1 of 1	0	08 Jul 15	FR.90L(143T,145T) IIC Ex d motor schedule drawing
ES1E100557	1 of 1	0	08 Jul 15	FR.90L(143T,145T) IIC Ex de motor schedule drawing
ES1E100558	1 of 1	0	08 Jul 15	FR.100L IIB Ex d motor schedule drawing
ES1E100559	1 of 1	0	08 Jul 15	FR.100L IIB Ex de motor schedule drawing
ES1E100560	1 of 1	0	08 Jul 15	FR.100L IIC Ex d motor schedule drawing
ES1E100561	1 of 1	0	08 Jul 15	FR.100L IIC Ex de motor schedule drawing
ES1E100562	1 of 1	0	08 Jul 15	FR.112M(182T,184T) IIB Ex d motor schedule drawing
ES1E100563	1 of 1	0	08 Jul 15	FR.112M(182T,184T) IIB Ex de motor schedule drawing
ES1E100564	1 of 1	0	08 Jul 15	FR.112M(182T,184T) IIC Ex d motor schedule drawing
ES1E100565	1 of 1	0	08 Jul 15	FR.112M(182T,184T) IIC Ex de motor schedule drawing
ES1E100566	1 of 1	0	08 Jul 15	FR.132S(213T) IIB Ex d motor schedule drawing
ES1E100567	1 of 1	0	08 Jul 15	FR.132S(213T) IIB Ex de motor schedule drawing
ES1E100568	1 of 1	0	08 Jul 15	FR.132S(213T) IIC Ex d motor schedule drawing
ES1E100569	1 of 1	0	08 Jul 15	FR.132S(213T) IIC Ex de motor schedule drawing
ES1E100570	1 of 1	0	08 Jul 15	FR.132M(215T) IIB Ex d motor schedule drawing
ES1E100571	1 of 1	0	08 Jul 15	FR.132M(215T) IIB Ex de motor schedule drawing
ES1E100572	1 of 1	0	08 Jul 15	FR.132M(215T) IIC Ex d motor schedule drawing
ES1E100573	1 of 1	0	08 Jul 15	FR.132M(215T) IIC Ex de motor schedule drawing
ES1E100574	1 of 1	0	08 Jul 15	FR.160M(254T) IIB Ex d motor schedule drawing
ES1E100575	1 of 1	0	08 Jul 15	FR.160M(254T) IIB Ex de motor schedule drawing
ES1E100576	1 of 1	0	08 Jul 15	FR.160M(254T) IIC Ex d motor schedule drawing
ES1E100577	1 of 1	0	08 Jul 15	FR.160M(254T) IIC Ex de motor schedule drawing
ES1E100578	1 of 1	0	08 Jul 15	FR.160L(256T) IIB Ex d motor schedule drawing
ES1E100579	1 of 1	0	08 Jul 15	FR.160L(256T) IIB Ex de motor schedule drawing
ES1E100580	1 of 1	0	08 Jul 15	FR.160L(256T) IIC Ex d motor schedule drawing
ES1E100581	1 of 1	0	08 Jul 15	FR.160L(256T) IIC Ex de motor schedule drawing
ES1E100582	1 of 1	0	08 Jul 15	FR.180M(284T) IIB Ex d motor schedule drawing
ES1E100583	1 of 1	0	08 Jul 15	FR.180M(284T) IIB Ex de motor schedule drawing

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Certificate Annexe

Certificate Number: **Sira 15ATEX1064X**

Equipment: **Explosion Proof Induction Motors Model Series**
E******** (11 Digits for Flameproof)**
E******** (13 Digits for Dust)**

Applicant: **HYOSUNG CORPORATION**

Drawing	Sheets	Rev.	Date (Sira Stamp)	Title
ES1E100584	1 of 1	0	08 Jul 15	FR.180M(284T) IIC Ex d motor schedule drawing
ES1E100585	1 of 1	0	08 Jul 15	FR.180M(284T) IIC Ex de motor schedule drawing
ES1E100586	1 of 1	0	08 Jul 15	FR.180L(286T) IIB Ex d motor schedule drawing
ES1E100587	1 of 1	0	08 Jul 15	FR.180L(286T) IIB Ex de motor schedule drawing
ES1E100588	1 of 1	0	08 Jul 15	FR.180L(286T) IIC Ex d motor schedule drawing
ES1E100589	1 of 1	0	08 Jul 15	FR.180L(286T) IIC Ex de motor schedule drawing
ES1E100590	1 of 1	0	08 Jul 15	FR.200L(326T) IIB Ex d motor schedule drawing
ES1E100591	1 of 1	0	08 Jul 15	FR.200L(326T) IIB Ex de motor schedule drawing
ES1E100592	1 of 1	0	08 Jul 15	FR.200L(326T) IIC Ex d motor schedule drawing
ES1E100593	1 of 1	0	08 Jul 15	FR.200L(326T) IIC Ex de motor schedule drawing
ES1E100594	1 of 1	0	08 Jul 15	FR.225S(364T) IIB Ex d motor schedule drawing
ES1E100595	1 of 1	0	08 Jul 15	FR.225S(364T) IIB Ex de motor schedule drawing
ES1E100596	1 of 1	0	08 Jul 15	FR.225S(364T) IIC Ex d motor schedule drawing
ES1E100597	1 of 1	0	08 Jul 15	FR.225S(364T) IIC Ex de motor schedule drawing
ES1E100598	1 of 1	0	08 Jul 15	FR.250S(404T) IIB Ex d motor schedule drawing
ES1E100599	1 of 1	0	08 Jul 15	FR.250S(404T) IIB Ex de motor schedule drawing
ES1E100600	1 of 1	0	08 Jul 15	FR.250S(404T) IIC Ex d motor schedule drawing
ES1E100601	1 of 1	0	08 Jul 15	FR.250S(404T) IIC Ex de motor schedule drawing
ES1E100602	1 of 1	0	08 Jul 15	FR.250M(405T) IIB Ex d motor schedule drawing
ES1E100603	1 of 1	0	08 Jul 15	FR.250M(405T) IIB Ex de motor schedule drawing
ES1E100604	1 of 1	0	08 Jul 15	FR.250M(405T) IIC Ex d motor schedule drawing
ES1E100605	1 of 1	0	08 Jul 15	FR.250M(405T) IIC Ex de motor schedule drawing
ES1E100606	1 of 1	0	08 Jul 15	FR.280S(444T) IIB Ex d motor schedule drawing
ES1E100607	1 of 1	0	08 Jul 15	FR.280S(444T) IIB Ex de motor schedule drawing
ES1E100608	1 of 1	0	08 Jul 15	FR.280S(444T) IIC Ex d motor schedule drawing
ES1E100609	1 of 1	0	08 Jul 15	FR.280S(444T) IIC Ex de motor schedule drawing
ES1E100610	1 of 1	0	08 Jul 15	FR.280M(445T) IIB Ex d motor schedule drawing
ES1E100611	1 of 1	0	08 Jul 15	FR.280M(445T) IIB Ex de motor schedule drawing
ES1E100612	1 of 1	0	08 Jul 15	FR.280M(445T) IIC Ex d motor schedule drawing
ES1E100613	1 of 1	0	08 Jul 15	FR.280M(445T) IIC Ex de motor schedule drawing
ES1E100614	1 of 1	0	08 Jul 15	FR.280L(447T) IIB Ex d motor schedule drawing
ES1E100615	1 of 1	0	08 Jul 15	FR.280L(447T) IIB Ex de motor schedule drawing
ES1E100616	1 of 1	0	08 Jul 15	FR.280L(447T) IIC Ex d motor schedule drawing
ES1E100617	1 of 1	0	08 Jul 15	FR.280L(447T) IIC Ex de motor schedule drawing
ES1E100618	1 of 1	0	08 Jul 15	FR.315S IIB Ex d motor schedule drawing
ES1E100619	1 of 1	0	08 Jul 15	FR.315S IIB Ex de motor schedule drawing
ES1E100620	1 of 1	0	08 Jul 15	FR.315S IIC Ex d motor schedule drawing
ES1E100621	1 of 1	0	08 Jul 15	FR.315S IIC Ex de motor schedule drawing
ES1E100622	1 of 1	0	08 Jul 15	FR.315M IIB Ex d motor schedule drawing
ES1E100623	1 of 1	0	08 Jul 15	FR.315M IIB Ex de motor schedule drawing
ES1E100624	1 of 1	0	08 Jul 15	FR.315M IIC Ex d motor schedule drawing
ES1E100625	1 of 1	0	08 Jul 15	FR.315M IIC Ex de motor schedule drawing
ES1E100626	1 of 1	0	08 Jul 15	FR.315M(50Hz only) IIB Ex d motor schedule drawing
ES1E100627	1 of 1	0	08 Jul 15	FR.315M(50Hz only) IIB Ex de motor schedule drawing
ES1E100628	1 of 1	0	08 Jul 15	FR.315M(50Hz only) IIC Ex d motor schedule drawing

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Certificate Annexe

Certificate Number: **Sira 15ATEX1064X**

Equipment: **Explosion Proof Induction Motors Model Series**
E******** (11 Digits for Flameproof)**
E******** (13 Digits for Dust)**

Applicant: **HYOSUNG CORPORATION**

Drawing	Sheets	Rev.	Date (Sira Stamp)	Title
ES1E100629	1 of 1	0	08 Jul 15	FR.315M(50Hz only) IIC Ex de motor schedule drawing
ES1E100634	1 of 1	0	08 Jul 15	Ex e AUX. Terminal box schedule drawing #1
ES1E100635	1 of 1	0	08 Jul 15	Ex e AUX. Terminal box schedule drawing #2
ES1E100636	1 of 1	0	08 Jul 15	Ex e Main Terminal box schedule drawing for FR.71 thru FR.180(140T thru 280T) #1
ES1E100650	1 of 1	0	08 Jul 15	Ex e Main Terminal box schedule drawing for FR.71 thru FR.180(140T thru 280T) #2
ES1E100637	1 of 1	0	08 Jul 15	Ex e Main Terminal box schedule drawing for FR.160 thru FR.200(250T thru 320T)
ES1E100638	1 of 1	0	08 Jul 15	Ex e Main Terminal box schedule drawing for FR.200 thru FR.225(320T thru 360T)
ES1E100639	1 of 1	0	08 Jul 15	Ex e Main Terminal box schedule drawing for FR.225 thru FR.250(360T thru 400T)
ES1E100640	1 of 1	0	08 Jul 15	Ex e Main Terminal box schedule drawing for FR.250 thru FR.315(400T thru 440T)
ES1E100641	1 of 1	0	08 Jul 15	Ex e Main Terminal box schedule drawing for FR.280 thru FR.315(440T)
ES1E100642	1 of 1	0	08 Jul 15	Ex e Main Terminal box schedule drawing for FR.200 thru FR.315(320T thru 440T)
ES1E100643	1 of 1	0	08 Jul 15	Ex e Main Terminal box schedule drawing for FR.250 thru FR.315(400T thru 440T)
ES1L100153	1 of 1	0	08 Jul 15	Frame drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100154	1 of 1	0	08 Jul 15	Endbell drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100155	1 of 1	0	08 Jul 15	Adapter drawing for FR.71 thru FR.315(140T thru 440T)
ES1B102112	1 of 1	0	08 Jul 15	Ex d Terminal box drawing for FR.71 thru FR.315(140T thru 440T)
ES1B102113	1 of 1	0	08 Jul 15	Ex d Terminal box cover drawing for FR.71 thru FR.315 (140T thru 440T)
ES1G100782	1 of 1	0	08 Jul 15	Name plate drawing for FR.71 thru FR.100
ES1G100783	1 of 1	0	08 Jul 15	Name plate drawing for FR.112 thru FR.315
ES1G100784	1 of 1	0	08 Jul 15	Inverter duty name plate drawing for FR.71 thru FR.100
ES1G100785	1 of 1	0	08 Jul 15	Inverter duty name plate drawing for FR.112 thru FR.315
ES1G100817	1 of 1	0	28 Jul 15	Certification name plate drawing for FR.71 thru FR.315 (140T thru 440T)
ES1L100156	1 of 1	0	08 Jul 15	Cooling fan drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100165	1 of 1	0	08 Jul 15	AUX. Terminal block drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100166	1 of 1	0	08 Jul 15	Sealing construction drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100175	1 of 1	0	08 Jul 15	Adapter plate drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100169	1 of 1	0	08 Jul 15	Max. output drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100170	1 of 1	0	08 Jul 15	Temperature code and inverter duty range drawing for FR.71 thru FR.315(140T thru 440T)
ES1E100748	1 of 1	0	24 Aug 15	Assembly Drawing – motor without terminal box(es)

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Issue 2

Drawing	Sheets	Rev.	Date (Sira stamp)	Title
ES1E100546	1 of 1	1	29 Dec 16	FR.71M IIB Ex d motor schedule drawing
ES1E100547	1 of 1	1	29 Dec 16	FR.71M IIB Ex de motor schedule drawing
ES1E100548	1 of 1	1	29 Dec 16	FR.71M IIC Ex d motor schedule drawing
ES1E100549	1 of 1	2	29 Dec 16	FR.71M IIC Ex de motor schedule drawing
ES1E100550	1 of 1	1	29 Dec 16	FR.80M IIB Ex d motor schedule drawing
ES1E100551	1 of 1	1	29 Dec 16	FR.80M IIB Ex de motor schedule drawing
ES1E100552	1 of 1	1	29 Dec 16	FR.80M IIC Ex d motor schedule drawing
ES1E100553	1 of 1	2	29 Dec 16	FR.80M IIC Ex de motor schedule drawing
ES1E100554	1 of 1	1	29 Dec 16	FR.90L(143T,145T) IIB Ex d motor schedule drawing
ES1E100555	1 of 1	1	29 Dec 16	FR.90L(143T,145T) IIB Ex de motor schedule drawing
ES1E100556	1 of 1	1	29 Dec 16	FR.90L(143T,145T) IIC Ex d motor schedule drawing
ES1E100557	1 of 1	2	29 Dec 16	FR.90L(143T,145T) IIC Ex de motor schedule drawing
ES1E100558	1 of 1	1	29 Dec 16	FR.100L IIB Ex d motor schedule drawing
ES1E100559	1 of 1	1	29 Dec 16	FR.100L IIB Ex de motor schedule drawing
ES1E100560	1 of 1	1	29 Dec 16	FR.100L IIC Ex d motor schedule drawing
ES1E100561	1 of 1	2	29 Dec 16	FR.100L IIC Ex de motor schedule drawing
ES1E100562	1 of 1	1	29 Dec 16	FR.112M(182T,184T) IIB Ex d motor schedule drawing
ES1E100563	1 of 1	1	29 Dec 16	FR.112M(182T,184T) IIB Ex de motor schedule drawing
ES1E100564	1 of 1	1	29 Dec 16	FR.112M(182T,184T) IIC Ex d motor schedule drawing
ES1E100565	1 of 1	2	29 Dec 16	FR.112M(182T,184T) IIC Ex de motor schedule drawing
ES1E100566	1 of 1	1	29 Dec 16	FR.132S(213T) IIB Ex d motor schedule drawing
ES1E100567	1 of 1	1	29 Dec 16	FR.132S(213T) IIB Ex de motor schedule drawing
ES1E100568	1 of 1	1	29 Dec 16	FR.132S(213T) IIC Ex d motor schedule drawing
ES1E100569	1 of 1	2	29 Dec 16	FR.132S(213T) IIC Ex de motor schedule drawing
ES1E100570	1 of 1	2	29 Dec 16	FR.132M(215T) IIB Ex d motor schedule drawing
ES1E100571	1 of 1	2	29 Dec 16	FR.132M(215T) IIB Ex de motor schedule drawing
ES1E100572	1 of 1	2	29 Dec 16	FR.132M(215T) IIC Ex d motor schedule drawing
ES1E100573	1 of 1	3	29 Dec 16	FR.132M(215T) IIC Ex de motor schedule drawing
ES1E100574	1 of 1	1	29 Dec 16	FR.160M(254T) IIB Ex d motor schedule drawing
ES1E100575	1 of 1	1	29 Dec 16	FR.160M(254T) IIB Ex de motor schedule drawing
ES1E100576	1 of 1	1	29 Dec 16	FR.160M(254T) IIC Ex d motor schedule drawing
ES1E100577	1 of 1	2	29 Dec 16	FR.160M(254T) IIC Ex de motor schedule drawing
ES1E100578	1 of 1	1	29 Dec 16	FR.160L(256T) IIB Ex d motor schedule drawing
ES1E100579	1 of 1	1	29 Dec 16	FR.160L(256T) IIB Ex de motor schedule drawing
ES1E100580	1 of 1	1	29 Dec 16	FR.160L(256T) IIC Ex d motor schedule drawing
ES1E100581	1 of 1	2	29 Dec 16	FR.160L(256T) IIC Ex de motor schedule drawing
ES1E100582	1 of 1	2	29 Dec 16	FR.180M(284T) IIB Ex d motor schedule drawing
ES1E100583	1 of 1	2	29 Dec 16	FR.180M(284T) IIB Ex de motor schedule drawing
ES1E100584	1 of 1	2	29 Dec 16	FR.180M(284T) IIC Ex d motor schedule drawing
ES1E100585	1 of 1	3	29 Dec 16	FR.180M(284T) IIC Ex de motor schedule drawing
ES1E100586	1 of 1	1	29 Dec 16	FR.180L(286T) IIB Ex d motor schedule drawing
ES1E100587	1 of 1	1	29 Dec 16	FR.180L(286T) IIB Ex de motor schedule drawing
ES1E100588	1 of 1	1	29 Dec 16	FR.180L(286T) IIC Ex d motor schedule drawing
ES1E100589	1 of 1	2	29 Dec 16	FR.180L(286T) IIC Ex de motor schedule drawing

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Certificate Annexe

Certificate Number: **Sira 15ATEX1064X**

Equipment: **Explosion Proof Induction Motors Model Series**
E******** (11 Digits for Flameproof)**
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Applicant: **HYOSUNG CORPORATION**

Drawing	Sheets	Rev.	Date (Sira stamp)	Title
ES1E100590	1 of 1	1	29 Dec 16	FR.200L(326T) IIB Ex d motor schedule drawing
ES1E100591	1 of 1	1	29 Dec 16	FR.200L(326T) IIB Ex de motor schedule drawing
ES1E100592	1 of 1	1	29 Dec 16	FR.200L(326T) IIC Ex d motor schedule drawing
ES1E100593	1 of 1	2	29 Dec 16	FR.200L(326T) IIC Ex de motor schedule drawing
ES1E100594	1 of 1	1	29 Dec 16	FR.225S(364T) IIB Ex d motor schedule drawing
ES1E100595	1 of 1	1	29 Dec 16	FR.225S(364T) IIB Ex de motor schedule drawing
ES1E100596	1 of 1	1	29 Dec 16	FR.225S(364T) IIC Ex d motor schedule drawing
ES1E100597	1 of 1	2	29 Dec 16	FR.225S(364T) IIC Ex de motor schedule drawing
ES1E100598	1 of 1	1	29 Dec 16	FR.250S(404T) IIB Ex d motor schedule drawing
ES1E100599	1 of 1	1	29 Dec 16	FR.250S(404T) IIB Ex de motor schedule drawing
ES1E100600	1 of 1	1	29 Dec 16	FR.250S(404T) IIC Ex d motor schedule drawing
ES1E100601	1 of 1	2	29 Dec 16	FR.250S(404T) IIC Ex de motor schedule drawing
ES1E100602	1 of 1	1	29 Dec 16	FR.250M(405T) IIB Ex d motor schedule drawing
ES1E100603	1 of 1	1	29 Dec 16	FR.250M(405T) IIB Ex de motor schedule drawing
ES1E100604	1 of 1	1	29 Dec 16	FR.250M(405T) IIC Ex d motor schedule drawing
ES1E100605	1 of 1	2	29 Dec 16	FR.250M(405T) IIC Ex de motor schedule drawing
ES1E100606	1 of 1	1	29 Dec 16	FR.280S(444T) IIB Ex d motor schedule drawing
ES1E100607	1 of 1	1	29 Dec 16	FR.280S(444T) IIB Ex de motor schedule drawing
ES1E100608	1 of 1	1	29 Dec 16	FR.280S(444T) IIC Ex d motor schedule drawing
ES1E100609	1 of 1	2	29 Dec 16	FR.280S(444T) IIC Ex de motor schedule drawing
ES1E100610	1 of 1	1	29 Dec 16	FR.280M(445T) IIB Ex d motor schedule drawing
ES1E100611	1 of 1	1	29 Dec 16	FR.280M(445T) IIB Ex de motor schedule drawing
ES1E100612	1 of 1	1	29 Dec 16	FR.280M(445T) IIC Ex d motor schedule drawing
ES1E100613	1 of 1	2	29 Dec 16	FR.280M(445T) IIC Ex de motor schedule drawing
ES1E100614	1 of 1	1	29 Dec 16	FR.280L(447T) IIB Ex d motor schedule drawing
ES1E100615	1 of 1	1	29 Dec 16	FR.280L(447T) IIB Ex de motor schedule drawing
ES1E100616	1 of 1	1	29 Dec 16	FR.280L(447T) IIC Ex d motor schedule drawing
ES1E100617	1 of 1	2	29 Dec 16	FR.280L(447T) IIC Ex de motor schedule drawing
ES1E100618	1 of 1	1	29 Dec 16	FR.315S IIB Ex d motor schedule drawing
ES1E100619	1 of 1	1	29 Dec 16	FR.315S IIB Ex de motor schedule drawing
ES1E100620	1 of 1	1	29 Dec 16	FR.315S IIC Ex d motor schedule drawing
ES1E100621	1 of 1	2	29 Dec 16	FR.315S IIC Ex de motor schedule drawing
ES1E100622	1 of 1	1	29 Dec 16	FR.315M IIB Ex d motor schedule drawing
ES1E100623	1 of 1	1	29 Dec 16	FR.315M IIB Ex de motor schedule drawing
ES1E100624	1 of 1	1	29 Dec 16	FR.315M IIC Ex d motor schedule drawing
ES1E100625	1 of 1	2	29 Dec 16	FR.315M IIC Ex de motor schedule drawing
ES1E100626	1 of 1	1	29 Dec 16	FR.315M(50Hz only) IIB Ex d motor schedule drawing
ES1E100627	1 of 1	1	29 Dec 16	FR.315M(50Hz only) IIB Ex de motor schedule drawing
ES1E100628	1 of 1	1	29 Dec 16	FR.315M(50Hz only) IIC Ex d motor schedule drawing
ES1E100629	1 of 1	2	29 Dec 16	FR.315M(50Hz only) IIC Ex de motor schedule drawing
ES1E100634	1 of 1	1	29 Dec 16	Ex e AUX. Terminal box schedule drawing #1
ES1E100635	1 of 1	1	29 Dec 16	Ex e AUX. Terminal box schedule drawing #2
ES1E100636	1 of 1	1	29 Dec 16	Ex e Main Terminal box schedule drawing for FR.71 thru FR.180(140T thru 280T) #1

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Certificate Annexe

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Drawing	Sheets	Rev.	Date (Sira stamp)	Title
ES1E100650	1 of 1	1	29 Dec 16	Ex e Main Terminal box schedule drawing for FR.71 thru FR.180(140T thru 280T) #2
ES1E100637	1 of 1	1	29 Dec 16	Ex e Main Terminal box schedule drawing for FR.160 thru FR.200(250T thru 320T)
ES1E100638	1 of 1	1	29 Dec 16	Ex e Main Terminal box schedule drawing for FR.200 thru FR.225(320T thru 360T)
ES1E100639	1 of 1	1	29 Dec 16	Ex e Main Terminal box schedule drawing for FR.225 thru FR.250(360T thru 400T)
ES1E100640	1 of 1	1	29 Dec 16	Ex e Main Terminal box schedule drawing for FR.250 thru FR.315(400T thru 440T)
ES1E100641	1 of 1	1	29 Dec 16	Ex e Main Terminal box schedule drawing for FR.280 thru FR.315(440T)
ES1E100642	1 of 1	1	29 Dec 16	Ex e Main Terminal box schedule drawing for FR.200 thru FR.315(320T thru 440T)
ES1E100643	1 of 1	1	29 Dec 16	Ex e Main Terminal box schedule drawing for FR.250 thru FR.315(400T thru 440T)
ES1L100153	1 of 1	1	29 Dec 16	Frame drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100154	1 of 1	1	29 Dec 16	Endbell drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100155	1 of 1	1	29 Dec 16	Adapter drawing for FR.71 thru FR.315(140T thru 440T)
ES1B102112	1 of 1	1	29 Dec 16	Ex d Terminal box drawing for FR.71 thru FR.315(140T thru 440T)
ES1B102113	1 of 1	1	29 Dec 16	Ex d Terminal box cover drawing for FR.71 thru FR.315 (140T thru 440T)
ES1G100782	1 of 1	0	29 Dec 16	Name plate drawing for FR.71 thru FR.100
ES1G100783	1 of 1	1	29 Dec 16	Name plate drawing for FR.112 thru FR.315
ES1G100784	1 of 1	0	29 Dec 16	Inverter duty name plate drawing for FR.71 thru FR.100
ES1G100785	1 of 1	1	29 Dec 16	Inverter duty name plate drawing for FR.112 thru FR.315
ES1G100817	1 of 1	1	29 Dec 16	Certification name plate drawing for FR.71 thru FR.315 (140T thru 440T)
ES1L100156	1 of 1	0	29 Dec 16	Cooling fan drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100165	1 of 1	0	29 Dec 16	AUX. Terminal block drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100166	1 of 1	1	29 Dec 16	Sealing construction drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100175	1 of 1	1	29 Dec 16	Adapter plate drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100169	1 of 1	1	29 Dec 16	Max. output drawing for FR.71 thru FR.315(140T thru 440T)
ES1L100170	1 of 1	0	29 Dec 16	Temperature code and inverter duty range drawing for FR.71 thru FR.315(140T thru 440T)
ES1G101105	1 of 1	1	29 Dec 16	Name plate drawing for FR.71 thru FR.100 (Ex tb)
ES1G101106	1 of 1	1	29 Dec 16	Name plate drawing for FR.112 thru FR.315 (Ex tb)
ES1G101107	1 of 1	1	29 Dec 16	_Inverter duty name plate drawing for FR.71 thru FR.100 (Ex tb)

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Drawing	Sheets	Rev.	Date (Sira stamp)	Title
ES1G101108	1 of 1	2	29 Dec 16	Inverter duty name plate drawing for FR.112 thru FR.315 (Ex tb)
ES1G101109	1 of 1	3	29 Dec 16	Certification name plate drawing fort FR.71 thru FR.315 (140T thru 440T) (Ex tb)
ES1G101120	1 of 1	0	29 Dec 16	certificate name plate drawing for Fr.71 thru fr.71(140T thur440T) Ex tc
ES1G101121	1 of 1	0	29 Dec 16	Name plate drawing for FR.112 thru FR.315 (Ex tc)
ES1G101122	1 of 1	0	29 Dec 16	Inverter duty name plate drawing for FR.71 thru FR.100 (Ex tc)
ES1G101123	1 of 1	0	29 Dec 16	Name plate drawing for FR.71 thru FR.100 (Ex tc)
ES1G101124	1 of 1	0	29 Dec 16	Inverter duty name plate drawing for FR.112 thru FR.315 (Ex tc
ES1L100230	1 of 1	0	29 Dec 16	Max. surface temperature and inverter duty range drawing for FR.71 thru FR.315(140T thru 440T)

Issue 3

Drawing	Sheets	Rev.	Date (Sira stamp)	Title
ES1E100630	1 of 1	1	07 Dec 17	Flame path joints and gaps drawing for IIB Ex db motor
ES1E100631	1 of 1	1	07 Dec 17	Flame path joints and gaps drawing for IIB Ex db e motor
ES1E100632	1 of 1	1	07 Dec 17	Flame path joints and gaps drawing for IIC Ex db motor
ES1E100633	1 of 1	1	07 Dec 17	Flame path joints and gaps drawing for IIC Ex db e motor
ES1E100546	1 of 1	2	07 Dec 17	FR.71M IIB Ex db motor schedule drawing
ES1E100547	1 of 1	2	07 Dec 17	FR.71M IIB Ex db e motor schedule drawing
ES1E100548	1 of 1	2	07 Dec 17	FR.71M IIC Ex db motor schedule drawing
ES1E100549	1 of 1	3	07 Dec 17	FR.71M IIC Ex db e motor schedule drawing
ES1E100550	1 of 1	2	07 Dec 17	FR.80M IIB Ex db motor schedule drawing
ES1E100551	1 of 1	2	07 Dec 17	FR.80M IIB Ex db e motor schedule drawing
ES1E100552	1 of 1	2	07 Dec 17	FR.80M IIC Ex db motor schedule drawing
ES1E100553	1 of 1	3	07 Dec 17	FR.80M IIC Ex db e motor schedule drawing
ES1E100554	1 of 1	2	07 Dec 17	FR.90L(143T,145T) IIB Ex db motor schedule drawing
ES1E100555	1 of 1	2	07 Dec 17	FR.90L(143T,145T) IIB Ex db e motor schedule drawing
ES1E100556	1 of 1	2	07 Dec 17	FR.90L(143T,145T) IIC Ex db motor schedule drawing
ES1E100557	1 of 1	3	07 Dec 17	FR.90L(143T,145T) IIC Ex db e motor schedule drawing
ES1E100558	1 of 1	2	07 Dec 17	FR.100L IIB Ex db motor schedule drawing
ES1E100559	1 of 1	2	07 Dec 17	FR.100L IIB Ex db e motor schedule drawing
ES1E100560	1 of 1	2	07 Dec 17	FR.100L IIC Ex db motor schedule drawing
ES1E100561	1 of 1	3	07 Dec 17	FR.100L IIC Ex db e motor schedule drawing
ES1E100562	1 of 1	2	07 Dec 17	FR.112M(182T,184T) IIB Ex db motor schedule drawing
ES1E100563	1 of 1	2	07 Dec 17	FR.112M(182T,184T) IIB Ex db e motor schedule drawing
ES1E100564	1 of 1	2	07 Dec 17	FR.112M(182T,184T) IIC Ex db motor schedule drawing
ES1E100565	1 of 1	3	07 Dec 17	FR.112M(182T,184T) IIC Ex db e motor schedule drawing
ES1E100566	1 of 1	2	07 Dec 17	FR.132S(213T) IIB Ex db motor schedule drawing
ES1E100567	1 of 1	2	07 Dec 17	FR.132S(213T) IIB Ex db e motor schedule drawing
ES1E100568	1 of 1	2	07 Dec 17	FR.132S(213T) IIC Ex db motor schedule drawing
ES1E100569	1 of 1	3	07 Dec 17	FR.132S(213T) IIC Ex db e motor schedule drawing

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Certificate Annexe

Certificate Number: **Sira 15ATEX1064X**

Equipment: **Explosion Proof Induction Motors Model Series**
E******** (11 Digits for Flameproof)**
E******** (13 Digits for Dust)**

Applicant: **HYOSUNG CORPORATION**

Drawing	Sheets	Rev.	Date (Sira stamp)	Title
ES1E100570	1 of 1	3	07 Dec 17	FR.132M(215T) IIB Ex db motor schedule drawing
ES1E100571	1 of 1	3	07 Dec 17	FR.132M(215T) IIB Ex db e motor schedule drawing
ES1E100572	1 of 1	3	07 Dec 17	FR.132M(215T) IIC Ex db motor schedule drawing
ES1E100573	1 of 1	4	07 Dec 17	FR.132M(215T) IIC Ex db e motor schedule drawing
ES1E100574	1 of 1	2	07 Dec 17	FR.160M(254T) IIB Ex db motor schedule drawing
ES1E100575	1 of 1	2	07 Dec 17	FR.160M(254T) IIB Ex db e motor schedule drawing
ES1E100576	1 of 1	2	07 Dec 17	FR.160M(254T) IIC Ex db motor schedule drawing
ES1E100577	1 of 1	3	07 Dec 17	FR.160M(254T) IIC Ex db e motor schedule drawing
ES1E100578	1 of 1	2	07 Dec 17	FR.160L(256T) IIB Ex db motor schedule drawing
ES1E100579	1 of 1	2	07 Dec 17	FR.160L(256T) IIB Ex db e motor schedule drawing
ES1E100580	1 of 1	2	07 Dec 17	FR.160L(256T) IIC Ex db motor schedule drawing
ES1E100581	1 of 1	3	07 Dec 17	FR.160L(256T) IIC Ex db e motor schedule drawing
ES1E100582	1 of 1	3	07 Dec 17	FR.180M(284T) IIB Ex db motor schedule drawing
ES1E100583	1 of 1	3	07 Dec 17	FR.180M(284T) IIB Ex db e motor schedule drawing
ES1E100584	1 of 1	3	07 Dec 17	FR.180M(284T) IIC Ex db motor schedule drawing
ES1E100585	1 of 1	4	07 Dec 17	FR.180M(284T) IIC Ex db e motor schedule drawing
ES1E100586	1 of 1	2	07 Dec 17	FR.180L(286T) IIB Ex db motor schedule drawing
ES1E100587	1 of 1	2	07 Dec 17	FR.180L(286T) IIB Ex db e motor schedule drawing
ES1E100588	1 of 1	2	07 Dec 17	FR.180L(286T) IIC Ex db motor schedule drawing
ES1E100589	1 of 1	3	07 Dec 17	FR.180L(286T) IIC Ex db e motor schedule drawing
ES1E100590	1 of 1	2	07 Dec 17	FR.200L(326T) IIB Ex db motor schedule drawing
ES1E100591	1 of 1	2	07 Dec 17	FR.200L(326T) IIB Ex db e motor schedule drawing
ES1E100592	1 of 1	2	07 Dec 17	FR.200L(326T) IIC Ex db motor schedule drawing
ES1E100593	1 of 1	3	07 Dec 17	FR.200L(326T) IIC Ex db e motor schedule drawing
ES1E100594	1 of 1	2	07 Dec 17	FR.225S(364T) IIB Ex db motor schedule drawing
ES1E100595	1 of 1	2	07 Dec 17	FR.225S(364T) IIB Ex db e motor schedule drawing
ES1E100596	1 of 1	2	07 Dec 17	FR.225S(364T) IIC Ex db motor schedule drawing
ES1E100597	1 of 1	3	07 Dec 17	FR.225S(364T) IIC Ex db e motor schedule drawing
ES1E100598	1 of 1	2	07 Dec 17	FR.250S(404T) IIB Ex db motor schedule drawing
ES1E100599	1 of 1	2	07 Dec 17	FR.250S(404T) IIB Ex db e motor schedule drawing
ES1E100600	1 of 1	2	07 Dec 17	FR.250S(404T) IIC Ex db motor schedule drawing
ES1E100601	1 of 1	3	07 Dec 17	FR.250S(404T) IIC Ex db e motor schedule drawing
ES1E100602	1 of 1	2	07 Dec 17	FR.250M(405T) IIB Ex db motor schedule drawing
ES1E100603	1 of 1	2	07 Dec 17	FR.250M(405T) IIB Ex db e motor schedule drawing
ES1E100604	1 of 1	2	07 Dec 17	FR.250M(405T) IIC Ex db motor schedule drawing
ES1E100605	1 of 1	3	07 Dec 17	FR.250M(405T) IIC Ex db e motor schedule drawing
ES1E100606	1 of 1	2	07 Dec 17	FR.280S(444T) IIB Ex db motor schedule drawing
ES1E100607	1 of 1	2	07 Dec 17	FR.280S(444T) IIB Ex db e motor schedule drawing
ES1E100608	1 of 1	2	07 Dec 17	FR.280S(444T) IIC Ex db motor schedule drawing
ES1E100609	1 of 1	3	07 Dec 17	FR.280S(444T) IIC Ex db e motor schedule drawing
ES1E100610	1 of 1	2	07 Dec 17	FR.280M(445T) IIB Ex db motor schedule drawing
ES1E100611	1 of 1	2	07 Dec 17	FR.280M(445T) IIB Ex db e motor schedule drawing
ES1E100612	1 of 1	2	07 Dec 17	FR.280M(445T) IIC Ex db motor schedule drawing
ES1E100613	1 of 1	3	07 Dec 17	FR.280M(445T) IIC Ex db e motor schedule drawing
ES1E100614	1 of 1	2	07 Dec 17	FR.280L(447T) IIB Ex db motor schedule drawing

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Certificate Annexe

Certificate Number: **Sira 15ATEX1064X**

Equipment: **Explosion Proof Induction Motors Model Series**
E******** (11 Digits for Flameproof)**
E******** (13 Digits for Dust)**

Applicant: **HYOSUNG CORPORATION**

Drawing	Sheets	Rev.	Date (Sira stamp)	Title
ES1E100615	1 of 1	2	07 Dec 17	FR.280L(447T) IIB Ex db e motor schedule drawing
ES1E100616	1 of 1	2	07 Dec 17	FR.280L(447T) IIC Ex db motor schedule drawing
ES1E100617	1 of 1	3	07 Dec 17	FR.280L(447T) IIC Ex db e motor schedule drawing
ES1E100618	1 of 1	2	07 Dec 17	FR.315S IIB Ex db motor schedule drawing
ES1E100619	1 of 1	2	07 Dec 17	FR.315S IIB Ex db e motor schedule drawing
ES1E100620	1 of 1	2	07 Dec 17	FR.315S IIC Ex db motor schedule drawing
ES1E100621	1 of 1	3	07 Dec 17	FR.315S IIC Ex db e motor schedule drawing
ES1E100622	1 of 1	2	07 Dec 17	FR.315M IIB Ex db motor schedule drawing
ES1E100623	1 of 1	2	07 Dec 17	FR.315M IIB Ex db e motor schedule drawing
ES1E100624	1 of 1	2	07 Dec 17	FR.315M IIC Ex db motor schedule drawing
ES1E100625	1 of 1	3	07 Dec 17	FR.315M IIC Ex db e motor schedule drawing
ES1E100626	1 of 1	2	07 Dec 17	FR.315M(50Hz only) IIB Ex db motor schedule drawing
ES1E100627	1 of 1	2	07 Dec 17	FR.315M(50Hz only) IIB Ex db e motor schedule drawing
ES1E100628	1 of 1	2	07 Dec 17	FR.315M(50Hz only) IIC Ex db motor schedule drawing
ES1E100629	1 of 1	3	07 Dec 17	FR.315M(50Hz only) IIC Ex db e motor schedule drawing
ES1G100782	1 of 1	1	07 Dec 17	Name plate drawing for FR.71 thru FR.100
ES1G100783	1 of 1	2	07 Dec 17	Name plate drawing for FR.112 thru FR.315
ES1G100784	1 of 1	1	07 Dec 17	Inverter duty name plate drawing for FR.71 thru FR.100
ES1G100785	1 of 1	2	07 Dec 17	Inverter duty name plate drawing for FR.112 thru FR.315
ES1G100817	1 of 1	2	07 Dec 17	Certification name plate drawing for FR.71 thru FR.315 (140T thru 440T)

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