■ 산업안전보건법 시행규칙 [별지 제10호의 5서식]

심사결과 통지서

신청인	사업장명	(주)키토코리아	사업장관리번호	1258178204
	사업자등록번호	125-81-78204	대표자 성명	김원세
	소재지	경기 성남시 분당구 삼평동 625 판교세븐벤처벨리 1단지 3동 9층		

안전인증대상기계·기구명	호이스트		
형식(규격)	KML-SHER2-010	용량(등급)	1 ton

「산업안전보건법」 제34조 및 같은 법 시행규칙 제58조의4제4항에 따라 실시한

[ ] 예비심사

[■] 서면심사

[ ] 기술능력 및 생산체계 심사 결과가 [■] 적 합 / [ ] 부적합 함을 통지합니다.

[ ] 개별 제품심사

[ ] 형식별 제품심사

2013년 09월 16일

인증심사원 최 창 일 (서명 또는 인)

조 준 기 (서명 또는 인)

한국승강기안전기술원 이사장

【별지 제4호서식】

동 일 형 식 일 람 표

사업장명	KITO CORP.	개정일자 및 번호	2013.10.12	인증번호	
형식 및 모델번호		**동일형식 항목 및 내역**			
형식번호	모델번호	동일형식 항목1	동일형식 항목2	동일형식 항목3	동일형식 항목4
KML-SHER2-010	KITO-SHER2SP010L	Lift max 30m	권상모타 0.9kW	횡행모타 없음	Trolley 있음
	KITO-SHER2SP010IL				
	KITO-SHER2SG010L		권상모타 0.9kW		Trolley + 수동체인
	KITO-SHER2SG010IL				
	KITO-SHER2M010L-S		권상모타 0.9kW	횡행모터 0.4kW .S : 24m/min .L: 12m/min .IS:24/4m/min .IL:12/2m/min	전기Trolley 결합 type
	KITO-SHER2M010L-L				
	KITO-SHER2M010L-IS				
	KITO-SHER2M010L-IL				
	KITO-SHER2M010IL-S		권상모타 0.9kW		
	KITO-SHER2M010IL-L				
	KITO-SHER2M010IL-IS				
	KITO-SHER2M010IL-IL				
	KITO-C-SHER2M010L-S		권상모타 0.9kW		전기Trolley 결합 Clean type
	KITO-C-SHER2M010L-L				
	KITO-C-SHER2M010L-IS				
	KITO-C-SHER2M010L-IL				
	KITO-C-SHER2M010IL-S		권상모타 0.9kW		
	KITO-C-SHER2M010IL-L				
	KITO-C-SHER2M010IL-IS				
	KITO-C-SHER2M010IL-IL				

제 2012-BJ-0009 호

안 전 인 증 서

정호엔지니어링

경기도 광명시 노온사동 440-5

위 사업장에서 제조하는 아래의 품목이 산업안전보건법 제34조 및 같은 법 시행규칙 제58조의4제4항에 따른 안전인증 심사 결과 안전 · 보건기준에 적합하므로 안전인증표시의 사용을 인증합니다.

품 목

양중기용 과부하방지장치

형식 · 모델/용량 · 등급/인증번호

형식·모델	용량·등급	인증번호
JDL-100	J-2	12-AV2BJ-0009

인 증 기 준

방호장치 의무안전인증 고시(고용노동부고시 제2010-36호)

인 증 조 건

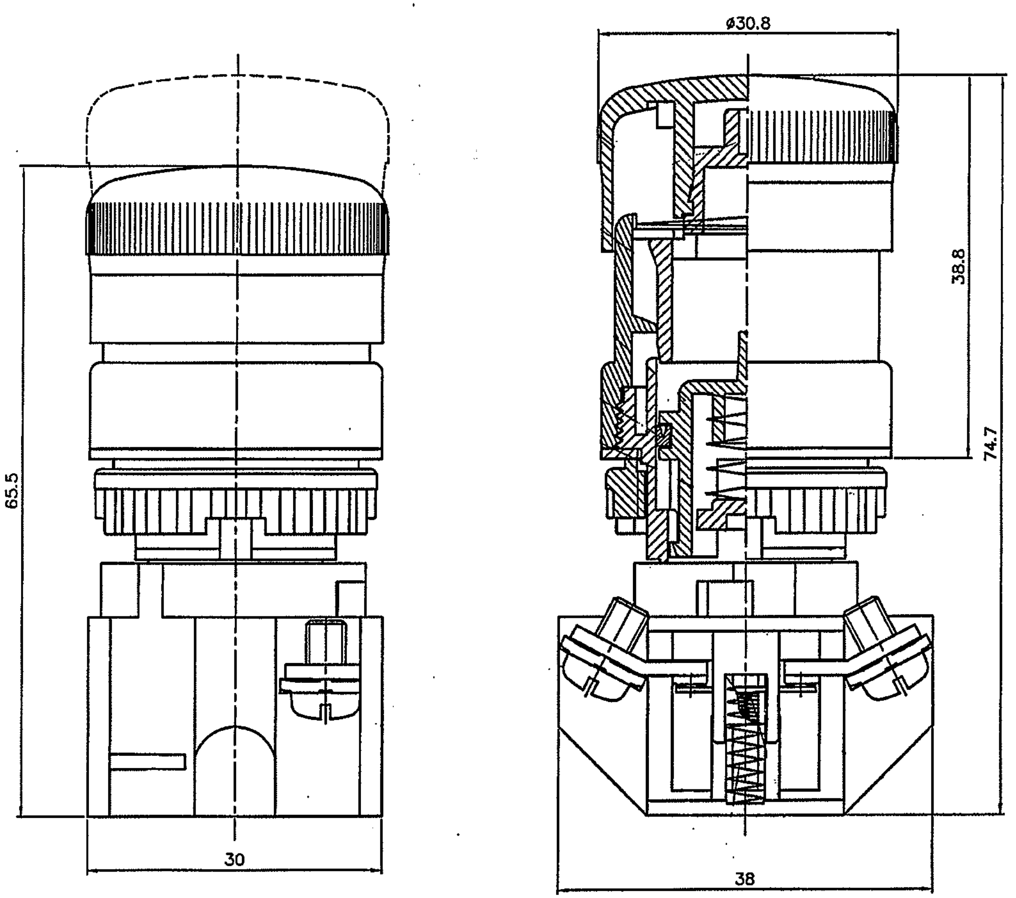
아래 주소에서 생산되는 제품에 한함.

정호엔지니어링, 경기도 광명시 노온사동 440-5

2012년 06월 11일

한국산업안전보건공단 이사장

면 심 사 필
2013 .09. 16
한국기안전기술원



一般公差	0.1~30mm: ±0.2	30.1~60mm: ±0.3	60.1~300mm: ±0.5	模具材質		模具處理		模具孔數		單 位	mm	材 質		圖 號	T2−BKH
天得科技股份有限公司 TEND TECHNOLOGY CO.,LTD.	最新修正 / 前次修正	品 保	品保部 95.05.24 林建宏	核 准	研發部 95.05.24 鐘健誌	核 對	研發部 95.05.24 周欽祥	繪 圖	設計課 95.05.24 吳宗達	比 例	2:1	表面處理		品 名	T2 BKH 連鎖開關
										投影法		顏 色			

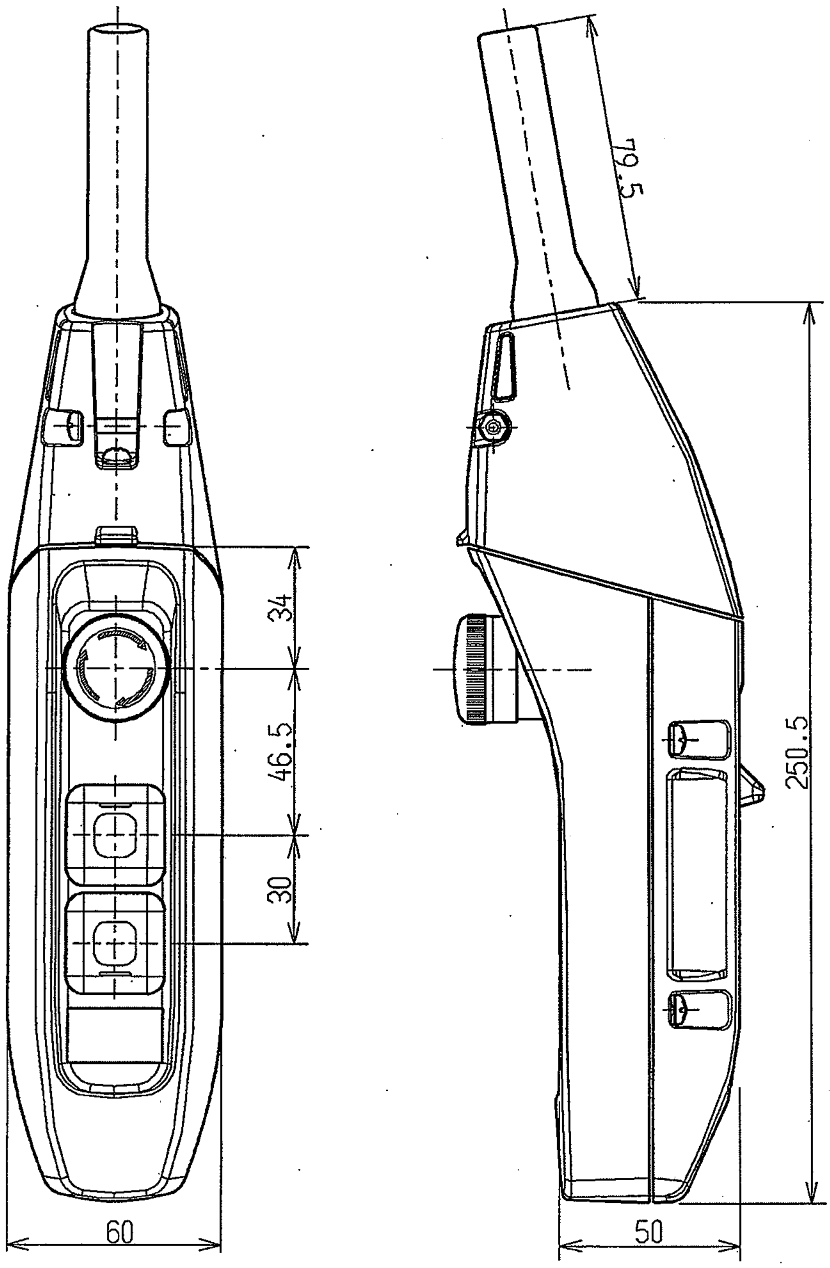
8 7 6 5 4 3 2 1

版序：A

.../T2/BKH/T2-BKH.dwg

様式:04KH-N001DA

Revision	Incidence	Description	Date	Charge	Approved



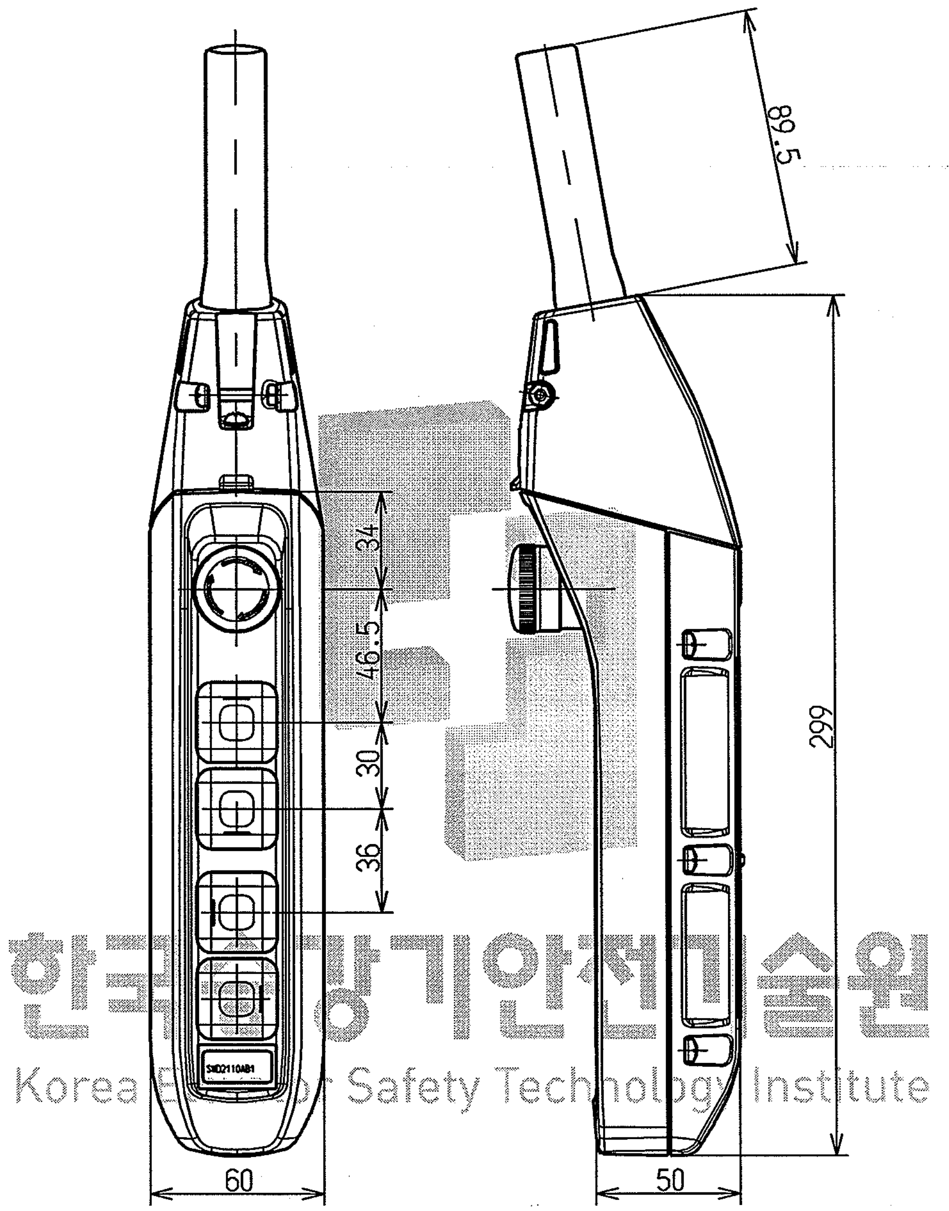
서 면 심 사 필
2013.09.16

⑥	NOTE					MATERIAL		CODE		
⑤										
④										
③						NOS./UNIT		NAME	3point Pendant control station MX subassembly	
②										
①										
Date issued	APPROVED	ISHIKAWA 08.02.08	CHECKED	FURIYA 08.02.08	DESIGNED	KOBAYASHI 08.02.08	DRAWN	KOBAYASHI 08.02.08	SCALE -	DWG.NO. SWD2X00AA1

KITO CORPORATION

UNIT: mm

Revision	Incidence	Description	Date	Charge	Approved



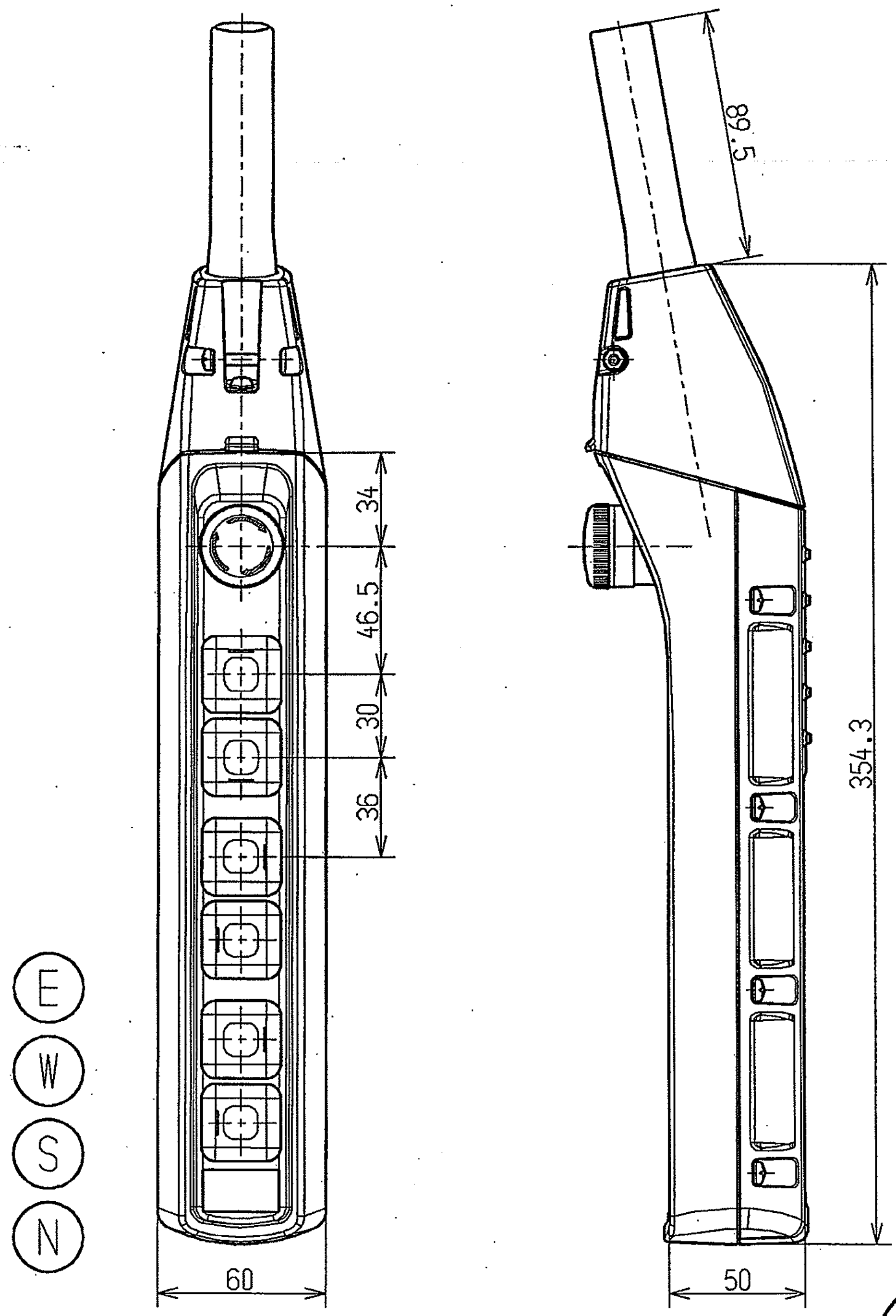
The lifting and lowering push buttons are marked with ⇑⇓ for single speed or ⇈⇊ for dual speed.

The traveling push buttons are marked with E W or N S depending on the installed direction.

⑥ ⑤ ④ ③ ② ①	NOTE		MATERIAL		CODE		
			NOS./UNIT		NAME	5point Pendant control station MXX subassembly	
Date issued	APPROVED H.FURIYA 09.04.21	CHECKED T.HATANO 09.04.21	DESIGNED KOBAYASHI 09.04.21	DRAWN KOBAYASHI 09.04.21	SCALE -	DWG.NO.	SWD2XX0AA1

様式:04KH-N001DA

Revision	Incidence	Description	Date	Charge	Approved



서면심사필
2013.09.16
한국산업기술시험원

NOTE		MATERIAL		CODE	
		NOS./UNIT		NAME	7point Pendant control station MXXX subassembly

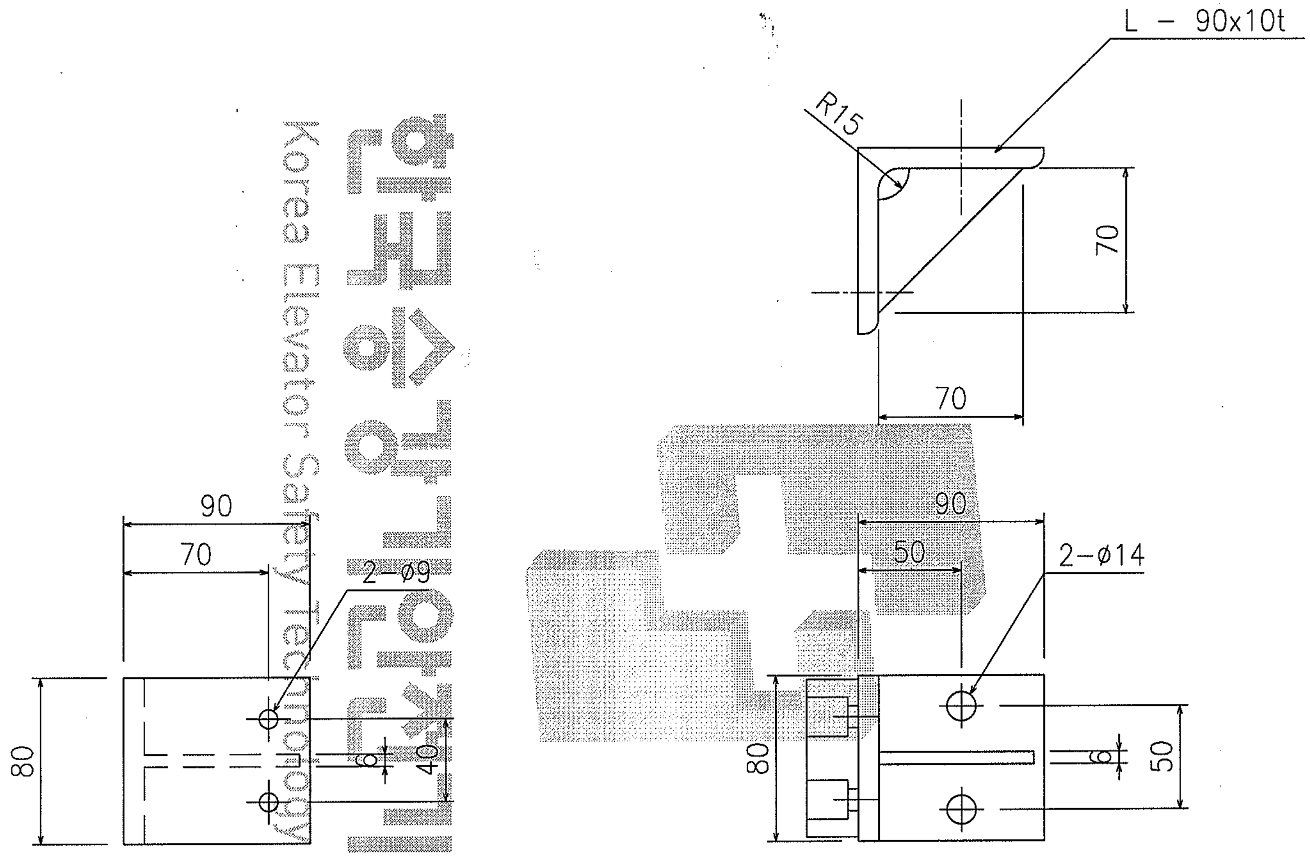
APPROVED	CHECKED	DESIGNED	DRAWN	SCALE	DWG.NO.
ISHIKAWA 08.02.08	FURIYA 08.02.08	KOBAYASHI 08.02.08	KOBAYASHI 08.02.08	-	SWD2XXXAA1

⑥ ⑤ ④ ③ ② ①

Date issued

KITO CORPORATION

UNIT: mm



No	Part Name	Description	Mat'l	Unit	Q'ty	Weight (Kg)	Remark
TITLE			SS400		4		대전방지

STOPPER – traversing

APPROVED	CHECKED	DESIGNED	DRAWN
J.S.CHO	J.S.CHO	W.H.EUN	W.H.EUN

(주)KITO KOREA

Part No.	STOPPER	SCALE	
DWG No.		REV.	

REV.	CONTENTS	DATE	DRAWN	APPRO-VED

3) HOIST 기 계 도 면

3-1. 조립도

1) 전체 조립도

3-2. 상세도

1) ER2 Frlction Clutch

2) ER2 Moter Brake Structure & Brake Gap Limit

3) Traversing wheel

4) Botton Hook

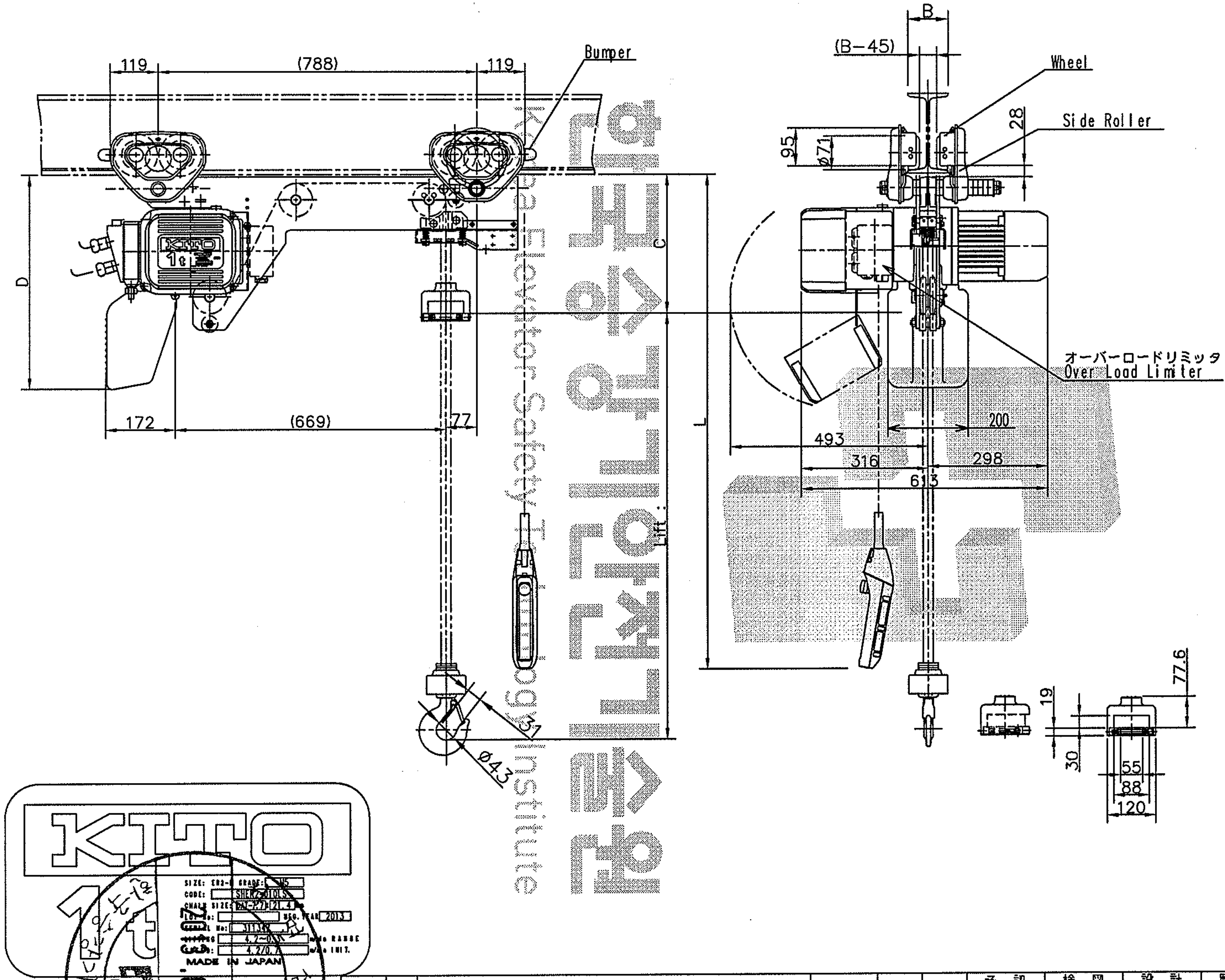
5) Botton yoke

3-3. MONO RAIL 설치도면

1) Safety Dwg.

2) General assembly

3) Girder detail



諸元表 Particulars		
基本本体 Size		ER2-D
定格荷重 Nominal Capacity		1t
揚程 Lift		4m(max 30m)
チェーンサイズ Chain size		ø7.7 x 1
レール下面よりフックまでの最小距離：C Min. Headroom		340mm
相数・電圧 Phase・Voltage		3ø 220(208)V 60Hz 380,440V 60Hz
モータ出力・反復定格・等級 Motor Output・Duty Rating・Classification	巻上モータ for Lifting IL	0.9kW・20/10%ED・M5
	L	0.9kW・30%ED・M5
巻上速度 Lifting Speed	IL	4.2/0.7 m/min
	L	4.2 m/min
オシボタンコード長さ：L Push Button Cord		3.2 m(max 30m)
キャブタイヤ給電ケーブル長さ Length of Power Supply Cable		2 m
レール下面よりチェーンバケットまでの寸法：D Chain Container Distance from Bottom of Beam		(545mm(max 787mm))
最小回転半径 Min. Radius for Curve		-
適用レール巾：B Flange Width		100~250 mm
質量 Mass		Approx 112kg
塗装色 Painting Color		KITO Yellow (マンセル 7.2YR6.5/14.5 相当) (Equivalent to Munsell 7.2YR6.5/14.5)

1.Short Head Room Type

형식번호: KML-SHER2-010

Model number.

KITO-SHER2SP010L
KITO-SHER2SP010IL

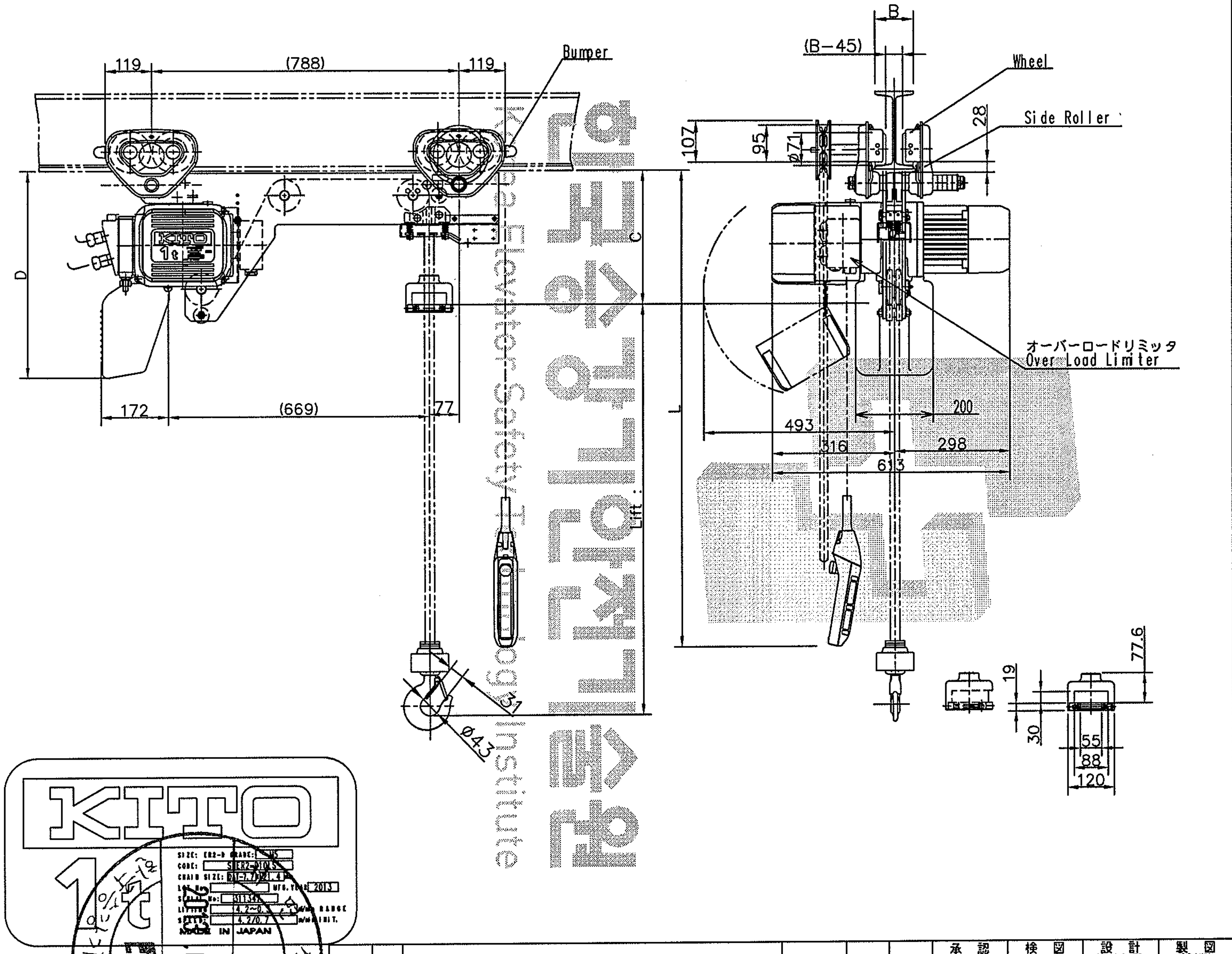
改訂 REV.	数 QTY	内容 CONTENTS	年.月.日 DATE	担当 DRAWN	承認 APPROVED
2		258→208	13, 8, 26	K.Horiuchi	A.Saito
1		24/4(m/min)→12/2(m/min)	13, 8, 26	K.Horiuchi	A.Saito

承認 APPROVED	検図 CHECKED	設計 DESIGNED	製図 DRAWN
A.Saito	K.Suzuki	K.Horiuchi	——
13, 8, 23	13, 8, 23	13, 8, 23	

KITO

名称 TITLE	1t ER2M SERIES ELECTRIC CHAIN HOIST WITH PLAN TROLLEY
製造番号 CODE	SHER2-SP
尺度 SCALE	NOT
図番 DWG. NO.	KML-SHER2-010-001
変更回数 REV.	0

様式 025P-19　三角法 単位：mm



諸元表 Particulars		
基本本体 Size		ER2-D
定格荷重 Nominal Capacity		1t
揚程 Lift		4m(max 30m)
チェーンサイズ Chain size		ø7.7 x 1
レール下面よりフックまでの最小距離 : C Min. Headroom		340mm
相数・電圧 Phase・Voltage		3ø 220(208)V 60Hz 380,440V 60Hz
モータ出力・反復定格・等級 Motor Output・Duty Rating・Classification	巻上モータ for Lifting IL	0.9kW・20/10%ED・M5
	L	0.9kW・30%ED・M5
巻上速度 Lifting Speed	IL	4.2/0.7 m/min
	L	4.2 m/min
オシボタンコード長さ: L Push Button Cord		3.2 m(max 30m)
キャブタイヤ給電ケーブル長さ Length of Power Supply Cable		2 m
レール下面よりチェーンバケットまでの寸法 : D Chain Container Distance from Bottom of Beam		(545mm(max 787mm))
最小回転半径 Min. Radius for Curve		-
適用レール巾 : B Flange Width		100~250 mm
質量 Mass		Approx 117kg
塗装色 Painting Color		KITO Yellow (マンセル 7.2YR6.5/14.5 相当) (Equivalent to Munsell 7.2YR6.5/14.5)

1. Short Head Room Type

형식번호: KML-SHER2-010

Model number.

KITO-SHER2SG010L

KITO-SHER2SG010IL

改訂 REV.	数 QTY	内容 CONTENTS	年.月.日 DATE	担当 DRAWN	承認 APPROVED
2		258→208	13, 8, 26	K.Horiuchi	A.Saito
1		24/4(m/min)→12/2(m/min)	13, 8, 26	K.Horiuchi	A.Saito

承認 APPROVED	検図 CHECKED	設計 DESIGNED	製図 DRAWN
A. Saito	K. Suzuki	K. Horiuchi	—
13, 8, 23	13, 8, 23	13, 8, 23	

KITO

名称 TITLE	1t ER2M SERIES ELECTRIC CHAIN HOIST WITH GEAR TROLLEY
製造番号 CODE	SHER2-SG
尺度 SCALE	NOT
図番 DWG. NO.	KML-SHER2-010-002
変更回数 REV.	0

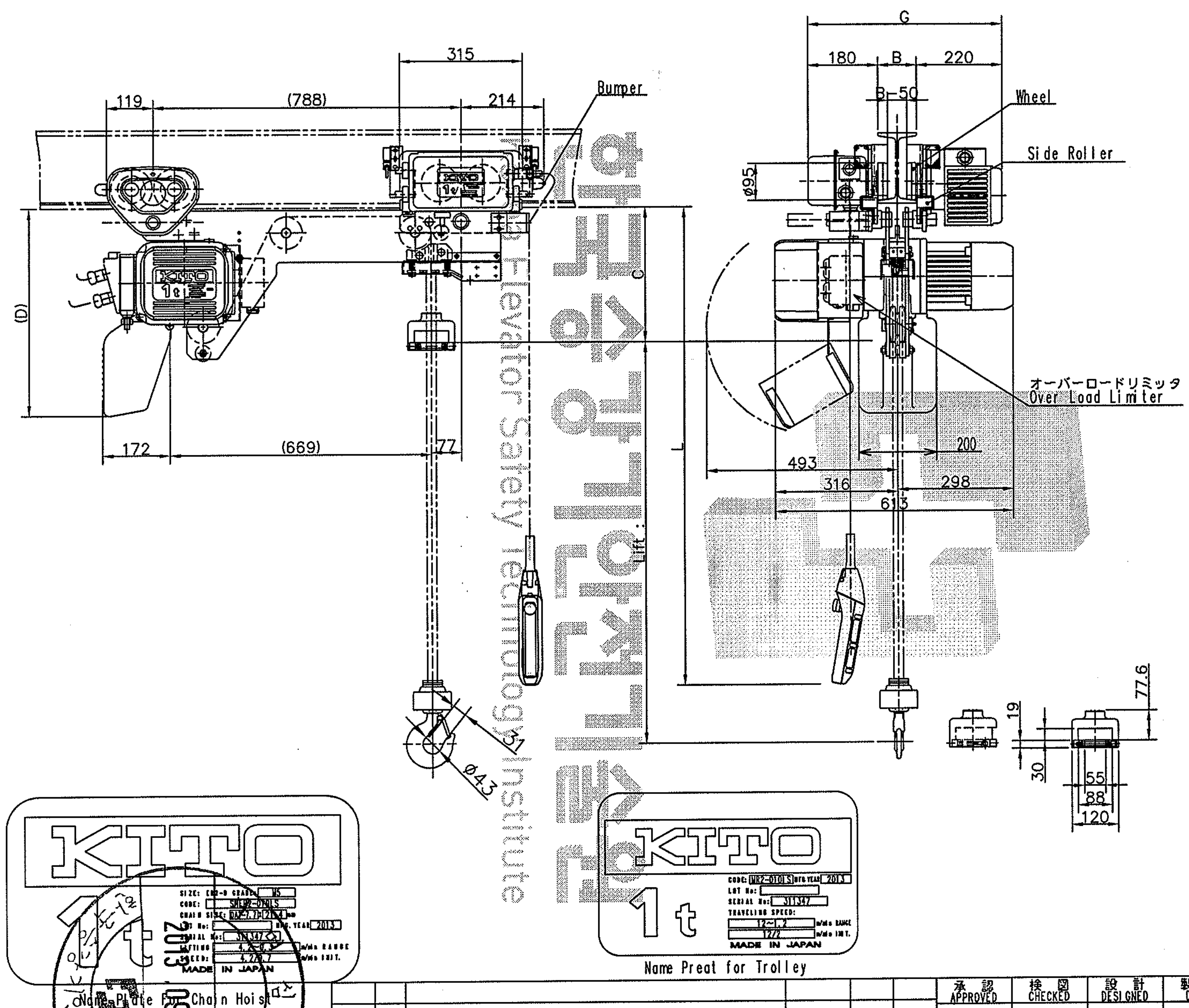
様式 025P-19

三角法 単位: mm

Name Plate for Chain Hoist

2013. 09. 16

XK000740



諸元表 Particulars

基本本体 Size			ER2-D
定格荷重 Nominal Capacity			1t
揚程 Lift			4m(max 30m)
チェーンサイズ Chain size			ø7.7 x 1
レール下面よりフックまでの最小距離 : C Min. Headroom			340mm
相数・電圧 Phase · Voltage			3ø 220(208)V 60Hz 380,440V 60Hz
モータ出力・反復定格・等級 Motor Output · Duty Rating · Classification	巻上モータ for Lifting	IL	0.9kW・20/10%ED・M5
		L	0.9kW・30%ED・M5
	横行モータ for Traversing	IS,IL	0.4kW・27/13%ED
		S,L	0.4kW・40%ED
巻上速度 Lifting Speed		IL	4.2/0.7 m/min
		L	4.2 m/min
横行速度 Traversing Speed	S速 Standard speed	IS	24/4 m/min
		IL	12/2 m/min
	L速 Low speed	S	24 m/min
		L	12 m/min
オシボタンコード長さ : L Push Button Cord			3.2 m(max 30m)
キャブタイヤ給電ケーブル長さ Length of Power Supply Cable			2 m
レール下面よりチェーンバケットまでの寸法 : D Chain Container Distance from Bottom of Beam			(545mm(max 787mm))
最小回転半径 Min. Radius for Curve			-
適用レール巾 : B Flange Width			100~250 mm
トロリ最大巾 : G Max. Dimension of Trolley Width			500~650 mm
質量 Mass			Approx 134kg
塗装色 Painting Color			KITO Yellow (マンセル 7.2YR6.5/14.5 相当) (Equivalent to Munsell 7.2YR6.5/14.5)

1.Short Head Room Type

형식번호: KML-SHER2-010

Model number.
KITO-SHER2M010L-S
KITO-SHER2M010L-L
KITO-SHER2M010L-IS
KITO-SHER2M010L-IL
KITO-SHER2M010IL-S
KITO-SHER2M010IL-L
KITO-SHER2M010IL-IS
KITO-SHER2M010IL-IL

改訂 REV.	数 QTY	内容 CONTENTS	年.月.日 DATE	担当 DRAWN	承認 APPROVED
2		258→208	13, 8, 26	K.Horiuchi	A.Saito
1		24/4(m/min)→12/2(m/min)	13, 8, 26	K.Horiuchi	A.Saito

承認 APPROVED	検図 CHECKED	設計 DESIGNED	製図 DRAWN
A.Saito	K.Suzuki	K.Horiuchi	—
13, 8, 23	13, 8, 23	13, 8, 23	

KITO

名称 TITLE: 1t ER2M SERIES ELECTRIC CHAIN HOIST WITH MOTORIZED TROLLEY

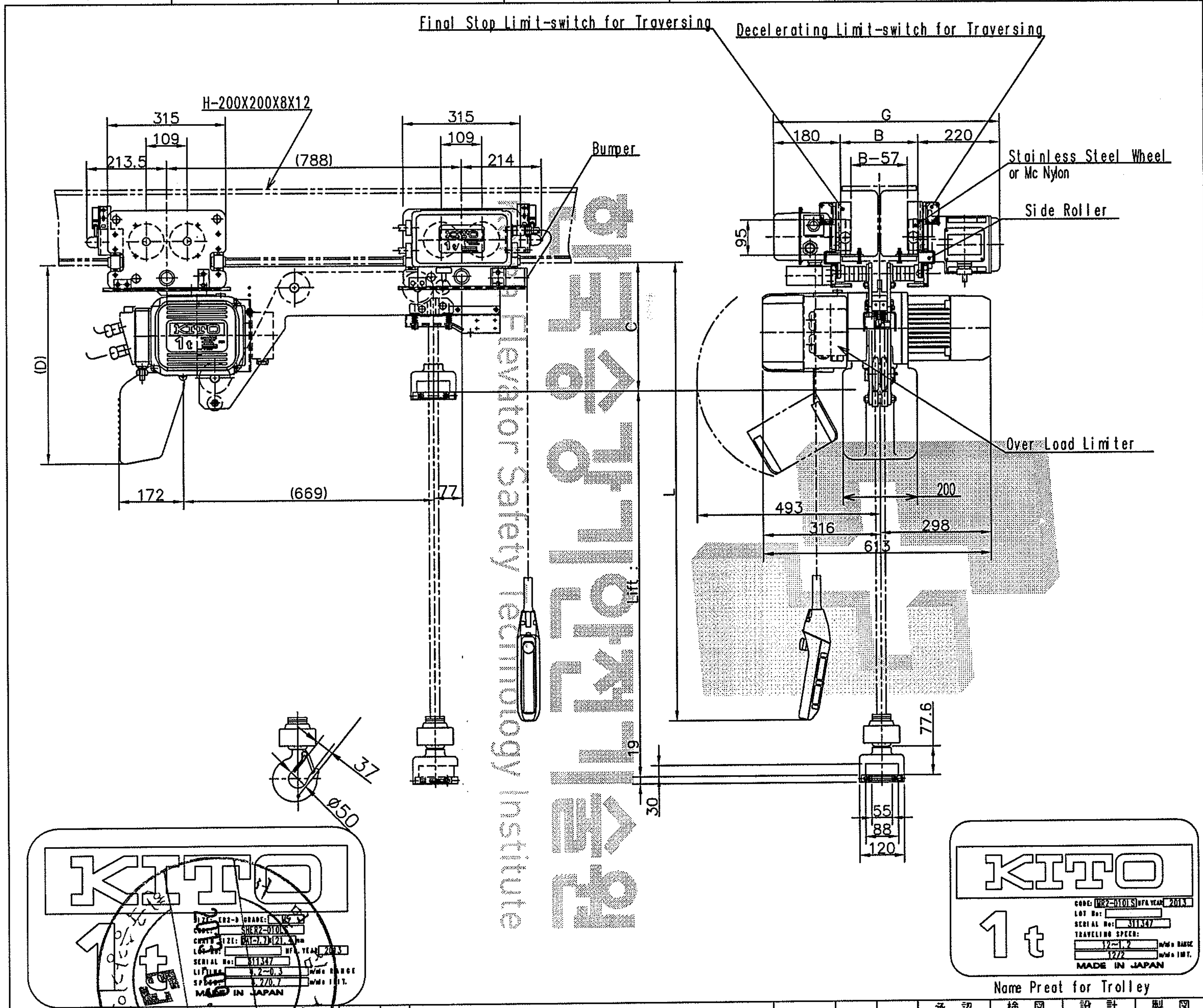
製造番号 CODE: SHER2-M | 尺度 SCALE: NOT

図番 DWG. NO.: KML-SHER2-010-003 | 変更回数 REV.: 0

様式 025P-19 三角法 単位 : mm

XK000740

2013. 09. 16



諸元表 Particulars			
基本本体 Size			ER2-D
定格荷重 Nominal Capacity			1t
揚程 Lift			4m(max 30m)
チェーンサイズ Chain size			ø7.7 x 1
レール下面よりフックまでの最小距離 : C Min. Headroom			340mm
相数・電圧 Phase・Voltage			3ø 220(208)V 60Hz 380,440V 60Hz
モータ出力・反復定格・等級 Motor Output・Duty Rating・Classification	巻上モータ for Lifting	IL	0.9kW・20/10%ED・M5
		L	0.9kW・30%ED・M5
	横行モータ for Traversing	IS,IL	0.4kW・27/13%ED
		S,L	0.4kW・40%ED
巻上速度 Lifting Speed		IL	4.2/0.7 m/min
		L	4.2 m/min
横行速度 Traversing Speed	S速 Standard speed	IS	24/4 m/min
		IL	12/2 m/min
	L速 Low speed	S	24 m/min
		L	12 m/min
オシボタンコード長さ:L Push Button Cord			3.2 m(max 30m)
キャブタイヤ給電ケーブル長さ Length of Power Supply Cable			2 m
レール下面よりチェーンバケットまでの寸法 : D Chain Container Distance from Bottom of Beam			(545mm(max 787mm))
最小回転半径 Min. Radius for Curve			-
適用レール巾 : B Flange Width			158~258 mm
トロリ最大巾 : G Max. Dimension of Trolley Width			557~657 mm
質量 Mass			Approx 140kg
塗装色 Painting Color			KITO Yellow (マンセル 7.2YR6.5/14.5 相当) (Equivalent to Munsell 7.2YR6.5/14.5)

1. Short Head Room Type

형식번호: KML-SHER2-010

Model number.
KITO-C-SHER2M010L-S
KITO-C-SHER2M010L-L
KITO-C-SHER2M010L-IS
KITO-C-SHER2M010L-IL
KITO-C-SHER2M010IL-S
KITO-C-SHER2M010IL-L
KITO-C-SHER2M010IL-IS
KITO-C-SHER2M010IL-IL

改訂 REV.	数 QTY	内容 CONTENTS	年,月,日 DATE	担当 DRAWN	承認 APPROVED
2		258→208	13, 8, 26	K.Horiuchi	A.Saito
1		24/4(m/min)→12/2(m/min)	13, 8, 26	K.Horiuchi	A.Saito

承認 APPROVED	検図 CHECKED	設計 DESIGNED	製図 DRAWN
A. Saito	K. Suzuki	K. Horiuchi	—
13, 8, 23	13, 8, 23	13, 8, 23	

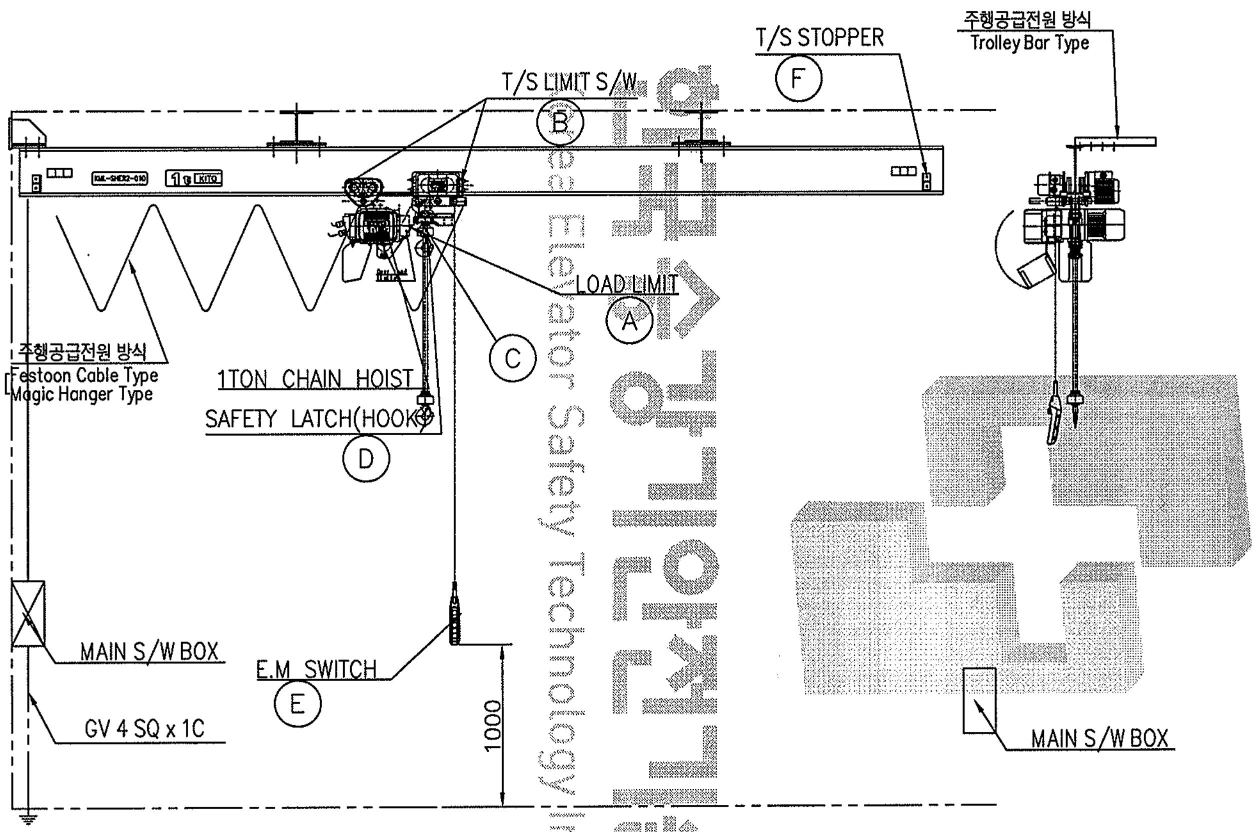
名称 TITLE: 1t ER2M SERIES ELECTRIC CHAIN HOIST WITH MOTORIZED TROLLEY

製造番号 CODE	SHER2-M	尺度 SCALE	NOT
図番 DWG. NO.	KML-SHER2-010-004	変更回数 REV.	0

KITO

様式 025P-19 三角法 単位 : mm

XK000740



SPECIFICATION

A	LOAD LIMIT	1	1TON USE
B	T/S LIMIT S/W	2	
C	UPPER LIMIT S/W	1	1TON USE
D	SAFETY LATCH(HOOK)	1	1TON USE
E	E.M SWITCH	1	PB 305
F	T/S STOPPER	2	MACHINE

W⇔E

방향표지판

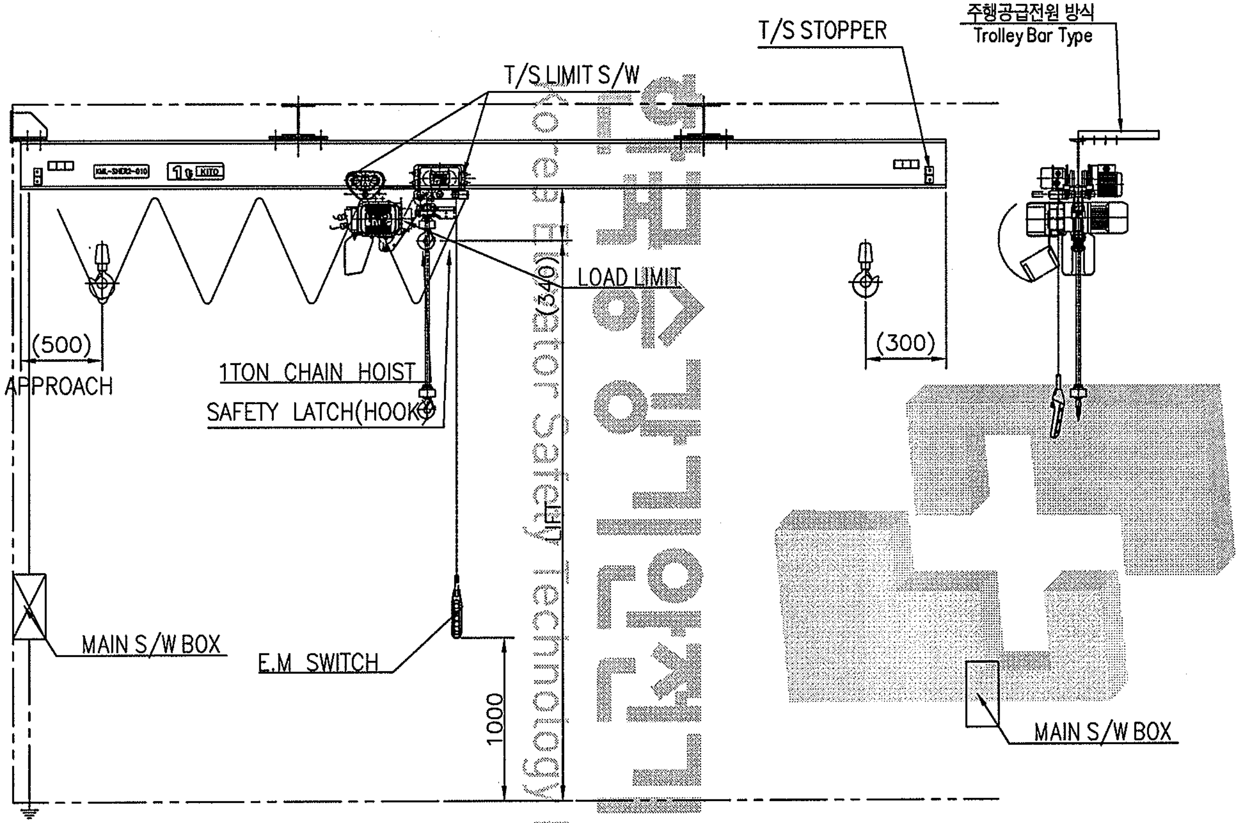
NOTE

1. 점검설비는 현장여건에 맞추어 설치한다.
2. 사용설명서를 제공한다.

承認 APPROVED	検図 CHECKED	設計 DESIGNED	製図 DRAWN	名称 TITLE	1t MONO RAIL HOIST SAFETY DRAWING
J. S. CHO	J.H.CHOI	EUN.WON HEE	EUN.WON HEE	設定番号 CODE	尺度 SCALE
KITO				図番 DWG. NO.	MONO RAIL 0 / 変更回数 REV.

改訂 REV.	数 QTY	内容 CONTENTS	年.月.日 DATE	担当 DRAWN	承認 APPROVED

형식번호: KMS-SHER2-010



SPECIFICATION		
BEAM 규격	PITCH	O.H
I-200x100x7/10	4.7 m	1.9 m
I-250x125x7.5/12.5	7 m	2.7 m
LOAD CHAIN	7.7mm X 1	
LIFT	Max 30m	

NAME PLATE

정격하중	1.0 ton
전기 설비 정격	V
제 조 자	
제 조 년 월	20 . .
안전인증 표시	KCs
형식번호	KML-SHER2-010
제조번호	

형식번호: KML-SHER2-010
Model number.
KITO-SHER2M010L-S
KITO-SHER2M010L-
KITO-SHER2M010L-
KITO-SHER2M010L-IL
KITO-SHER2M010IL-S
KITO-SHER2M010IL-
KITO-SHER2M010IL-IS
KITO-SHER2M010IL-IL

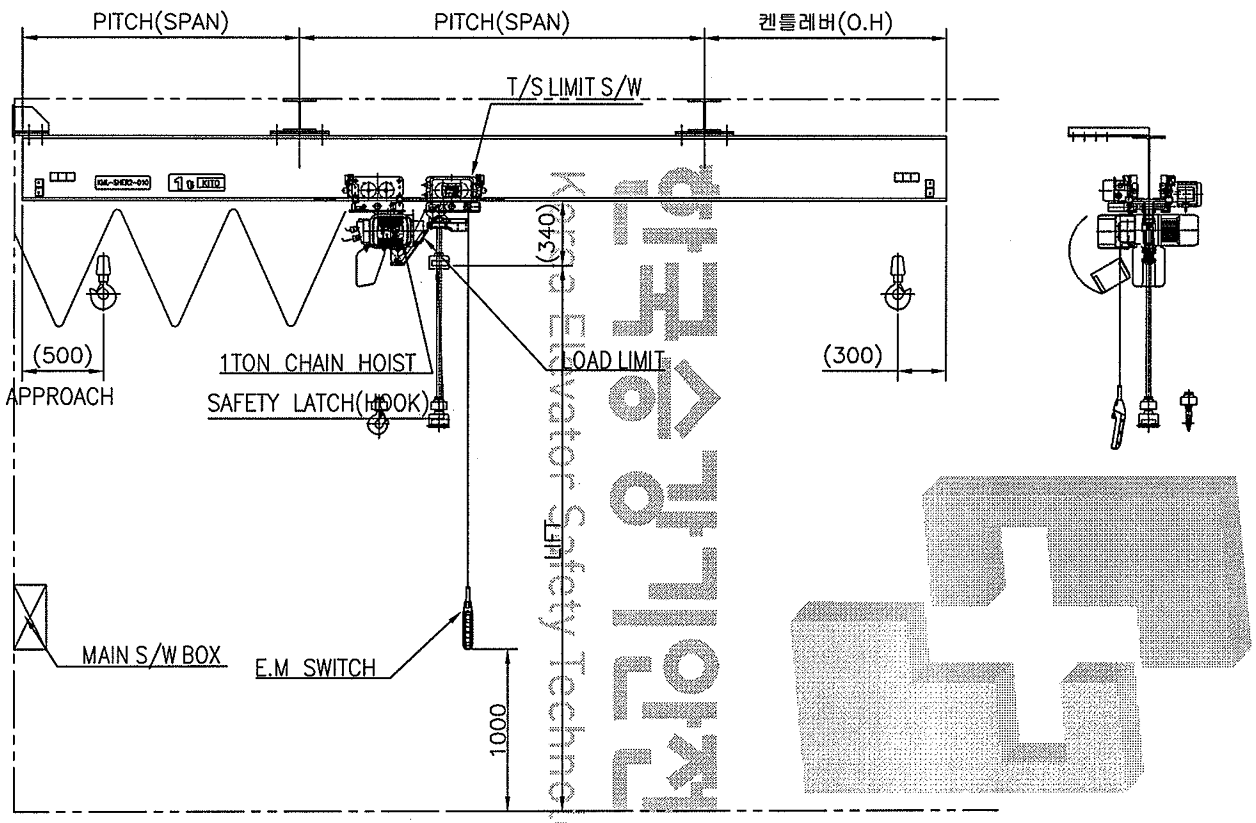
改訂 REV.	数 QTY	内容 CONTENTS	年.月.日 DATE	担当 DRAWN	承認 APPROVED

承認 APPROVED	検図 CHECKED	設計 DESIGNED	製図 DRAWN
J.S.CHO	J.H.CHOI	EUN.WON HEE	EUN.WON HEE

KITO

名称 TITLE	1t MONO RAIL HOIST GENERAL ASSEMBLY-1		
製品番号 CODE		尺度 SCALE	
図番 DWG. NO.	MONO RAIL 1	変更回数 REV.	

2013.09.16



SPECIFICATION		
BEAM 규격	PITCH	O.H
H-200x200x8/12	6.5 m	2.5 m
H-300x150x6.5/9	8 m	3.2 m
H-350x175x7/11	10.5 m	4 m
H-400x200x8/13	13 m	5 m
H-450x200x9/14	14.5 m	6 m
LOAD CHAIN	7.7mm X 1	
LIFT	Max 30m	

NAME PLATE

정격하중	1.0 ton
전기 설비 정격	V
제 조 자	
제 조 년 월	20 . .
안전인증 표시	KCs
형 식 번 호	KML-SHER2-010
제 조 번 호	

2013 .09.16

형식번호: KML-SHER2-010

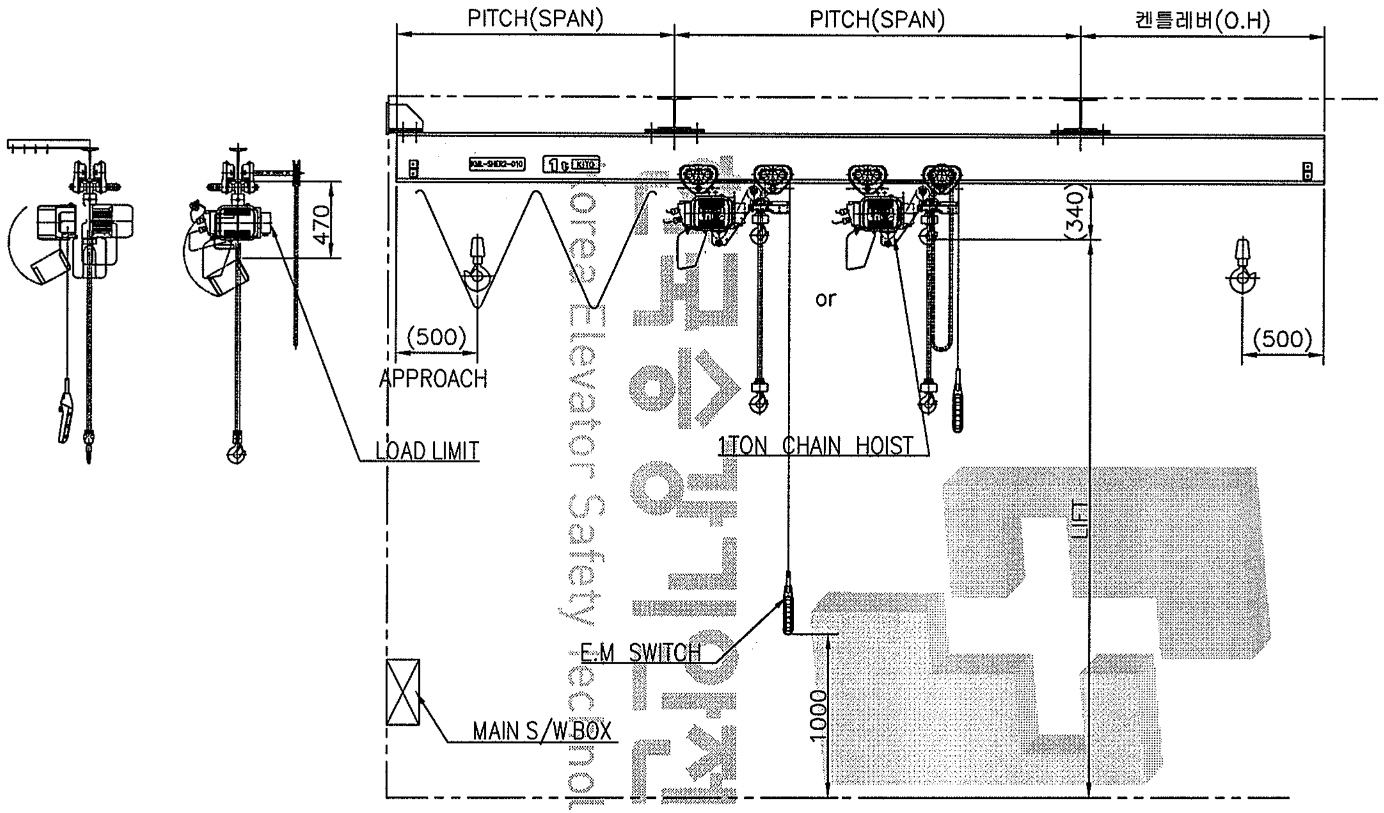
Model number.
- KITO-C-SHER2M010L-S
- KITO-C-SHER2M010L-L
- KITO-C-SHER2M010L-IS
- KITO-C-SHER2M010L-IL
- KITO-C-SHER2M010IL-S
- KITO-C-SHER2M010IL-L
- KITO-C-SHER2M010IL-IS
- KITO-C-SHER2M010IL-IL

承認 APPROVED	検図 CHECKED	設計 DESIGNED	製図 DRAWN	名称 TITLE
J. S. CHO	J.H.CHOI	EUN.WON HEE	EUN.WON HEE	1t MONO RAIL HOIST GENERAL ASSEMBLY-2
KITO				製造番号 CODE / 尺度 SCALE
				図番 DWG. NO.: MONO RAIL 2 / 変更回数 REV.

改訂 REV.	数 QTY	内容 CONTENTS	年.月.日 DATE	担当 DRAWN	承認 APPROVED

SPECIFICATION

BEAM 규격	PITCH	O.H
I-200x100x7/10	4.7 m	1.9 m
I-250x125x7.5/12.5	7 m	2.7 m
LOAD CHAIN	7.7mm X 1	
LIFT	Max 30m	



정격하중	1.0 ton
전기 설비 정격	V
제 조 자	
제 조 년 월	20 . .
안전인증 표시	KCs
형 식 번 호	KML-SHER2-010
제 조 번 호	

NAME PLATE

2013.09.6

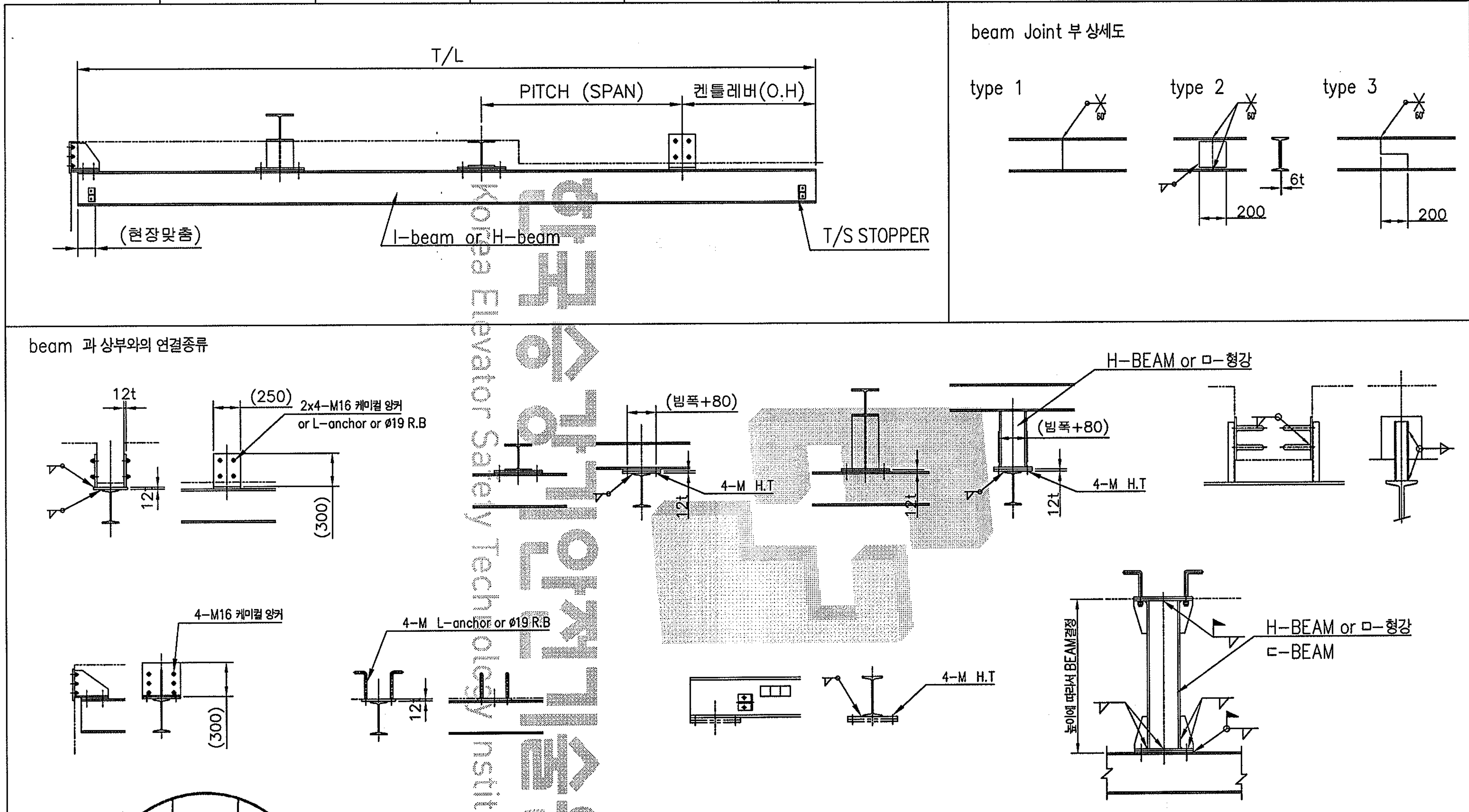
형식번호: KML-SHER2-010	형식번호: KML-SHER2-010
Model number.	Model number.
KITO-SHER2SP010L	KITO-SHER2SG010L
KITO-SHER2SP010IL	KITO-SHER2SG010IL

承認 APPROVED	検図 CHECKED	設計 DESIGNED	製図 DRAWN	名称 TITLE
J.S.CHO	J.H.CHOI	EUN.WON HEE	EUN.WON HEE	1t MONO RAIL HOIST GENERAL ASSEMBLY-3

改訂 REV.	数 QTY	内容 CONTENTS	年.月.日 DATE	担当 DRAWN	承認 APPROVED

KITO

製造番号 CODE		尺度 SCALE	
図番 DWG. NO.	MONO RAIL 3	変更回数 REV.	



note
bolt 규원
H.T.B M14,M16,M18,M20일때 브라켓트당 4개 이상 사용한다.

용접재원
각장은 높이 5일때 용접길이 L=60mm이상
각장은 높이 6일때 용접길이 L=50mm이상
각장은 높이 7일때 용접길이 L=40mm이상

특기사항
1. 지시없는 용접부는 얇은모재의 70%로 용접한다.

承認 APPROVED	検図 CHECKED	設計 DESIGNED	製図 DRAWN	名称 TITLE	1t MONO RAIL HOIST GIRDER BEAM
J.S.CHO	J.H.CHOI	EUN.WON HEE	EUN.WON HEE	製造番号 CODE	
KITO				図番 DWG. NO.	MONO RAIL- D1

改訂 REV.	数 QTY	内容 CONTENTS	年.月.日 DATE	担当 DRAWN	承認 APPROVED

尺度 SCALE

変更回数 REV.

4. 전 기 도 면

1) ELECTRICAL SPECIFICATION

2) SYMBOL LIST

3) 배선배관도 & 접지계통도

4) 전기회로도

5) PANEL 관련도

한국승강기안전기술원

Korea Elevator Safety Technology Institute

LOAD SUMMARY 1 – INVERTER사양(IL)

*POWER SOURCE : AC 3Φ 220(208)V

OBJECT	HOISTING	TRAVERSING	CONTROL CIRCUIT
MOTOR OUTPUT	0.9KW x 4P	0.4KW x 4P	
FULL LOAD CURRENT	5.7 (A)	3 (A)	0.5 (A)

*크레인 하중상태를 HOIST의 정격 LOAD의 100(%)를 사용했을때를 기준으로 작성하였음.

*** NOMAL 전류값 ***

권상과 횡행시 : HOISTING + TRAVERSING + CONTROL CIRCUIT = 9.2 A

*** PEAK 전류값 ***

K= NAMAL 전류치가 50A미만일때 1.25, 50A이상일때 1.1적용

NOMAL 전류값 * K = 9.2 * 1.25 = 11.5 A

*POWER SOURCE : AC 3Φ 380(440)V

OBJECT	HOISTING	TRAVERSING	CONTROL CIRCUIT
MOTOR OUTPUT	0.9KW x 4P	0.4KW x 4P	
FULL LOAD CURRENT	3.6 (A)	2.5 (A)	0.5 (A)

*크레인 하중상태를 HOIST의 정격 LOAD의 100(%)를 사용했을때를 기준으로 작성하였음.

*** NOMAL 전류값 ***

권상과 횡행시 : HOISTING + TRAVERSING + CONTROL CIRCUIT = 6.6 A

*** PEAK 전류값 ***

K= NAMAL 전류치가 50A미만일때 1.25, 50A이상일때 1.1적용

NOMAL 전류값 * K = 6.6 * 1.25 = 8.25 A

LOAD SUMMARY 2 – INVERTER사양(IL)

*POWER SOURCE : AC 3Φ 220(208)V

OBJECT	HOISTING	TRAVERSING	CONTROL CIRCUIT
MOTOR OUTPUT	0.9KW x 4P	–	
FULL LOAD CURRENT	5.7 (A)	0 (A)	0.5 (A)

*크레인 하중상태를 HOIST의 정격 LOAD의 100(%)를 사용했을때를 기준으로 작성하였음.

*** NOMAL 전류값 ***

권상시 : HOISTING + CONTROL CIRCUIT = 6.2 A

*** PEAK 전류값 ***

K= NAMAL 전류치가 50A미만일때 1.25, 50A이상일때 1.1적용

NOMAL 전류값 * K = 6.2 * 1.25 = 7.75 A

*POWER SOURCE : AC 3Φ 380(440)V

OBJECT	HOISTING	TRAVERSING	CONTROL CIRCUIT
MOTOR OUTPUT	0.9KW x 4P	–	
FULL LOAD CURRENT	3.6 (A)	0 (A)	0.5 (A)

*크레인 하중상태를 HOIST의 정격 LOAD의 100(%)를 사용했을때를 기준으로 작성하였음.

*** NOMAL 전류값 ***

권상시 : HOISTING + CONTROL CIRCUIT = 4.1 A

*** PEAK 전류값 ***

K= NAMAL 전류치가 50A미만일때 1.25, 50A이상일때 1.1적용

NOMAL 전류값 * K = 4.1 * 1.25 = 5.125 A

LOAD SUMMARY 3 – 1속저속형사양(L)

*POWER SOURCE : AC 3Φ 220(208)V

OBJECT	HOISTING	TRAVERSING	CONTROL CIRCUIT
MOTOR OUTPUT	0.9KW x 4P	0.4KW x 4P	
FULL LOAD CURRENT	4.7 (A)	3 (A)	0.5 (A)

*크레인 하중상태를 HOIST의 정격 LOAD의 100(%)를 사용했을때를 기준으로 작성하였음.

*** NOMAL 전류값 ***

권상과 횡행시 : HOISTING + TRAVERSING + CONTROL CIRCUIT = 8.2 A

*** PEAK 전류값 ***

K= NAMAL 전류치가 50A미만일때 1.25, 50A이상일때 1.1적용

NOMAL 전류값 * K = 8.2 * 1.25 = 10.25 A

*POWER SOURCE : AC 3Φ 380(440)V

OBJECT	HOISTING	TRAVERSING	CONTROL CIRCUIT
MOTOR OUTPUT	0.9KW x 4P	0.4KW x 4P	
FULL LOAD CURRENT	2.6 (A)	2.2 (A)	0.5 (A)

*크레인 하중상태를 HOIST의 정격 LOAD의 100(%)를 사용했을때를 기준으로 작성하였음.

*** NOMAL 전류값 ***

권상과 횡행시 : HOISTING + TRAVERSING + CONTROL CIRCUIT = 5.3 A

*** PEAK 전류값 ***

K= NAMAL 전류치가 50A미만일때 1.25, 50A이상일때 1.1적용

NOMAL 전류값 * K = 5.3 * 1.25 = 6.625 A

LOAD SUMMARY 4 – 1속 저속형사양(L)

*POWER SOURCE : AC 3Φ 220(208)V

OBJECT	HOISTING	TRAVERSING	CONTROL CIRCUIT
MOTOR OUTPUT	0.9KW x 4P	–	
FULL LOAD CURRENT	4.7 (A)	0 (A)	0.5 (A)

*크레인 하중상태를 HOIST의 정격 LOAD의 100(%)를 사용했을때를 기준으로 작성하였음.

*** NOMAL 전류값 ***

권상시 : HOISTING + CONTROL CIRCUIT = 5.2 A

*** PEAK 전류값 ***

K= NAMAL 전류치가 50A미만일때 1.25, 50A이상일때 1.1적용

NOMAL 전류값 * K = 5.2 * 1.25 = 6.5 A

*POWER SOURCE : AC 3Φ 380(440)V

OBJECT	HOISTING	TRAVERSING	CONTROL CIRCUIT
MOTOR OUTPUT	0.9KW x 4P	–	
FULL LOAD CURRENT	2.6 (A)	0 (A)	0.5 (A)

*크레인 하중상태를 HOIST의 정격 LOAD의 100(%)를 사용했을때를 기준으로 작성하였음.

*** NOMAL 전류값 ***

권상시 : HOISTING + CONTROL CIRCUIT = 3.1 A

*** PEAK 전류값 ***

K= NAMAL 전류치가 50A미만일때 1.25, 50A이상일때 1.1적용

NOMAL 전류값 * K = 3.1 * 1.25 = 3.875 A

ROTATING MACHINE

- SYNCHRONOUS GENERATOR, 3-PHASE
- AC INDUCTION MOTOR, 3-PHASE
  - * N : NORMAL DUTY
  - S : STAND-BY
- DC MOTOR

LIGHTNING ARRESTERS

- LA : LIGHTNING ARRESTER
  SA : SURGE ARRESTER
  SS : SURGE SUPPRESSOR
- DISCHARGE COUNTER

INSTRUMENT TRANSFORMERS

- CURRENT TRANSFORMER
- ZERO PHASE CURRENT TRANSFORMER
- POTENTIAL TRANSFORMER

CIRCUIT BREAKERS

- POWER CIRCUIT BREAKER, FIXED TYPE
  - GCB : SF6 GAS CIRCUIT BREAKER
  - VCB : VACUUM CIRCUIT BREAKER
  - ACB : AIR CIRCUIT BREAKER
- POWER CIRCUIT BREAKER, DRAWOUT TYPE

- CIRCUIT BREAKER, FIXED TYPE
  - MCCB : MOULDED CASE CIRCUIT BREAKER
  - MCB : MINIATURE CIRCUIT BREAKER
- CIRCUIT BREAKER, DRAWOUT TYPE
- WITHDRAWABLE INTERCONNECTOR
- CIRCUIT BREAKER, MANUALLY OPERATED FIXED TYPE WITH THERMAL & MAGNETIC TRIP
- CIRCUIT BREAKER, MANUALLY OPERATED FIXED TYPE WITH MAGNETIC TRIP ONLY
- CIRCUIT BREAKER, MANUALLY OPERATED DRAWOUT TYPE WITH THERMAL & MAGNETIC TRIP
- CIRCUIT BREAKER, MANUALLY OPERATED FIXED TYPE WITH THERMAL & MAGNETIC TRIP AND RESIDUAL CURRENT RELEASE

SWITCHES

- DISCONNECTOR SWITCH, SINGLE THROW MANUALLY OPERATED
- LOAD BREAK SWITCH, SINGLE THROW MANUALLY OPERATED,
- EARTHING SWITCH, SINGLE THROW MANUALLY OPERATED
- DISCONNECTOR SWITCH, SINGLE THROW MOTOR OPERATED
- EARTHING SWITCH, SINGLE THROW MOTOR OPERATED
- VACUUM CIRCUIT SWITCH
- FUSED DISCONNECTOR SWITCH
- FUSE-SWITCH
- LIMIT SWITCH (MAKE CONTACT)
- LIMIT SWITCH (BREAK CONTACT)
- PUSH BUTTON, NORMALLY OPEN MOMENTARY CONTACT
- PUSH BUTTON, NORMALLY CLOSED MOMENTARY CONTACT
- PUSH BUTTON, NORMALLY OPEN PUSH TO LOCK, RELEASED BY KEY
- MANUAL SELECTOR SWITCH (LOCKED)

CONTACTORS AND STARTERS

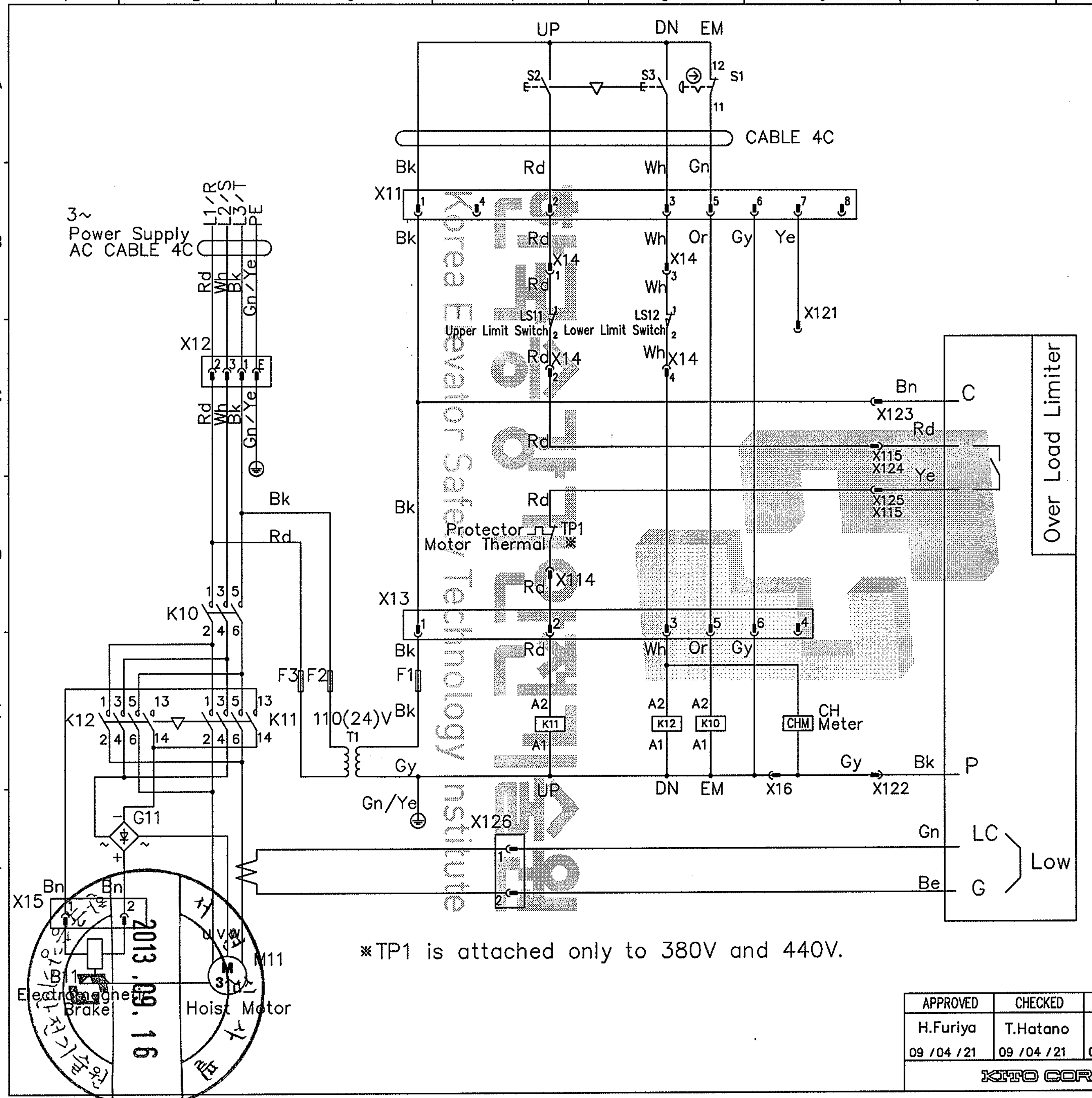
- AUX. CONTACT, NORMALLY OPEN WHEN MAIN SWITCHING DEVICE IS DE-ENERGIZED
- AUX. CONTACT, NORMALLY CLOSED WHEN MAIN SWITCHING DEVICE IS DE-ENERGIZED
- MAGNETIC CONTACTOR, ELECTRICALLY OPERATED
- EOCR — COMBINATION STARTER, FULL VOLTAGE, NON-REVERSING, DRAWOUT TYPE, WITH ELECTRICALLY OPERATED CONTACTORS, WITH MAGNETIC MOTOR CIRCUIR BREAKER, BUILT IN ELECTRONIC OVER-CURRENT RELAY WITH ADJUSTABLE TRIP RATING
- COMBINATION STARTER, FULL VOLTAGE, NON-REVERSING, FIXED TYPE, WITH ELECTRICALLY OPERATED CONTACTORS, WITH MAGNETIC MOTOR CIRCUIT BREAKER, BUILT IN THERMAL OVER-CURRENT RELAY WITH ADJUSTABLE TRIP RATING

GRAPHIC SYMBOLS

- GENERAL OPERATING COIL
- CAPACITOR
- CAPACITOR VOLTAGE TRANSFORMER(CVT)
- RESISTOR
- DIODE

- CONTROLLED RECTIFIER
- DC-DC CONVERTER
- RECTIFIER, BATTERY CHARGER
- DC-AC INVERTER
- BATTERY BANK
- ELECTRIC HEATER, INDICATE 1* OR 3* AND kW RATING. UNLESS OTHERWISE SPECIFIED, TO BE REGARDED AS 1*.
- EARTHING CONNECTION
- DISCONNECTION LINK
- CROSSING OF CONDUCTORS NOT CONNECTED
- OR — JUNCTION OF CONDUCTORS OR WIRES
- BUS DUCT
  - SPB : SEGREGATED PHASE BUS DUCT
  - IPB : ISOLATED PHASE BUS DUCT
- CABLE HEAD AND CABLE CONNECTION
- AS — AMMETER SWITCH
- VS — VOLTMETER SWITCH
- SIGNAL LAMP
  - * R = RED, G = GREEN, W = WHITE, C = CYAN
  - Y = YELLOW, B = BLUE, A = AMBER

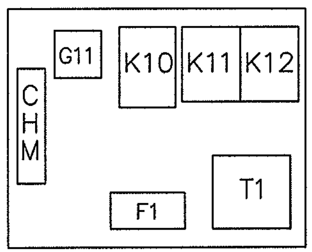
APPROVED	CHECKED	DESIGNED	SYMBOL LIST			
			CODE		SCALE	—
KITO CORP.			DWG.NO.	SYMBOL LIST	DATE	



※TP1 is attached only to 380V and 440V.

전선 색상
Black : 전원
Red : 교류제어선
Blue : 직류제어선
Orange : 외부에서 공급되는 연동장치 제어회로
Green & Yellow : 접지

The layout of electric parts



Body size : C~F

특수 공구(+,육각)을 사용하여
개방구 쪽은 제외

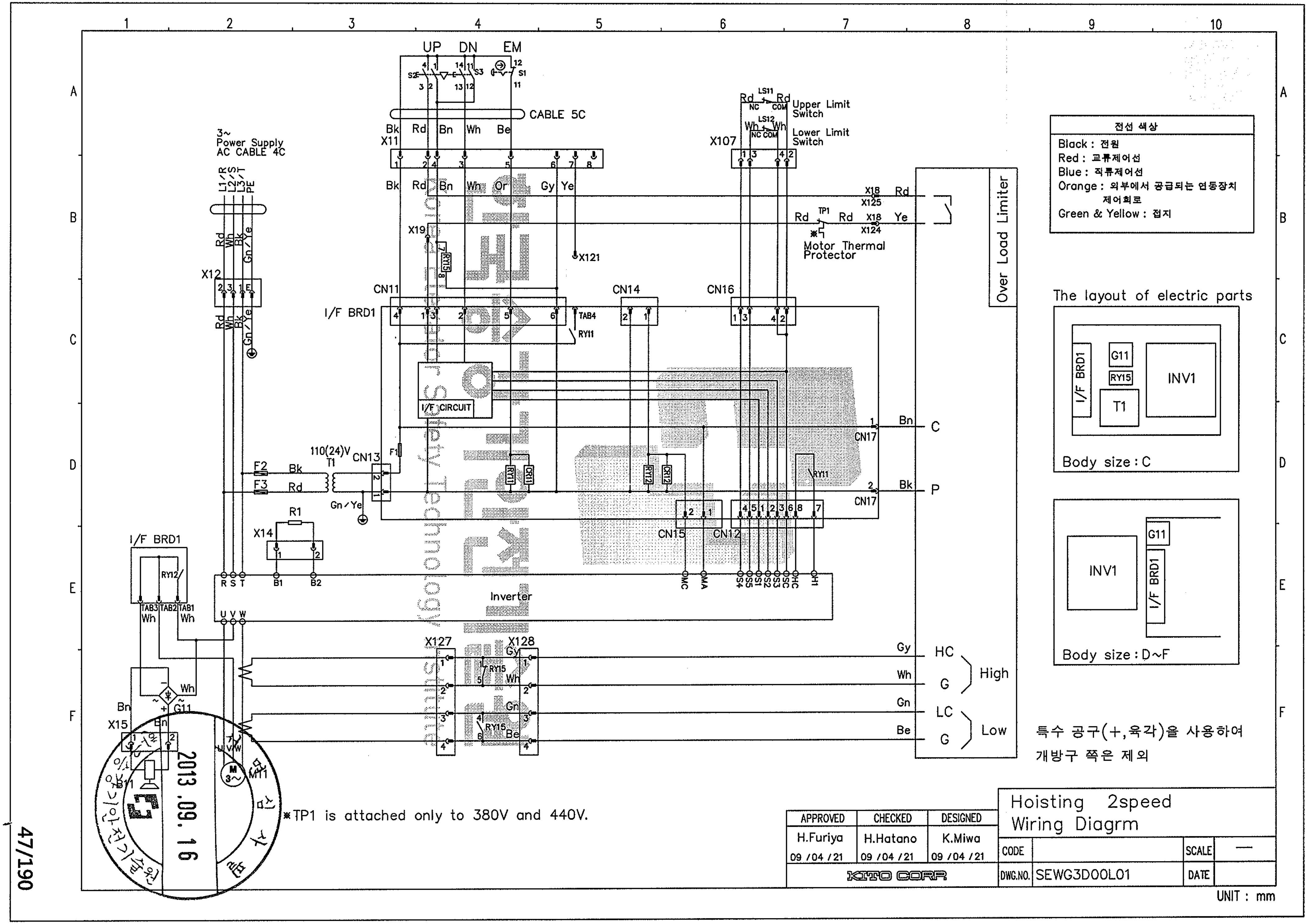
APPROVED	CHECKED	DESIGNED
H.Furiya	T.Hatano	K.Miwa
09 /04 /21	09 /04 /21	09 /04 /21

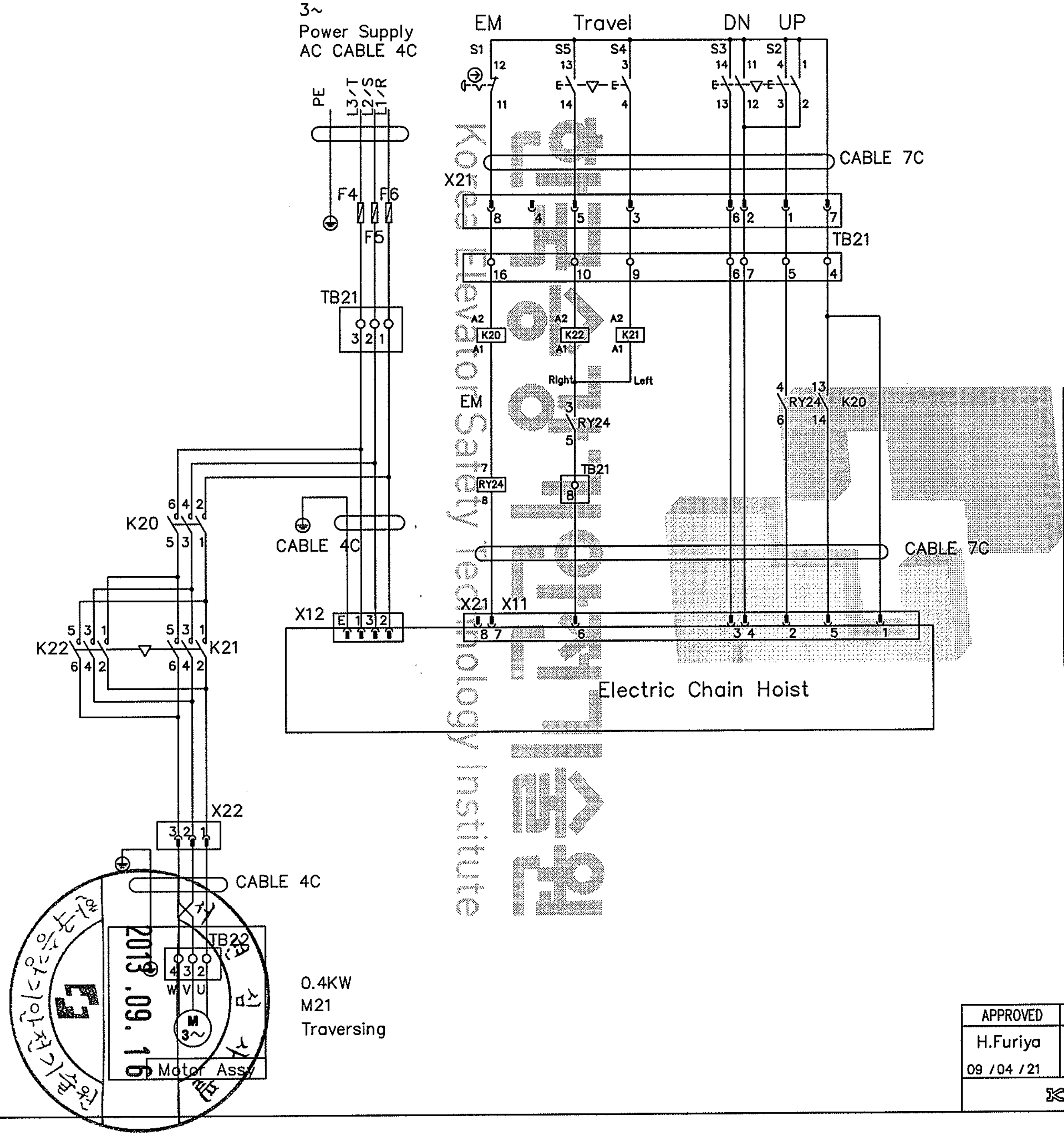
KITO CORP.

Hoisting : 1 speed
Wiring Diagrm

CODE		SCALE	—
DWG.NO.	SEWG3100L01	DATE	

UNIT : mm

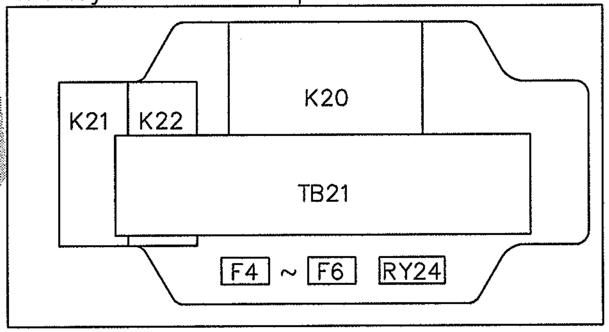

Hoisting 2speed
Wiring Diagrm
APPROVED H.Furiya 09 /04 /21
CHECKED H.Hatano 09 /04 /21
DESIGNED K.Miwa 09 /04 /21
KITO CORP
CODE
SCALE —
DWG.NO. SEWG3D00L01
DATE
UNIT : mm
전선 색상
Black : 전원
Red : 교류제어선
Blue : 직류제어선
Orange : 외부에서 공급되는 연동장치 제어회로
Green & Yellow : 접지
The layout of electric parts
Body size : C
Body size : D~F
특수 공구(+,육각)을 사용하여
개방구 쪽은 제외
※TP1 is attached only to 380V and 440V.
Over Load Limiter
Upper Limit Switch
Lower Limit Switch
Motor Thermal Protector
3~ Power Supply AC CABLE 4C
CABLE 5C
Inverter
I/F BRD1
I/F CIRCUIT
High
Low
2013 .09. 16



전선 색상

Black : 전원
Red : 교류제어선
Blue : 직류제어선
Orange : 외부에서 공급되는 연동장치 제어회로
Green & Yellow : 접지

The layout of electric parts



특수 공구(+,육각)을 사용하여
개방구 쪽은 제외

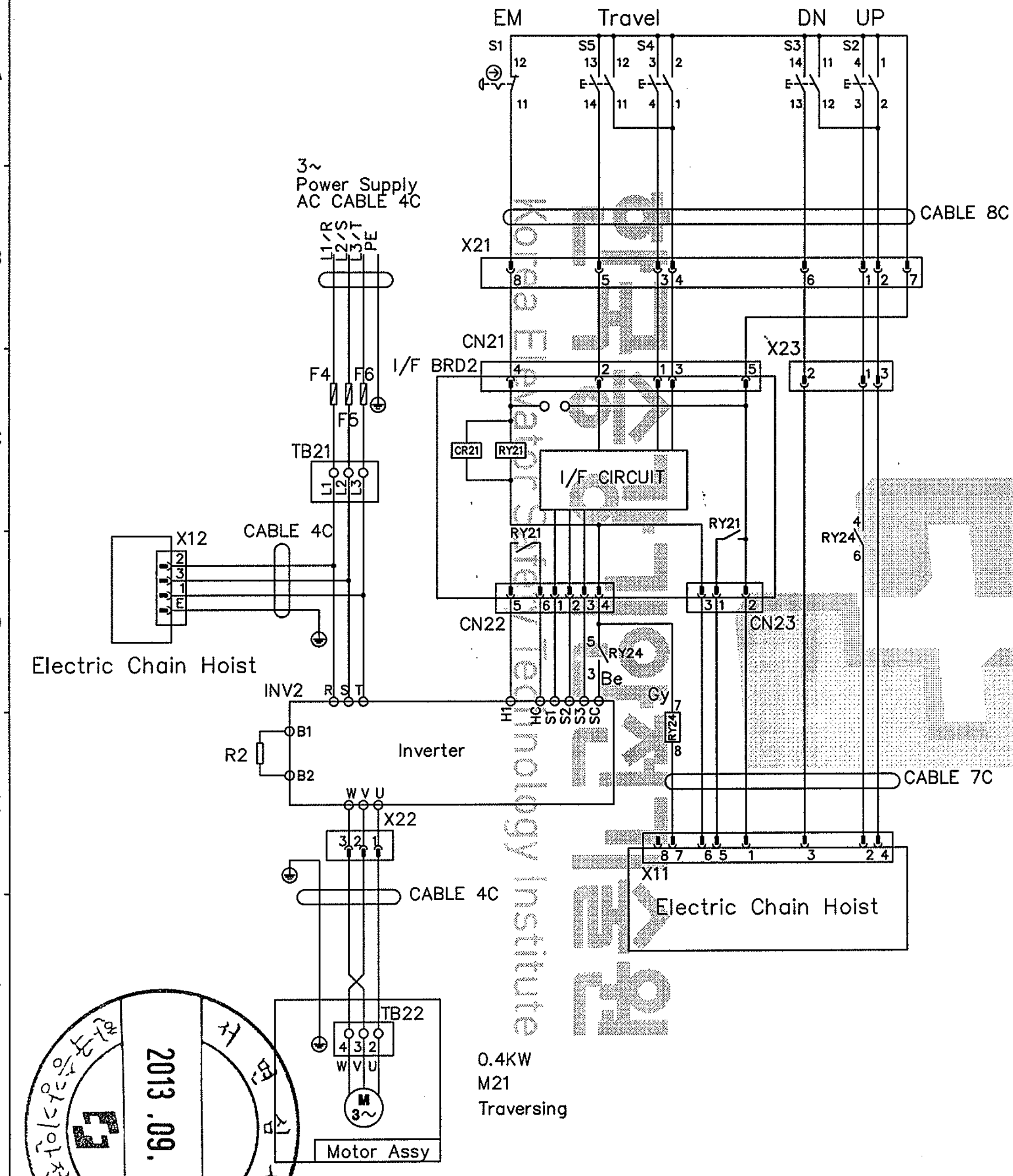
APPROVED	CHECKED	DESIGNED
H.Furiya	H.Hatano	K.Miwa
09 /04 /21	09 /04 /21	09 /04 /21

KITO CORP.

Traversing 1speed
Wiring Diagrm

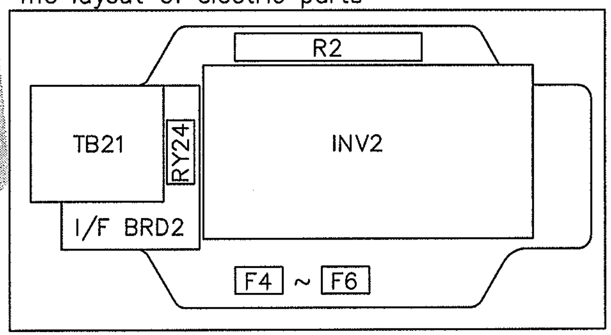
CODE		SCALE	—
DWG.NO.	SEWG3DD0L01	DATE	

UNIT : mm



전선 색상
Black : 전원
Red : 교류제어선
Blue : 직류제어선
Orange : 외부에서 공급되는 연동장치 제어회로
Green & Yellow : 접지

The layout of electric parts

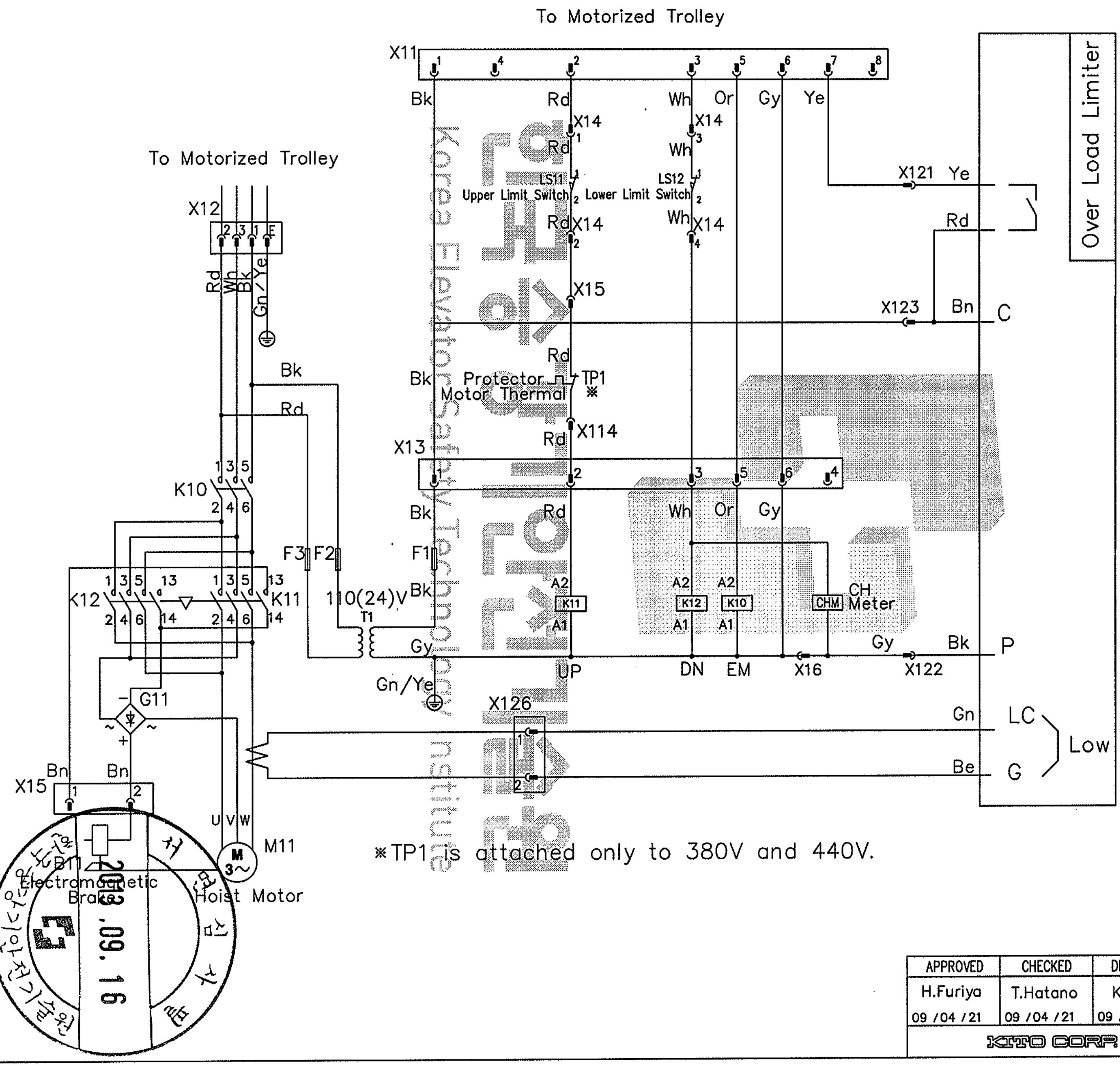


특수 공구(+,육각)을 사용하여
개방구 쪽은 제외

APPROVED	CHECKED	DESIGNED
H.Furiya 09 /04 /21	H.Hatano 09 /04 /21	K.Miwa 09 /04 /21
KITO CORP		

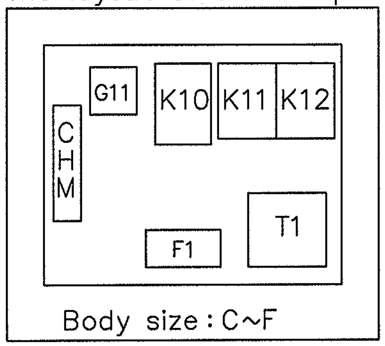
Traversing 2speed Wiring Diagrm			
CODE		SCALE	—
DWG.NO.	SEWG3DDOL01	DATE	

UNIT : mm



전선 색상
Black : 전원
Red : 교류제어선
Blue : 직류제어선
Orange : 외부에서 공급되는 연동장치 제어회로
Green & Yellow : 접지

The layout of electric parts



Body size : C~F

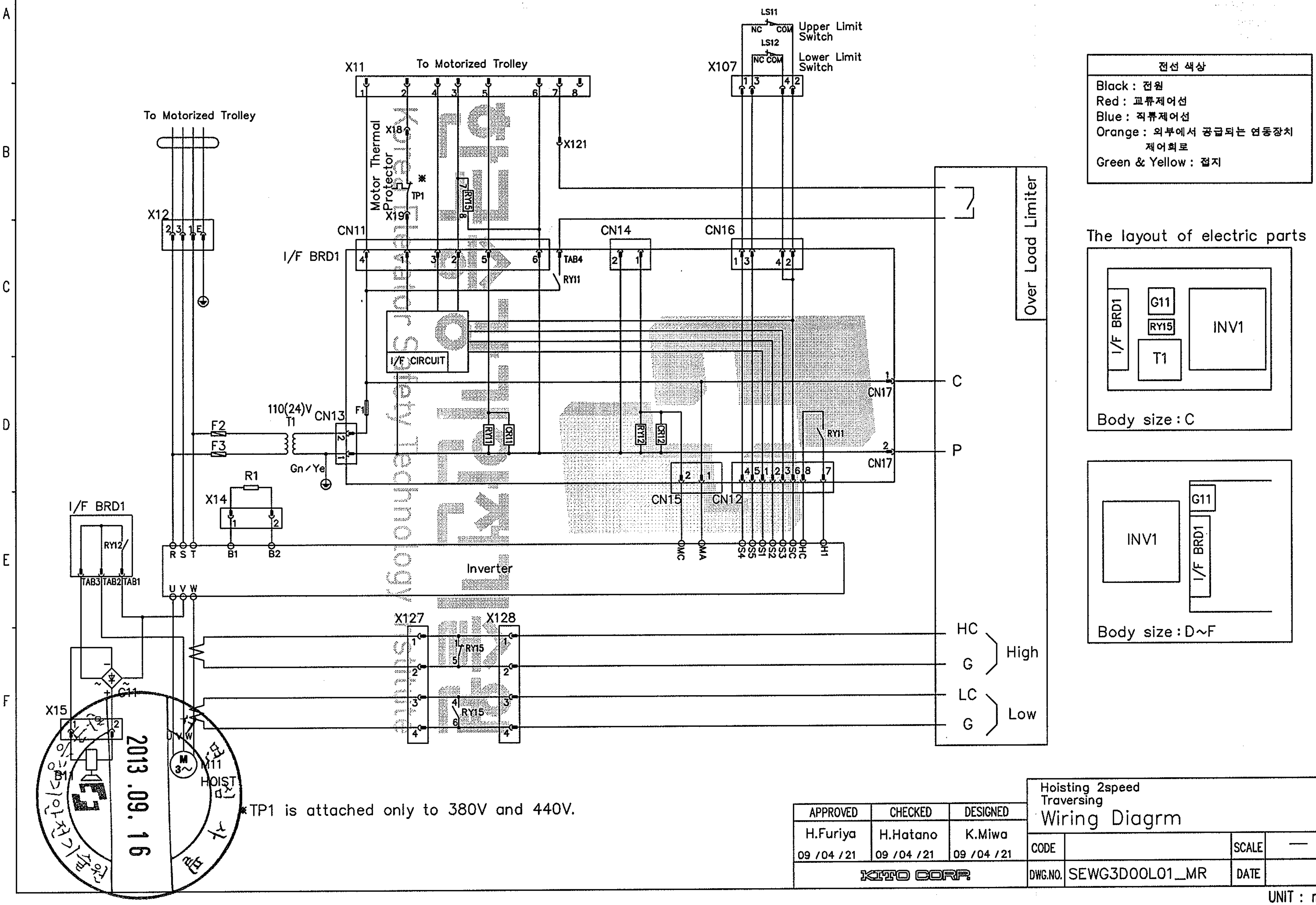
특수 공구(+,육각)을 사용하여 개방구 쪽은 제외

For MR connection

APPROVED	CHECKED	DESIGNED	Hoisting 1speed Traversing Wiring Diagrm			
H.Furiya 09 /04 /21	T.Hatano 09 /04 /21	K.Miwa 09 /04 /21	CODE		SCALE	—
KITO CORP.			DWG.NO.	SEWG3100L01_MR	DATE	

UNIT : mm

2013 .09. 16



*TP1 is attached only to 380V and 440V.

2013.09.16

APPROVED	CHECKED	DESIGNED
H.Furiya	H.Hatano	K.Miwa
09 /04 /21	09 /04 /21	09 /04 /21

KITO CORP.

Hoisting 2speed
Traversing
Wiring Diagrm

CODE		SCALE	—
DWG.NO.	SEWG3D00L01_MR	DATE	

UNIT : mm

CABLE 구성도 및 사양 – 권상 용량 0.9kW

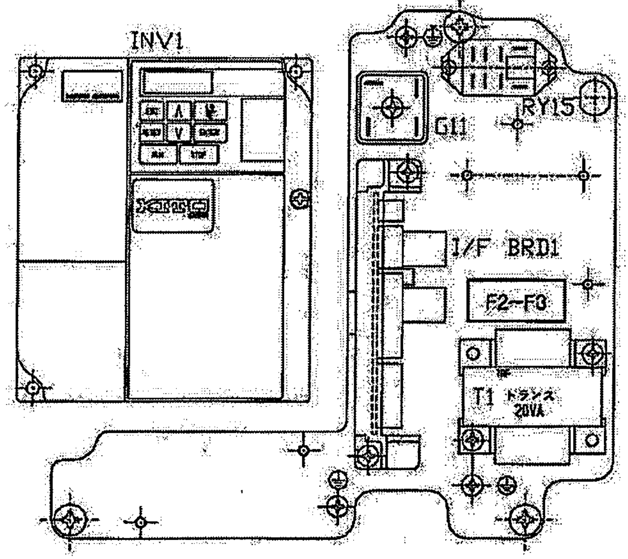
CABLE SPECIFICATION FOR ER2M

NO	ITEM	TYPE	ER2M10
			SIZE
①	Power Line	VCT	3.5sq x 4C
②	Push Button Switch	VCT	1.25sq x 8C
③	Loas Limit	VCT	0.75sq x 8C
④	Power Line for ER	VCT	1.5sq x 4C
⑤	Control Line for ER	VCT	1.25sq x 6C
⑥	Traversing Motor With Earth	VCT	1.25sq x 4C

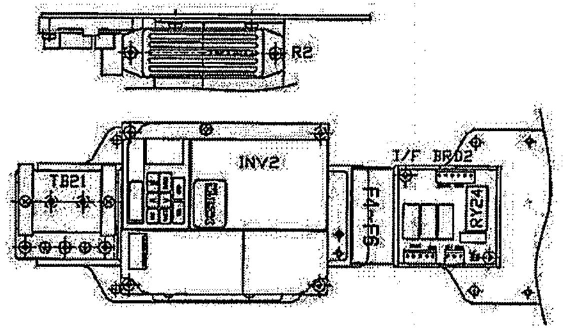
(3Φ 220(208)V / 380V / 440V 60Hz)

. 호이스트 CONTROL BOX 배치도

HOISTING CONTROL BOX

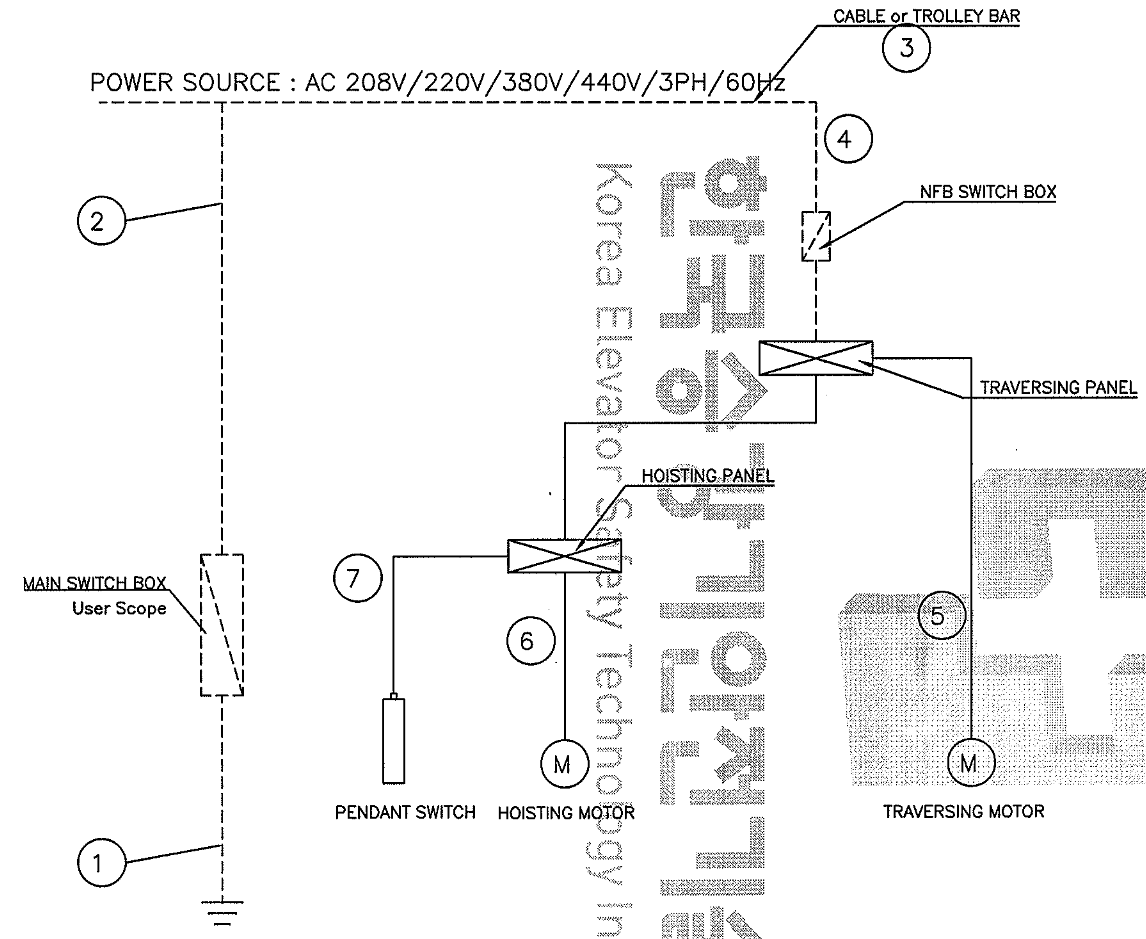


TRAVERSING CONTROL BOX



ENCLOSURE : HOIST BODY – IP55
PUSH BUTTON – IP65

MARK	DESCRIPTION	TYPE OF MODEL			Q'TY	MAKER	REMARKS
		220V	380V	440V			
INV1	INVERTER	V1000	V1000	V1000	1	YASKAWA	UP/DOWN
T1	TRANSFORMER	220V/ 24V(110V) 20VA	380V/ 24V(110V) 20VA	440V/24V(110V) 20VA	1	KITO	CONTROL CIRCUIT
G11	BRIDGE DIODE	S15VB60	S15VB60	S15VB60	1	SHINDENGEN	
I/F BRD1	INTERFACE BOARD	10~15A	10~15A	10~15A	1	KITO	
F2~F3	GLASS FUSE	10A	10A	10A	2	FUJI	
F4~F6	GLASS FUSE	30A	30A	30A	3	FUJI	
RY15	RELAY	110V	110V	110V	1	OMRON	HIGH/LOW
INV2	INVERTER	V1000	V1000	V1000	1	YASKAWA	RIGHT/LEFT
I/F BRD2	INTERFACE BOARD	10~15A	10~15A	10~15A	1	KITO	
RY24	RELAY	110V	110V	110V	1	OMRON	EMERGENCY STOP
TB21	TERMINAL BOARD 21	10~15A	10~15A	10~15A	1	KITO	



접지설비 시공방법

1.전동기의 외함,제어반 등은 접지를 해야 하며 그 접지저항은 다음의 규정을 따른다

접지공사		
3종 접지공사	400V 이하	100 Ω이하
특3종 접지공사	400V 이상	10 Ω이하

단,방폭지역은 전압관계없이 10 Ω이하일것

2. 접지전용 Trolley Duct 및 전선은 당해 전기기기, 기구에 대하여 충분한 용량과 전기적,기계적인 강도를 가져야 함.

3. 접지선이 외상을 받을 우려가 있는 경우는 전선관, 합성수지관 등과 함께 사용한다

4. 접지공사는 지표면에서 최저 75cm이상의 깊이에 접지봉을 박고 접지봉에는 접지동판을 연결한다.

CABLE 종류 및 굵기

NO	FROM	CABLE SPEC.	Earth Cable
1	Main Earth Line	VCT 4SQx1C	User Scope(1Core)
2	Main Power Sorce	VCT 4SQ x 4C	User Scope(1Core)
3	Trolley bar or Festoon cable	60A x 4P	User Scope(1Core)
4	Main Power Sorce	VCT 4SQ x 4C	User Scope(1Core)
5	Traversing Motor	VCT 1.25SQ x 6C	(G–1Core)
6	Hoist Motor	VCT 1.5SQ x 4C	(G–1Core)
7	Push Button Switch	VCT 1.25SQ x 8C	(G–1Core)
8			

REV.	QTY	CONTENTS	DATE	DRAWN	APPRO-VED

APPROVED	CHECKED	DESIGNED	DRAWN
M.Fukasawa	I.Iinuma	A.Shimura	---
11.07.20	11.07.20	11.07.20	

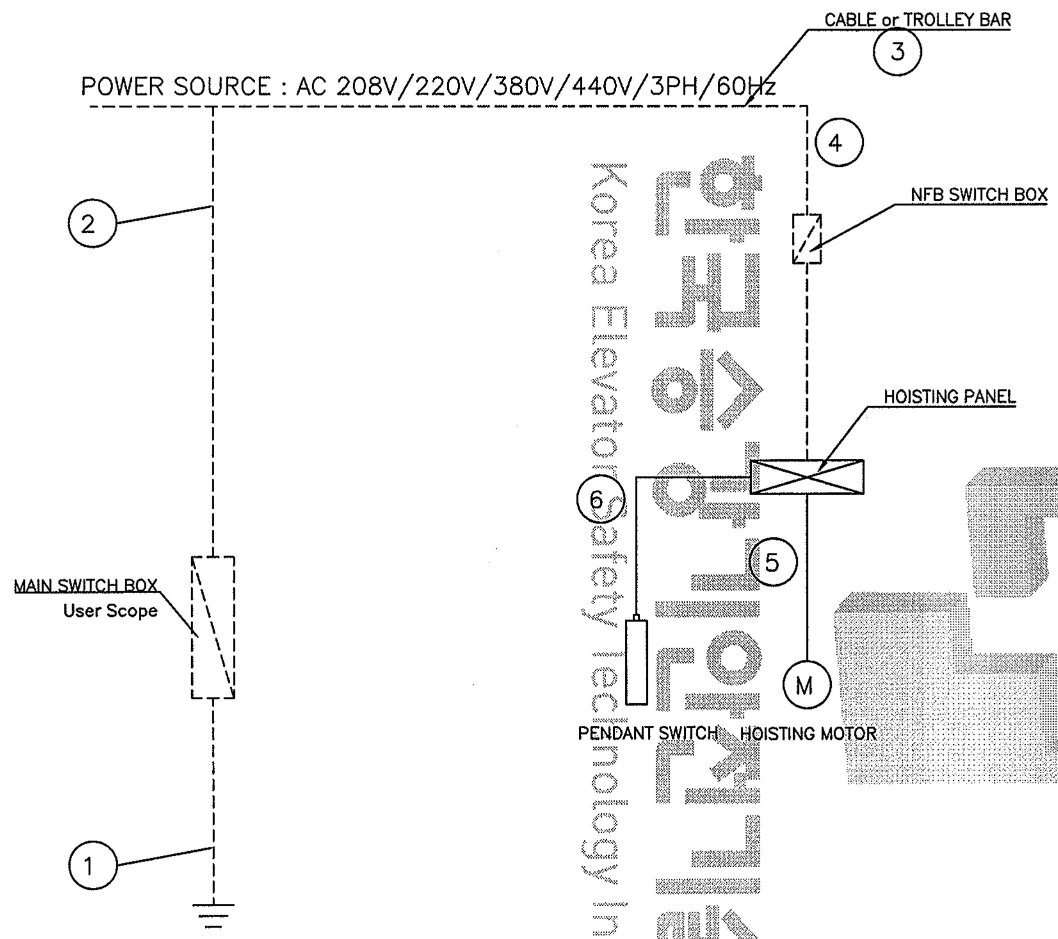
KITO CORPORATION

TITLE 1t MOTORIZED—4점식 케이블 구성도 및 접지계통도

MDL.	942513	SCALE	NOT
DWG. NO.	3NNU942513	REV.	0

樣式 025G-05

UNIT : mm



접지설비 시공방법

1. 전동기의 외함, 제어반 등은 접지를 해야 하며 그 접지저항은 다음의 규정을 따른다

접지공사		
3종 접지공사	400V 이하	100 Ω이하
특3종 접지공사	400V 이상	10 Ω이하

단, 방폭지역은 전압관계없이 10 Ω이하일것

2. 접지전용 Trolley Duct 및 전선은 당해 전기기기, 기구에 대하여 충분한 용량과 전기적, 기계적인 강도를 가져야 함.
3. 접지선이 외상을 받을 우려가 있는 경우는 전선관, 합성수지관 등과 함께 사용한다
4. 접지공사는 지표면에서 최저 75cm이상의 깊이에 접지봉을 박고 접지봉에는 접지동판을 연결한다.

CABLE 종류 및 굵기

NO	FROM	CABLE SPEC.	Earth Cable
1	Main Earth Line	VCT 4SQx1C	User Scope(1Core)
2	Main Power Sorce	VCT 4SQ x 4C	User Scope(1Core)
3	Trolley bar or Festoon cable	60A x 4P	User Scope(1Core)
4	Main Power Sorce	VCT 4SQ x 4C	User Scope(1Core)
5	Hoist Motor	VCT 1.5SQ x 4C	(G-1Core)
6	Push Button Switch	VCT 1.25SQ x 8C	(G-1Core)
7			
8			

서면심사 2013.09.16 한국승강기안전기술원

APPROVED	CHECKED	DESIGNED	DRAWN
M.Fukasawa	I.Iinuma	A.Shimura	---
11.07.20	11.07.20	11.07.20	

KITO CORPORATION

REV. | QTY | CONTENTS | DATE | DRAWN | APPROVED

TITLE 1t MOTORIZED-2점식 케이블 구성도 및 접지계통도

MDL. 942513 SCALE NOT

DWG. NO. 3NNU942514 REV. 0

様式 025G-05 UNIT : mm

허용 최대 SPAN 적용표 (I-BEAM, H-BEAM)

PROJECT NAME : KML-SHER2-010
RATED LOAD : 1 ton
DESCRIPTION : LIFT(max) 30 m

NO.	I-BEAM-SIZE (B*H*t1/t2)	Ix cm^4	Iy cm^4	Zx cm^3	Zy cm^3	A cm^2	Wb kg/m	Wh ton	Wg ton	Wg1 ton	L cm	L1 cm	L2 cm	b(최악) cm	E kg/cm²	Φ	Ψ	Σσ1 TON/cm²	Σσ2 TON/cm²	Σσ3 TON/cm²	Σσ4 TON/cm²	δ1<L/800->O.K δ1	L/800	δ2<L1/500->O.K δ2	L1/500	결과
I - BEAM																										
1	200x100x7/10t	2170	138	217	27.7	33.06	26	0.14	0.122	0.049	470	190	30	45.8	2100000	1.11	1.1	0.823	1.205	0.843	1.237	0.577	0.588	0.3508	0.38	O.K
2	250x125x7.5/12.5	5180	337	414	53.9	48.79	38.3	0.14	0.268	0.103	700	270	30	45.8	2100000	1.11	1.1	0.723	0.982	0.876	1.102	0.859	0.875	0.5062	0.54	O.K
H - BEAM																										
3	200x200x8/12t	4720	1600	472	160	63.53	49.9	0.14	0.324	0.125	650	250	30	45.8	2100000	1.11	1.1	0.544	0.730	0.290	0.358	0.775	0.813	0.4328	0.50	O.K
4	300x150x6.5/9t	7210	508	481	67.7	40.8	32	0.14	0.256	0.102	800	320	30	45.8	2100000	1.11	1.1	0.717	1.028	0.905	1.205	0.916	1.000	0.6397	0.64	O.K
5	350x175x7/11t	13500	984	771	112	62.91	49.4	0.14	0.519	0.198	1050	400	30	45.8	2100000	1.11	1.1	0.676	0.863	0.991	1.104	1.246	1.313	0.7348	0.80	O.K
6	400x200x8/13t	23500	1740	1170	174	83.37	65.4	0.14	0.85	0.327	1300	500	30	45.8	2100000	1.11	1.1	0.629	0.775	0.998	1.099	1.550	1.625	0.9029	1.00	O.K
7	450x200x9/14t	32900	1870	1460	187	95.43	74.9	0.14	1.086	0.449	1450	600	30	45.8	2100000	1.11	1.1	0.622	0.834	1.087	1.503	1.672	1.813	1.1941	1.20	O.K

Ix X축의 단면 2차모멘트
Iy Y축의 단면 2차모멘트
Zx X축의 단면계수
Zy Y축의 단면계수
A BEAM의 단면적
Wb BEAM의 단위중량
Wh HOIST 자중
Wg GIRDER 자중
Wg1 켄틀레버 GIRDER 자중
L SPAN-PITCH내 LENGTH
L1 켄틀레버 LENGTH
L2 HOOK APPROACH
b(최악) WHEEL BASE OF HOIST
E 종탄성계수
Φ = M 작업계수
Ψ = F 정하중계수

1. PITCH내 Σσ1 = (PITCH내 계산응력) < 1.279 TON/CM^2 이하일 경우 "O.K" (SS400,용접효율 80%적용,풍하중 115%적용)
작업시 풍하중을 고려 허용응력에 115% 적용 1391 * 80%(용접효율)*115%(작업시 풍하중) = 1279 KG/CM^2

2. 작업시 켄틀레버 Σσ2 = (켄틀레버 계산응력) < 1.600 TON/CM^2 이하일 경우 "O.K"(SS400,풍하중 115%적용)
작업시 풍하중을 고려 허용응력에 115% 적용 1391 * 115%(작업시 풍하중) = 1600 KG/CM^2
(켄틀레버 용접부위 없음)

3. 휴지시 PITCH내 Σσ3 = (PITCH내 계산응력) < 1.447 TON/CM^2 이하일 경우 "O.K" (SS400,풍하중 130%적용)
휴지시 풍하중을 고려 허용응력에 130% 적용 1391 *80%*130%(휴지시 풍하중) = 1447 KG/CM^2

3. 휴지시 켄틀레버 Σσ4 = (켄틀레버 계산응력) < 1.808 TON/CM^2 이하일 경우 "O.K" (SS400,풍하중 130%적용)
휴지시 풍하중을 고려 허용응력에 130% 적용 1391 * 130%(휴지시 풍하중) = 1808 KG/CM^2
(켄틀레버 BEAM 연결부위 없음)

4. δ1 = (PITCH내 처짐량) < L / 800 이하일 경우 "O.K"
δ2 = (켄틀레버 처짐량) < L1 / 500 이하일 경우 "O.K"

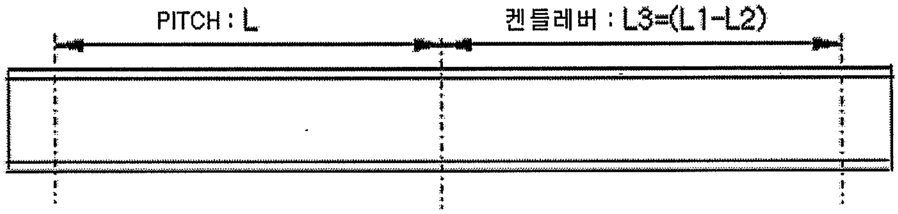
5. AREA CLASSIFICATION : IN DOOR or OUT DOOR

1. I-BEAM 최대허용 가능 SPAN 계산

1. SPECIFICATION

.정격하중	--------------------------------	Q =	1	ton
.SPAN (PITCH)	--------------------------------	L=	470	cm
.켄틸리버	---------------------	L1=	190	cm
.TROLLEY WHEEL BASE	---------------------	B=	45.8	cm
.WEIGHT OF HOIST	---------------------	Wh=	0.14	ton
.PITCH내의 GIRDER 무게	---------------------	Wg=	0.122	ton
.켄틸리버의 GIRDER 무게	---------------------	Wg1=	0.049	ton
.I-BEAM SIZE	---------------------	200x100x7/10t		
		Ix =	2170	cm^4
		Iy =	138	cm^4
		Zx =	217	cm^3
		Zy =	27.7	cm^3
		A =	33.06	cm^2
		Wb =	26	kg/m
.HOOK APPROACH	---------------------	L2=	30	cm
탄성계수	---------------------	E=	2100000	kg/㎠
동하중 계수(작업계수)	---------------------	M(Φ)=	1.11	
정하중 계수(충격계수)	---------------------	F(Ψ)=	1.10	

1. DESIGN



2. I-BEAM에 작용하는 하중

P = Q + Wh = 1 + 0.14 = 1.14 ton

3. 수직하중에 의한 BENDING MOMENT

1) PITCH 지점내 BENDING MOMENT

Mh1 = F x M x P x (L−B/2)^2 / (4 x L)

= 1.11*1.1*1.14*(470−45.8/2)^2/(4*470)

= 148.0 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.14*(190-30) = 222.71 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.122*470 / 8 = 7.956 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.049*190 / 2 = 5.17 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 156 ton.cm

Mmax2 = Mh2 + Mt2 = 227.9 ton.cm

6. 풍하중에 의한 수평하중의 BENDING MOMENT

(1) GIRDER에 의한 수직 풍하중

작업시 V=16m/s , q = 19.9 kg/㎡ h(최고양정) = 30 M

작업시 $q = 8.5 \times \sqrt[4]{h} = 8.5 \times \sqrt[4]{42} =$ 19.9 kg/㎡

H=(GIRDER높이) 0.20 m

PITCH내 풍하중 = F x L x H x q x 1.6 =1.11x4.7x0.2x19.9x1.6 = 33 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.3 =1.11x1.9x0.2x19.9x1.3 = 11 kg

$M_{FGG} = \frac{0.033x470}{8} + \frac{0.011 \times 190}{2} =$ 0.894 ton.cm

$M_{FG1} = \frac{0.011 \times 190}{2} =$ 1.045 ton.cm

(2) HOIST에 의한 풍하중

* 작업시

HH= 1.0 m HB= 0.65 m

풍하중 = F x HB x HH x q x 1.2 =1.11x0.65x1x19.9x1.2 = 17 kg

*PITCH내 풍하중

$M_{FHG=}$ 17 x 470 / 4 = 1997.5 kg.cm = 1.9975 ton.cm

*켄틀레버 풍하중

$M_{FH1=}$ 17 x 190 = 3230 kg.cm = 3.23 ton.cm

7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 0.894+1.9975= 2.892 ton.cm

*켄틀레버

M_{HC1}= M_{FG1} + M_{FH1} = 1.045+3.23= 4.275 ton.cm

8. BENDING STRESS

A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 156 / 217 = 0.719 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 227.9 / 217 = 1.050 ton/㎠

B. 수평 최대 응력

1. PITCH 내

σv3= M_{HCG}/Zy= 2.8915 / 27.7 = 0.104 ton/㎠

2. 켄틀레버

σv4= M_{HC1}/Zy= 4.275 / 27.7 = 0.154 ton/㎠

9. 합성 응력

Σσ1 = σv1+ σv3= 0.823

0.823	<	1.279	ton/cm^2	☞	O.K

Σσ2 = σv2+σv4= 1.205

1.205	<	1.6	ton/cm^2	☞	O.K

용접효율 : 80% 응력1391x80% x 115%= 1.279 ton/cm^2

켄틀레버는 용접부 없음 1391*작업시1.15(풍하중포함) = 1.600 ton/cm^2

10. 휴지시 풍하중에 의한 BENDING MOMENT

휴지시 V=45m/s , q = 158.0 kg/㎡ h(최고양정) = 30 m

휴지시 q = M x $\sqrt[4]{h}$ = 67.5 x $\sqrt[4]{30}$ = 158.0 kg/㎡

M= V² /30 = 67.5

***휴지시 풍하중에 의한 수평하중**

PITCH내 풍하중 = F x L x H x q x 1.6 =1.11x4.7x0.2x158x1.6 = 264 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.3 =1.11x1.9x0.2x158x1.3 = 87 kg

$$MM_{G1}= \frac{0.264x470}{8} - \frac{0.087 \times 190}{2} = 7.245 \text{ ton.cm}$$

$$MM_{1}= \frac{0.087 \times 190}{2} = 8.265 \text{ ton.cm}$$

HOIST에 대한 풍하중=FxHBxHHxqx1.2 =1.11x0.65x1x158x1.2 = 137 kg

*PITCH내 $MM_{H0=}$ 137 x 470 / 4= 64390 KG.CM = 16.0975 ton.cm

*켄틀레버 $MM_{H1=}$ 137 x 190 = 26030 KG.CM = 26.0[illegible] ton.cm

* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 7.245 + 16.0975 = 23.3425 ton.cm
$MM_4 = MM_1 + MM_{H1} =$ 8.265 + 26 = 34.27 ton.cm

* BENDING STRESS

$\Sigma\sigma 3 = MM_2 / Zy =$ 23.3425 / 27.7 = 0.843 ton/cm^2 < 1.447 ton/cm^2—O.K
$\Sigma\sigma 4 = MM_4 / Zy =$ 34.265 / 27.7 = 1.237 ton/cm^2 < 1.808 ton/cm^2—O.K

PITCH내 휴지시 응력 1391 x 80% x130% = 1447 ton/cm^2
켄틀레버는 용접부 없음 휴지시 응력 1391 x 130% = 1808 ton/cm^2

11. DEFLECTION OF GIRDER

* PITCH 내
1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\ Ix} = 0.5411\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wg \times L^3}{384 \times E \times Ix} = 0.0362\ cm$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 0.577 cm

RATIO : D3/L = 1/ 814 < 800 ------- O.K

* 켄틀레버
1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\ Ix} = 0.3416\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1 \times L1^3}{8 \times E \times Ix} = 0.0092\ cm$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 0.3508 cm

RATIO : D3/L = 1/ 542 < 500 ------ O.K

2. I-BEAM 최대허용 가능 SPAN 계산

1. SPECIFICATION

.정격하중	Q =	1	ton
.SPAN (PITCH)	L=	700	cm
.켄틸리버	L1=	270	cm
.TROLLEY WHEEL BASE	B=	45.8	cm
.WEIGHT OF HOIST	Wh=	0.14	ton
.PITCH내의 GIRDER 무게	Wg=	0.268	ton
.켄틸리버의 GIRDER 무게	Wg1=	0.103	ton
.I-BEAM SIZE	250x125x7.5/12.5t		
	Ix =	5180	cm^4
	Iy =	337	cm^4
	Zx =	414	cm^3
	Zy =	53.9	cm^3
	A =	48.79	cm^2
	Wb =	38.3	kg/m
.HOOK APPROACH	L2=	30	cm
탄성계수	E=	2100000	kg/㎠
동하중 계수(작업계수)	M(Φ)=	1.11	
정하중 계수(충격계수)	F(Ψ)=	1.10	

1. DESIGN

2. I-BEAM에 작용하는 하중

P = Q + Wh = 1 + 0.14 = 1.14 ton

3. 수직하중에 의한 BENDING MOMENT

1) PITCH 지점내 BENDING MOMENT

Mh1 = F x M x P x (L-B/2)^2 / (4 x L)

= 1.11*1.1*1.14*(700-45.8/2)^2/(4*700)

= 227.9 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.14*(270-30) = 334.07 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.268*700 / 8 = 26.03 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.103*270 / 2 = 15.43 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 253.9 ton.cm

Mmax2 = Mh2 + Mt2 = 349.5 ton.cm

6. 풍하중에 의한 수평하중의 BENDING MOMENT

(1) GIRDER에 의한 수직 풍하중

작업시 V=16m/s , q = 19.9 kg/㎡ h(최고양정) = 30 M

작업시 $q = 8.5 \times \sqrt[4]{h} = 8.5 \times \sqrt[4]{42} =$ 19.9 kg/㎡

H=(GIRDER높이) 0.25 m

PITCH내 풍하중 = F x L x H x q x 1.7 =1.11x7x0.25x19.9x1.7 = 66 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.4 =1.11x2.7x0.25x19.9x1.4 = 21 kg

$$M_{FGG} = \frac{0.066 \times 700}{8} + \frac{0.021 \times 270}{2} = 2.94 \text{ ton.cm}$$

$$M_{FG1} = \frac{0.021 \times 270}{2} = 2.835 \text{ ton.cm}$$

(2) HOIST에 의한 풍하중

* 작업시

HH= 1.0 m HB= 0.65 m

풍하중 = F x HB x HH x q x 1.2 =1.11x0.65x1x19.9x1.2 = 17 kg

*PITCH내 풍하중

$M_{FHG=}$ 17 x 700 / 4 = 2975 kg.cm = 2.975 ton.cm

*켄틀레버 풍하중

$M_{FH1=}$ 17 x 270 = 4590 kg.cm = 4.59 ton.cm

7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 2.94+2.975= 5.915 ton.cm

*켄틀레버

M_{HC1}= M_{FG1} + M_{FH1} = 2.835+4.59= 7.425 ton.cm

8. BENDING STRESS

A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 253.9 / 414 = 0.613 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 349.5 / 414 = 0.844 ton/㎠

B. 수평 최대 응력

1. PITCH 내

σv3= M_{HCG}/Zy= 5.915 / 53.9 = 0.110 ton/㎠

2. 켄틀레버

σv4= M_{HC1}/Zy= 7.425 / 53.9 = 0.138 ton/㎠

9. 합성 응력

Σσ1 = σv1+ σv3= 0.723

0.723 < 1.279 ton/cm^2 ☞ O.K

Σσ2 = σv2+σv4= 0.982

0.982 < 1.6 ton/cm^2 ☞ O.K

용접효율 : 80% 응력1391x80% x 115%= 1.279 ton/cm^2

켄틀레버는 용접부 없음 1391*작업시1.15(풍하중포함) = 1.600 ton/cm^2

10. 휴지시 풍하중에 의한 BENDING MOMENT

휴지시 V=45m/s , q = 158.0 kg/㎡ h(최고양정) = 30 m

휴지시 q = M x $\sqrt[4]{h}$ = 67.5 x $\sqrt[4]{30}$ = 158.0 kg/㎡

M= V^2 /30 = 67.5

*휴지시 풍하중에 의한 수평하중

PITCH내 풍하중 = F x L x H x q x 1.7 =1.11x7x0.25x158x1.7 = 522 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.4 =1.11x2.7x0.25x158x1.4 = 166 kg

$$MM_{G1} = \frac{0.522x700}{8} - \frac{0.166 \times 270}{2} = 23.265 \text{ ton.cm}$$

$$MM_1 = \frac{0.166 \times 270}{2} = 22.41 \text{ ton.cm}$$

HOIST에 대한 풍하중=FxHBxHHxqx1.2 =1.11x0.65x1x158x1.2 = 137 kg

*PITCH내 $MM_{H0=}$ 137 x 700 / 4= 95900 KG.CM = 23.975 ton.cm

*켄틀레버 $MM_{H1=}$ 137 x 270 = 36990 KG.CM = 37.0 ton.cm

* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 23.265 + 23.975 = 47.24 ton.cm

$MM_4 = MM_1 + MM_{H1} =$ 22.41 + 37 = 59.41 ton.cm

* BENDING STRESS

$\Sigma\sigma 3 = MM_2 / Zy =$ 47.24 / 53.9 = 0.876 ton/cm^2 < 1.447 ton/cm^2—O.K

$\Sigma\sigma 4 = MM_4 / Zy =$ 59.41 / 53.9 = 1.102 ton/cm^2 < 1.808 ton/cm^2—O.K

PITCH내 휴지시 응력 1391 x 80% x130% = 1447 ton/cm^2

켄틀레버는 용접부 없음 휴지시 응력 1391 x 130% = 1808 ton/cm^2

11. DEFLECTION OF GIRDER

* PITCH 내

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\ Ix} = 0.7489\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\ L^3}{384 \times E \times Ix} = 0.1100\ cm$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 0.859 cm

RATIO : D3/L = 1/ 815 < 800 ------- O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\ Ix} = 0.4829\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\ L1^3}{8 \times E \times Ix} = 0.0233\ cm$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 0.5062 cm

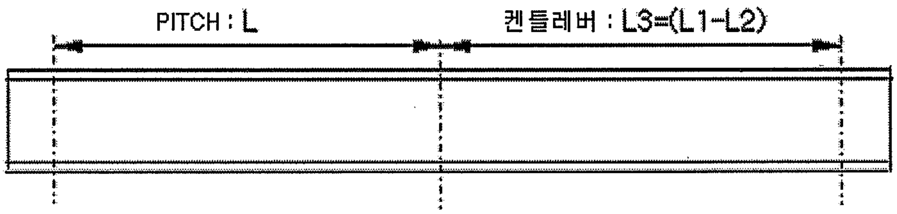
RATIO : D3/L = 1/ 533 < 500 ------- O.K

3. H-BEAM 최대허용 가능 SPAN 계산

1. SPECIFICATION

.정격하중	------------------------------	Q =	1	ton
.SPAN (PITCH)	------------------------------	L=	650	cm
.켄틸리버	--------------------	L1=	250	cm
.TROLLEY WHEEL BASE	--------------------	B=	45.8	cm
.WEIGHT OF HOIST	--------------------	Wh=	0.14	ton
.PITCH내의 GIRDER 무게	--------------------	Wg=	0.324	ton
.켄틸리버의 GIRDER 무게	--------------------	Wg1=	0.125	ton
.H-BEAM SIZE	--------------------	200x200x8/12t		
		Ix =	4720	cm^4
		Iy =	1600	cm^4
		Zx =	472	cm^3
		Zy =	160	cm^3
		A =	63.53	cm^2
		Wb =	49.9	kg/m
.HOOK APPROACH	--------------------	L2=	30	cm
탄성계수	--------------------	E=	2100000	kg/㎠
동하중 계수(작업계수)	--------------------	M(Φ)=	1.11	
정하중 계수(충격계수)	--------------------	F(Ψ)=	1.10	

1. DESIGN



2. H-BEAM에 작용하는 하중

P = Q + Wh = 1 + 0.14 = 1.14 ton

3. 수직하중에 의한 BENDING MOMENT

1) PITCH 지점내 BENDING MOMENT

Mh1 = F x M x P x (L−B/2)^2 / (4 x L)

= 1.11*1.1*1.14*(650−45.8/2)^2/(4*650)

= 210.5 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.14*(250-30) = 306.23 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.324*650 / 8 = 29.221 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.125*250 / 2 = 17.34 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 239.8 ton.cm

Mmax2 = Mh2 + Mt2 = 323.6 ton.cm

6. 풍하중에 의한 수평하중의 BENDING MOMENT

(1) GIRDER에 의한 수직 풍하중

작업시 V=16m/s , q = 19.9 kg/㎡ h(최고양정) = 30 m

작업시 $q = 8.5 \times \sqrt[4]{h} = 8.5 \times \sqrt[4]{42} =$ 19.9 kg/㎡

H=(GIRDER높이) 0.30 m

PITCH내 풍하중 = F x L x H x q x 1.7 =1.11x6.5x0.3x19.9x1.7 = 73 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.4 =1.11x2.5x0.3x19.9x1.4 = 23 kg

$M_{FGG} = \frac{0.073 \times 650}{8} - \frac{0.023 \times 250}{2} =$ 3.056 ton.cm

$M_{FG1} = \frac{0.023 \times 250}{2} =$ 2.875 ton.cm

(2) HOIST에 의한 풍하중

* 작업시

HH= 1.0 m HB= 0.65 m

풍하중 = F x HB x HH x q x 1.2 =1.11x0.65x1x19.9x1.2 = 17 kg

*PITCH내 풍하중

$M_{FHG=}$ 17 x 650 / 4 = 2762.5 kg.cm = 2.7625 ton.cm

*켄틀레버 풍하중

$M_{FH1=}$ 17 x 250 = 4250 kg.cm = 4.25 ton.cm

7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 3.056+2.7625= 5.819 ton.cm

*켄틀레버

M_{HC1}= M_{FG1} + M_{FH1} = 2.875+4.25= 7.125 ton.cm

8. BENDING STRESS

A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 239.8 / 472 = 0.508 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 323.6 / 472 = 0.686 ton/㎠

B. 수평 최대 응력

1. PITCH 내

σv3= M_{HCG}/Zy= 5.8185 / 160 = 0.036 ton/㎠

2. 켄틀레버

σv4= M_{HC1}/Zy= 7.125 / 160 = 0.045 ton/㎠

9. 합성 응력

Σσ1 = σv1+ σv3= 0.544

0.544 < 1.279 ton/cm^2 ☞ O.K

Σσ2 = σv2+σv4= 0.730

0.730 < 1.6 ton/cm^2 ☞ O.K

용접효율 : 80% 응력1391x80% x 115%= 1.279 ton/cm^2

켄틀레버는 용접부 없음 1391*작업시1.15(풍하중포함) = 1.600 ton/cm^2

10. 휴지시 풍하중에 의한 BENDING MOMENT

휴지시 V=45m/s , q = 158.0 kg/㎡ h(최고양정) = 30 m

휴지시 q = M x $\sqrt[4]{h}$ = 67.5 x $\sqrt[4]{30}$ = 158.0 kg/㎡

M= V^2 /30 = 67.5

*휴지시 풍하중에 의한 수평하중

PITCH내 풍하중 = F x L x H x q x 1.7 =1.11x6.5x0.3x158x1.7 = 581 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.4 =1.11x2.5x0.3x158x1.4 = 184 kg

$$MM_{G1} = \frac{0.581x650}{8} - \frac{0.184 \times 250}{2} = 24.20625 \text{ ton.cm}$$

$$MM_1 = \frac{0.184 \times 250}{2} = 23 \text{ ton.cm}$$

HOIST에 대한 풍하중=FxHBxHHxqx1.2 =1.11x0.65x1x158x1.2 = 137 kg

*PITCH내 $MM_{H0=}$ 137 x 650 / 4= 89050 KG.CM = 22.2625 ton.cm

*켄틀레버 $MM_{H1=}$ 137 x 250 = 34250 KG.CM = 34.3 ton.cm

* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 24.20625 + 22.2625 = 46.46875 ton.cm
$MM_4 = MM_1 + MM_{H1} =$ 23 + 34.3 = 57.30 ton.cm

* BENDING STRESS

$\Sigma\sigma 3 = MM_2 / Zy =$ 46.46875 / 160 = 0.290 ton/cm^2 < 1.447 ton/cm^2---O.K
$\Sigma\sigma 4 = MM_4 / Zy =$ 57.3 / 160 = 0.358 ton/cm^2 < 1.808 ton/cm^2---O.K

PITCH내 휴지시 응력 1391 x 80% x130% = 1447 ton/cm^2
켄틀레버는 용접부 없음 휴지시 응력 1391 x 130% = 1808 ton/cm^2

11. DEFLECTION OF GIRDER

* PITCH 내
1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\ Ix} = 0.6580\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wg x\ L^3}{384 \times E \times Ix} = 0.1169\ cm$$

3) TOTAL DEFLECTION

.δ1 = D1+ D2 = 0.775 cm

RATIO : D3/L = 1/ 839 < 800 ------- O.K

* 켄틀레버
1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\ Ix} = 0.4082\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\ L1^3}{8 \times E \times Ix} = 0.0246\ cm$$

3) TOTAL DEFLECTION

.δ2 = D1+ D2 = 0.4328 cm

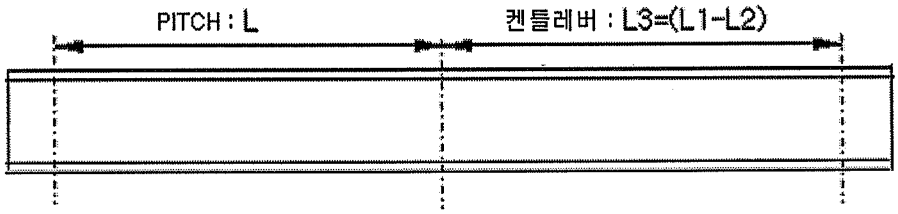
RATIO : D3/L = 1/ 578 < 500 ------- O.K

4. H-BEAM 최대허용 가능 SPAN 계산

1. SPECIFICATION

.정격하중	------------------------------	Q =	1	ton
.SPAN (PITCH)	------------------------------	L=	800	cm
.켄틸리버	--------------------	L1=	320	cm
.TROLLEY WHEEL BASE	--------------------	B=	45.8	cm
.WEIGHT OF HOIST	--------------------	Wh=	0.14	ton
.PITCH내의 GIRDER 무게	--------------------	Wg=	0.256	ton
.켄틸리버의 GIRDER 무게	--------------------	Wg1=	0.102	ton
.H-BEAM SIZE	--------------------	300x150x6.5/9t		
		Ix =	7210	cm^4
		Iy =	508	cm^4
		Zx =	481	cm^3
		Zy =	67.7	cm^3
		A =	40.8	cm^2
		Wb =	32	kg/m
.HOOK APPROACH	--------------------	L2=	30	cm
탄성계수	--------------------	E=	2100000	kg/㎠
동하중 계수(작업계수)	--------------------	M(Φ)=	1.11	
정하중 계수(충격계수)	--------------------	F(Ψ)=	1.10	

1. DESIGN



2. H-BEAM에 작용하는 하중

P = Q + Wh = 1 + 0.14 = 1.14 ton

3. 수직하중에 의한 BENDING MOMENT

1) PITCH 지점내 BENDING MOMENT

Mh1 = F x M x P x (L-B/2)^2 / (4 x L)

= 1.11*1.1*1.14*(800-45.8/2)^2/(4*800)

= 262.7 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.14*(320-30) = 403.66 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.256*800 / 8 = 28.416 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.102*320 / 2 = 18.12 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 291.1 ton.cm

Mmax2 = Mh2 + Mt2 = 421.8 ton.cm

6. 풍하중에 의한 수평하중의 BENDING MOMENT

(1) GIRDER에 의한 수직 풍하중

작업시 V=16m/s , q = 19.9 kg/㎡ h(최고양정) = 30 m

작업시 $q = 8.5 \times \sqrt[4]{h} = 8.5 \times \sqrt[4]{42} =$ 19.9 kg/㎡

H=(GIRDER높이) 0.30 m

PITCH내 풍하중 = F x L x H x q x 1.7 =1.11x8x0.3x19.9x1.7 = 90 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.4 =1.11x3.2x0.3x19.9x1.4 = 30 kg

$M_{FGG} = \frac{0.09 \times 800}{8} - \frac{0.03 \times 320}{2} =$ 4.2 ton.cm

$M_{FG1} = \frac{0.03 \times 320}{2} =$ 4.8 ton.cm

(2) HOIST에 의한 풍하중

* 작업시

HH= 1.0 m HB= 0.65 m

풍하중 = F x HB x HH x q x 1.2 =1.11x0.65x1x19.9x1.2 = 17 kg

*PITCH내 풍하중

$M_{FHG=}$ 17 x 800 / 4 = 3400 kg.cm = 3.4 ton.cm

*켄틀레버 풍하중

$M_{FH1=}$ 17 x 320 = 5440 kg.cm = 5.44 ton.cm

7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 4.2+3.4= 7.600 ton.cm

*켄틀레버

M_{HC1}= M_{FG1} + M_{FH1} = 4.8+5.44= 10.240 ton.cm

8. BENDING STRESS

A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 291.1 / 481 = 0.605 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 421.8 / 481 = 0.877 ton/㎠

B. 수평 최대 응력

1. PITCH 내

σv3= M_{HCG}/Zy= 7.6 / 67.7 = 0.112 ton/㎠

2. 켄틀레버

σv4= M_{HC1}/Zy= 10.24 / 67.7 = 0.151 ton/㎠

9. 합성 응력

Σσ1 = σv1+ σv3= 0.717

0.717	<	1.279	ton/cm^2	☞	O.K

Σσ2 = σv2+σv4= 1.028

1.028	<	1.6	ton/cm^2	☞	O.K

용접효율 : 80% 응력1391x80% x 115%= 1.279 ton/cm^2

켄틀레버는 용접부 없음 1391*작업시1.15(풍하중포함) = 1.600 ton/cm^2

10. 휴지시 풍하중에 의한 BENDING MOMENT

휴지시 V=45m/s , q = 158.0 kg/㎡ h(최고양정) = 30 m

휴지시 $q = M \times \sqrt[4]{h} = 67.5 \times \sqrt[4]{30} =$ 158.0 kg/㎡

$M = V^2 / 30 =$ 67.5

*휴지시 풍하중에 의한 수평하중

PITCH내 풍하중 = F x L x H x q x 1.7 =1.11x8x0.3x158x1.7 = 716 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.4 =1.11x3.2x0.3x158x1.4 = 236 kg

$$MM_{G1} = \frac{0.716 \times 800}{8} - \frac{0.236 \times 320}{2} = 33.84 \text{ ton.cm}$$

$$MM_1 = \frac{0.236 \times 320}{2} = 37.76 \text{ ton.cm}$$

HOIST에 대한 풍하중=FxHBxHHxqx1.2 =1.11x0.65x1x158x1.2 = 137 kg

*PITCH내 $MM_{H0=}$ 137 x 800 / 4= 109600 KG.CM = 27.4 ton.cm

*켄틀레버 $MM_{H1=}$ 137 x 320 = 43840 KG.CM = 43.8 ton.cm

* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 33.84 + 27.4 = 61.24 ton.cm
$MM_4 = MM_1 + MM_{H1} =$ 37.76 + 43.8 = 81.56 ton.cm

* BENDING STRESS

$\Sigma\sigma 3 = MM_2 / Zy =$ 61.24 / 67.7 = 0.905 ton/cm^2 < 1.447 ton/cm^2---O.K
$\Sigma\sigma 4 = MM_4 / Zy =$ 81.56 / 67.7 = 1.205 ton/cm^2 < 1.808 ton/cm^2---O.K

PITCH내	휴지시 응력 1391 x 80% x130% =	1447 ton/cm^2
켄틀레버는 용접부 없음	휴지시 응력 1391 x 130% =	1808 ton/cm^2

11. DEFLECTION OF GIRDER

* PITCH 내

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\ Ix} = 0.8031\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\ L^3}{384 \times E \times Ix} = 0.1127\ cm$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 0.916 cm

RATIO : D3/L = 1/ 874 < 800 ------ O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\ Ix} = 0.6121\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\ L1^3}{8 \times E \times Ix} = 0.0276\ cm$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 0.6397 cm

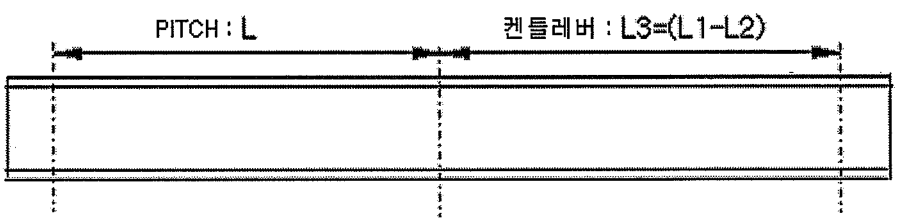
RATIO : D3/L = 1/ 500 < 500 ------ O.K

5. H-BEAM 최대허용 가능 SPAN 계산

1. SPECIFICATION

.정격하중	------------------------------	Q =	1	ton
.SPAN (PITCH)	------------------------------	L=	1050	cm
.켄틸리버	--------------------	L1=	400	cm
.TROLLEY WHEEL BASE	--------------------	B=	45.8	cm
.WEIGHT OF HOIST	--------------------	Wh=	0.14	ton
.PITCH내의 GIRDER 무게	--------------------	Wg=	0.519	ton
.켄틸리버의 GIRDER 무게	--------------------	Wg1=	0.198	ton
.H-BEAM SIZE	--------------------	350x175x7/11t		
		Ix =	13500	cm^4
		Iy =	984	cm^4
		Zx =	771	cm^3
		Zy =	112	cm^3
		A =	62.91	cm^2
		Wb =	49.4	kg/m
.HOOK APPROACH	--------------------	L2=	30	cm
탄성계수	--------------------	E=	2100000	kg/㎠
동하중 계수(작업계수)	--------------------	M(Φ)=	1.11	
정하중 계수(충격계수)	--------------------	F(Ψ)=	1.10	

1. DESIGN



2. H-BEAM에 작용하는 하중

P = Q + Wh = 1 + 0.14 = 1.14 ton

3. 수직하중에 의한 BENDING MOMENT

1) PITCH 지점내 BENDING MOMENT

Mh1 = F x M x P x (L−B/2)^2 / (4 x L)

= 1.11*1.1*1.14*(1050−45.8/2)^2/(4*1050)

= 349.6 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.14*(400-30) = 515.02 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.519*1050 / 8 = 75.612 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.198*400 / 2 = 43.96 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 425.2 ton.cm

Mmax2 = Mh2 + Mt2 = 559 ton.cm

6. 풍하중에 의한 수평하중의 BENDING MOMENT

(1) GIRDER에 의한 수직 풍하중

작업시 V=16m/s , q = 19.9 kg/㎡ h(최고양정) = 30 m

작업시 $q = 8.5 \times \sqrt[4]{h} = 8.5 \times \sqrt[4]{42} =$ 19.9 kg/㎡

H=(GIRDER높이) 0.35 m

PITCH내 풍하중 = F x L x H x q x 1.7 =1.11x10.5x0.35x19.9x1.7 = 138 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.4 =1.11x4x0.35x19.9x1.4 = 43 kg

$$M_{FGG} = \frac{0.138 \times 1050}{8} + \frac{0.043 \times 400}{2} = 9.513 \text{ ton.cm}$$

$$M_{FG1} = \frac{0.043 \times 400}{2} = 8.6 \text{ ton.cm}$$

(2) HOIST에 의한 풍하중

* 작업시

HH= 1.0 m HB= 0.65 m

풍하중 = F x HB x HH x q x 1.2 =1.11x0.65x1x19.9x1.2 = 17 kg

*PITCH내 풍하중

$M_{FHG=}$ 17 x 1050 / 4 = 4462.5 kg.cm = 4.4625 ton.cm

*켄틀레버 풍하중

$M_{FH1=}$ 17 x 400 = 6800 kg.cm = 6.8 ton.cm

7. COMBINED MOMENT

*PITCH내

M_{HCG}= M_{FGG} + M_{FHG} = 9.513+4.4625= 13.976 ton.cm

*켄틀레버

M_{HC1}= M_{FG1} + M_{FH1} = 8.6+6.8= 15.400 ton.cm

8. BENDING STRESS

A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 425.2 / 771 = 0.551 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 559 / 771 = 0.725 ton/㎠

B. 수평 최대 응력

1. PITCH 내

σv3= M_{HCG}/Zy= 13.9755 / 112 = 0.125 ton/㎠

2. 켄틀레버

σv4= M_{HC1}/Zy= 15.4 / 112 = 0.138 ton/㎠

9. 합성 응력

Σσ1 = σv1+ σv3= 0.676

0.676 < 1.279 ton/cm^2 ☞ O.K

Σσ2 = σv2+σv4= 0.863

0.863 < 1.6 ton/cm^2 ☞ O.K

용접효율 : 80% 응력1391x80% x 115%= 1.279 ton/cm^2

켄틀레버는 용접부 없음 1391*작업시1.15(풍하중포함) = 1.600 ton/cm^2

10. 휴지시 풍하중에 의한 BENDING MOMENT

휴지시 V=45m/s , q = 158.0 kg/㎡ h(최고양정) = 30 m

휴지시 q = M x $\sqrt[4]{h}$ = 67.5 x $\sqrt[4]{30}$ = 158.0 kg/㎡

M= V² /30 = 67.5

*휴지시 풍하중에 의한 수평하중

PITCH내 풍하중 = F x L x H x q x 1.7 =1.11x10.5x0.35x158x1.7 = 1096 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.4 =1.11x4x0.35x158x1.4 = 344 kg

$$MM_{G1} = \frac{1.096x1050}{8} - \frac{0.344 \times 400}{2} = 75.05 \text{ ton.cm}$$

$$MM_1 = \frac{0.344 \times 400}{2} = 68.8 \text{ ton.cm}$$

HOIST에 대한 풍하중=FxHBxHHxqx1.2 =1.11x0.65x1x158x1.2 = 137 kg

*PITCH내 $MM_{H0=}$ 137 x 1050 / 4= 143850 KG.CM = 35.9625 ton.cm

*켄틀레버 $MM_{H1=}$ 137 x 400 = 54800 KG.CM = 54.8 ton.cm

* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 75.05 + 35.9625 = 111.0125 ton.cm

$MM_4 = MM_1 + MM_{H1} =$ 68.8 + 54.8 = 123.60 ton.cm

* BENDING STRESS

$\Sigma\sigma 3 = MM_2 / Zy =$ 111.0125 / 112 = 0.991 ton/cm^2 < 1.447 ton/cm^2---O.K

$\Sigma\sigma 4 = MM_4 / Zy =$ 123.6 / 112 = 1.104 ton/cm^2 < 1.808 ton/cm^2---O.K

PITCH내 휴지시 응력 1391 x 80% x130% = 1447 ton/cm^2

켄틀레버는 용접부 없음 휴지시 응력 1391 x 130% = 1808 ton/cm^2

11. DEFLECTION OF GIRDER

* PITCH 내

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\ Ix} = 0.9698\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\ L^3}{384 \times E \times Ix} = 0.2759\ cm$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 1.246 cm

RATIO : D3/L = 1/ 843 < 800 ------ O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\ Ix} = 0.6789\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\ L1^3}{8 \times E \times Ix} = 0.0559\ cm$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 0.7348 cm

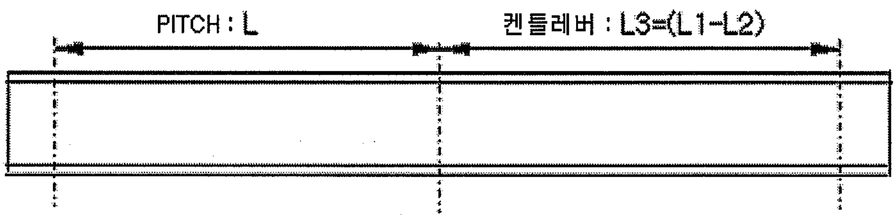
RATIO : D3/L = 1/ 544 < 500 ------ O.K

6. H-BEAM 최대허용 가능 SPAN 계산

1. SPECIFICATION

.정격하중	Q =	1	ton
.SPAN (PITCH)	L=	1300	cm
.켄틸리버	L1=	500	cm
.TROLLEY WHEEL BASE	B=	45.8	cm
.WEIGHT OF HOIST	Wh=	0.14	ton
.PITCH내의 GIRDER 무게	Wg=	0.85	ton
.켄틸리버의 GIRDER 무게	Wg1=	0.327	ton
.H-BEAM SIZE	400x200x8/13t		
	Ix =	23500	cm^4
	Iy =	1740	cm^4
	Zx =	1170	cm^3
	Zy =	174	cm^3
	A =	83.37	cm^2
	Wb =	65.4	kg/m
.HOOK APPROACH	L2=	30	cm
탄성계수	E=	2100000	kg/㎠
동하중 계수(작업계수)	M(Φ)=	1.11	
정하중 계수(충격계수)	F(Ψ)=	1.10	

1. DESIGN



2. H-BEAM에 작용하는 하중

P = Q + Wh = 1 + 0.14 = 1.14 ton

3. 수직하중에 의한 BENDING MOMENT

1) PITCH 지점내 BENDING MOMENT

Mh1 = F x M x P x (L−B/2)^2 / (4 x L)

= 1.11*1.1*1.14*(1300−45.8/2)^2/(4*1300)

= 436.6 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.14*(500−30) = 654.21 ton.cm

4. 자중에 의한 BENDING MOMENT(I−BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.85*1300 / 8 = 153.319 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.327*500 / 2 = 90.74 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 589.9 ton.cm

Mmax2 = Mh2 + Mt2 = 745 ton.cm

6. 풍하중에 의한 수평하중의 BENDING MOMENT

(1) GIRDER에 의한 수직 풍하중

작업시 V=16m/s , q = 19.9 kg/㎡ h(최고양정) = 30 m

작업시 $q = 8.5 \times \sqrt[4]{h} = 8.5 \times \sqrt[4]{42} =$ 19.9 kg/㎡

H=(GIRDER높이) 0.40 m

PITCH내 풍하중 = F x L x H x q x 1.7 =1.11x13x0.4x19.9x1.7 = 195 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.4 =1.11x5x0.4x19.9x1.4 = 62 kg

$M_{FGG} = \frac{0.195 \times 1300}{8} + \frac{0.062 \times 500}{2} =$ 16.188 ton.cm

$M_{FG1} = \frac{0.062 \times 500}{2} =$ 15.5 ton.cm

(2) HOIST에 의한 풍하중

* 작업시

HH= 1.0 m HB= 0.65 m

풍하중 = F x HB x HH x q x 1.2 =1.11x0.65x1x19.9x1.2 = 17 kg

*PITCH내 풍하중

M_{FHG}= 17 x 1300 / 4 = 5525 kg.cm = 5.525 ton.cm

*켄틀레버 풍하중

M_{FH1}= 17 x 500 = 8500 kg.cm = 8.5 ton.cm

7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG}$ = 16.188+5.525= 21.713 ton.cm

*켄틀레버

M_{HC1}= M_{FG1} + M_{FH1} = 15.5+8.5= 24.000 ton.cm

8. BENDING STRESS

A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 589.9 / 1170 = 0.504 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 745 / 1170 = 0.637 ton/㎠

B. 수평 최대 응력

1. PITCH 내

σv3= M_{HCG}/Zy= 21.713 / 174 = 0.125 ton/㎠

2. 켄틀레버

σv4= M_{HC1}/Zy= 24 / 174 = 0.138 ton/㎠

9. 합성 응력

Σσ1 = σv1+ σv3= 0.629

0.629 < 1.279 ton/cm^2 ☞ O.K

Σσ2 = σv2+σv4= 0.775

0.775 < 1.6 ton/cm^2 ☞ O.K

용접효율 : 80% 응력1391x80% x 115%= 1.279 ton/cm^2

켄틀레버는 용접부 없음 1391*작업시1.15(풍하중포함) = 1.600 ton/cm^2

10. 휴지시 풍하중에 의한 BENDING MOMENT

휴지시 V=45m/s , q = 158.0 kg/㎡ h(최고양정) = 30 m

휴지시 q = M x $\sqrt[4]{h}$ = 67.5 x $\sqrt[4]{30}$ = 158.0 kg/㎡

M= V^2 /30 = 67.5

*휴지시 풍하중에 의한 수평하중

PITCH내 풍하중 = F x L x H x q x 1.7 =1.11x13x0.4x158x1.7 = 1550 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.4 =1.11x5x0.4x158x1.4 = 491 kg

$$MM_{G1} = \frac{1.55x1300}{8} - \frac{0.491 \times 500}{2} = 129.125 \text{ ton.cm}$$

$$MM_1 = \frac{0.491 \times 500}{2} = 122.75 \text{ ton.cm}$$

HOIST에 대한 풍하중=FxHBxHHxqx1.2 =1.11x0.65x1x158x1.2 = 137 kg

*PITCH내 $MM_{H0=}$ 137 x 1300 / 4= 178100 KG.CM = 44.525 ton.cm

*켄틀레버 $MM_{H1=}$ 137 x 500 = 68500 KG.CM = 68.5 ton.cm

* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 129.125 + 44.525 = 173.65 ton.cm
$MM_4 = MM_1 + MM_{H1} =$ 122.75 + 68.5 = 191.25 ton.cm

* BENDING STRESS

$\Sigma\sigma3 = MM_2 / Zy =$	173.65 / 174 =	0.998 ton/cm^2	< 1.447	ton/cm^2---O.K
$\Sigma\sigma4 = MM_4 / Zy =$	191.25 / 174 =	1.099 ton/cm^2	< 1.808	ton/cm^2---O.K

PITCH내	휴지시 응력 1391 x 80% x130% =	1447 ton/cm^2
켄틀레버는 용접부 없음	휴지시 응력 1391 x 130% =	1808 ton/cm^2

11. DEFLECTION OF GIRDER

* PITCH 내

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\,Ix} = 1.0573\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\ L^3}{384 \times E \times Ix} = 0.4927\ cm$$

3) TOTAL DEFLECTION

$.\delta1 = D1 + D2 =$ 1.550 cm

RATIO : D3/L = 1/ 839 < 800 ------- O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\,Ix} = 0.7994\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\ L1^3}{8 \times E \times Ix} = 0.1035\ cm$$

3) TOTAL DEFLECTION

$.\delta2 = D1 + D2 =$ 0.9029 cm

RATIO : D3/L = 1/ 554 < 500 ------- O.K

7. H-BEAM 최대허용 가능 SPAN 계산

1. SPECIFICATION

.정격하중	----------	Q =	1	ton
.SPAN (PITCH)	----------	L=	1450	cm
.켄틸리버	----------	L1=	600	cm
.TROLLEY WHEEL BASE	----------	B=	45.8	cm
.WEIGHT OF HOIST	----------	Wh=	0.14	ton
.PITCH내의 GIRDER 무게	----------	Wg=	1.086	ton
.켄틸리버의 GIRDER 무게	----------	Wg1=	0.449	ton
.H-BEAM SIZE	----------	450x200x9/14t		
		Ix =	32900	cm^4
		Iy =	1870	cm^4
		Zx =	1460	cm^3
		Zy =	187	cm^3
		A =	95.43	cm^2
		Wb =	74.9	kg/m
.HOOK APPROACH	----------	L2=	30	cm
탄성계수	----------	E=	2100000	kg/㎠
동하중 계수(작업계수)	----------	M(Φ)=	1.11	
정하중 계수(충격계수)	----------	F(Ψ)=	1.10	

1. DESIGN

2. H-BEAM에 작용하는 하중

P = Q + Wh = 1 + 0.14 = 1.14 ton

3. 수직하중에 의한 BENDING MOMENT

1) PITCH 지점내 BENDING MOMENT

Mh1 = F x M x P x (L-B/2)^2 / (4 x L)

= 1.11*1.1*1.14*(1450-45.8/2)^2/(4*1450)

= 488.8 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.14*(600−30) = 793.41 ton.cm

4. 자중에 의한 BENDING MOMENT(I−BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*1.086*1450 / 8 = 218.49 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.449*600 / 2 = 149.52 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 707.3 ton.cm

Mmax2 = Mh2 + Mt2 = 942.9 ton.cm

6. 풍하중에 의한 수평하중의 BENDING MOMENT

(1) GIRDER에 의한 수직 풍하중

작업시 V=16m/s , q = 19.9 kg/㎡ h(최고양정) = 30 m

작업시 $q = 8.5 \times \sqrt[4]{h} = 8.5 \times \sqrt[4]{42} =$ 19.9 kg/㎡

H=(GIRDER높이) 0.45 m

PITCH내 풍하중 = F x L x H x q x 1.7 =1.11x14.5x0.45x19.9x1.7 = 245 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.4 =1.11x6x0.45x19.9x1.4 = 83 kg

$M_{FGG} = \frac{0.245 \times 1450}{8} - \frac{0.083 \times 600}{2} =$ 19.506 ton.cm

$M_{FG1} = \frac{0.083 \times 600}{2} =$ 24.9 ton.cm

(2) HOIST에 의한 풍하중

* 작업시

HH= 1.0 m HB= 0.65 m

풍하중 = F x HB x HH x q x 1.2 =1.11x0.65x1x19.9x1.2 = 17 kg

*PITCH내 풍하중

$M_{FHG} =$ 17 x 1450 / 4 = 6162.5 kg.cm = 6.1625 ton.cm

*켄틀레버 풍하중

$M_{FH1} =$ 17 x 600 = 10200 kg.cm = 10.2 ton.cm

7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 19.506+6.1625= 25.669 ton.cm

*켄틀레버

M_{HC1}= M_{FG1} + M_{FH1} = 24.9+10.2= 35.100 ton.cm

8. BENDING STRESS

A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 707.3 / 1460 = 0.484 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 942.9 / 1460 = 0.646 ton/㎠

B. 수평 최대 응력

1. PITCH 내

σv3= M_{HCG}/Zy= 25.6685 / 187 = 0.137 ton/㎠

2. 켄틀레버

σv4= M_{HC1}/Zy= 35.1 / 187 = 0.188 ton/㎠

9. 합성 응력

Σσ1 = σv1+ σv3= 0.622

0.622	<	1.279	ton/cm²	☞	O.K

Σσ2 = σv2+σv4= 0.834

0.834	<	1.6	ton/cm²	☞	O.K

용접효율 : 80% 응력1391x80% x 115%= 1.279 ton/cm²

켄틀레버는 용접부 없음 1391*작업시1.15(풍하중포함) = 1.600 ton/cm²

10. 휴지시 풍하중에 의한 BENDING MOMENT

휴지시 V=45m/s , q = 158.0 kg/㎡ h(최고양정) = 30 m

휴지시 q = M x $\sqrt[4]{h}$ = 67.5 x $\sqrt[4]{30}$ = 158.0 kg/㎡

M= V² /30 = 67.5

*휴지시 풍하중에 의한 수평하중

PITCH내 풍하중 = F x L x H x q x 1.7 =1.11x14.5x0.45x158x1.7 = 1945 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.4 =1.11x6x0.45x158x1.4 = 663 kg

$$MM_{G1} = \frac{1.945x1450}{8} - \frac{0.663 \times 600}{2} = 153.63125 \text{ ton.cm}$$

$$MM_1 = \frac{0.663 \times 600}{2} = 198.9 \text{ ton.cm}$$

HOIST에 대한 풍하중=FxHBxHHxqx1.2 =1.11x0.65x1x158x1.2 = 137 kg

*PITCH내 MM_{H0}= 137 x 1450 / 4= 198650 KG.CM = 49.6625 ton.cm

*켄틀레버 MM_{H1}= 137 x 600 = 82200 KG.CM = 82.2 ton.cm

* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 153.63125 + 49.6625 203.29375 ton.cm

$MM_4 = MM_1 + MM_{H1} =$ 198.9 + 82.2 = 281.10 ton.cm

* BENDING STRESS

$\Sigma\sigma 3 = MM_2 / Zy =$	203.29375 / 187 =	1.087 ton/cm^2	< 1.447	ton/cm^2—O.K
$\Sigma\sigma 4 = MM_4 / Zy =$	281.1 / 187 =	1.503 ton/cm^2	< 1.808	ton/cm^2—O.K

PITCH내	휴지시 응력 1391 x 80% x130% =	1447 ton/cm^2
켄틀레버는 용접부 없음	휴지시 응력 1391 x 130% =	1808 ton/cm^2

11. DEFLECTION OF GIRDER

* PITCH 내

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\ Ix} = 1.0480\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\ L^3}{384 \times E \times Ix} = 0.6240\ cm$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 1.672 cm

RATIO : D3/L = 1/ 867 < 800 ------ O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\ Ix} = 1.0186\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\ L1^3}{8 \times E \times Ix} = 0.1755\ cm$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 1.1941 cm

RATIO : D3/L = 1/ 502 < 500 ------ O.K

SUSPENSION MONORAIL 볼트 및 용접강도계산

1.볼트로 고정시의 강도계산

* 허용 최대 SPAN 및 하중은 최악의 조건으로 계산한다.
(허용 최대 스판 14.5 M, , HOIST자중 : 140 KG)

.Q = RATED LOAD= 1000 KG
.Q1=HOIST SELF WEIGHT= 140 KG
.Q2=I-BEAM WEIGHT = 1086 KG

BOLT 재질 :	H.T.B 9.8 이상 사용할것
BOLT 허용전단응력 :	2100 KG/CM^2

M12 일때 do= 1.0106 CM n= 4.6 . n = 유효산수(산수*80% 너트1종너트사용
M14 일때 do= 1.1835 CM n= 4.4
M16 일때 do= 1.3835 CM n= 5.2
M18 일때 do= 1.5294 CM n= 4.8

P = 1.14*(Q+Q1) + 1.1* Q2/2
= 1.14*(1000+140) + 1.1* 1086/2
= 1897 KG (σa = 2100 KG/CM^2)

1)인장(전단)강도 : $\sigma = P/A$; $\sigma = \frac{4 \times P}{\pi \times do^2 \times Z}$ ∗ $Z = \frac{4 \times P}{\pi \times do^2 \times \sigma}$

M12 일때 $Z = \frac{4 \times P}{\pi \times do^2 \times \sigma} = \frac{4x1897}{\pi \times 1.0106\text{^}2 \times 2100} =$ 1.13 개

M14 일때 $Z = \frac{4 \times P}{\pi \times do^2 \times \sigma} = \frac{4x1897}{\pi \times 1.1835\text{^}2 \times 2100} =$ 0.82 개

M16 일때 $Z = \frac{4 \times P}{\pi \times do^2 \times \sigma} = \frac{4x1897}{\pi \times 1.3835\text{^}2 \times 2100} =$ 0.6 개

M18 일때 $Z = \frac{4 \times P}{\pi \times do^2 \times \sigma} = \frac{4x1897}{\pi \times 1.5294\text{^}2 \times 2100} =$ 0.49 개

2)접촉 면압 강도 (σa = 400 KG/CM^2)

$\sigma = \frac{4 \times P}{\pi \times (d^2-do^2) \times Z \times n}$; $Z = \frac{4 \times P}{\pi \times (d^2-do^2) \times \sigma \times n}$

M12 일때 $Z = \frac{4x1897}{\pi \times (1.2\text{^}2 - 1.0106\text{^}2) x400x\ 4.57} =$ 3.16 개

M14 일때 $Z = \frac{4x1897}{\pi \times (1.4\text{^}2 - 1.1835\text{^}2) x400x\ 4.4} =$ 2.45 개

M16 일때 $Z = \frac{4x1897}{\pi \times (1.6\text{^}2 - 1.3835\text{^}2) x400x\ 5.2} =$ 1.8 개

M18 일때 $Z = \frac{4x1897}{\pi \times (1.8\text{^}2 - 1.5294\text{^}2) x400x\ 4.8} =$ 1.4 개

. do = 골경,   P=브라켓 한 개에 작용하는 하중, Z = 볼트수
. n =   유효산수(산수*80%),   너트1종너트사용

3)따라서 다음과 같이 적용한다

H.T.B M12,M14,M16,M18일때 : 브라켓트당 4개 이상 사용한다.

2. I-빔을 용접시공으로 고정시의 강도계산

* 허용 최대 SPAN 및 하중은 최악의 조건으로 계산한다.
(허용 최대 스판 14.5 M, , HOIST자중 : 140 KG)

.Q = RATED LOAD= 1000 KG (h : 용접두께
.Q1=HOIST SELF WEIGHT= 140 KG L : 용접길이)
.Q2=I-BEAM WEIGHT = 1086 KG

1) 용접이음부 인장강도 계산 (용접두께 : 45° 용접부위)

$$\sigma = \frac{1.414 \times P}{h * L} \; ; \; (\sigma a = 1200\ KG/CM^2) \qquad L = \frac{1.414 \times P}{h * \sigma}$$

(1) h 가 5일때

$$L = \frac{1.414 x1897}{0.5 \times 1200} = 4.47\ CM = 44.7\ mm$$

(2) h 가 6일때

$$L = \frac{1.414 x1897}{0.6 \times 1200} = 3.73\ CM = 37.3\ mm$$

(3) h 가 7일때

$$L = \frac{1.414 x1897}{0.7 \times 1200} = 3.19\ CM = 31.9\ mm$$

2) 적용

h = 5일때, 한 브라켓트당 용접길이 L = 60mm 이상 용접한다.
h = 6일때, 한 브라켓트당 용접길이 L = 50mm 이상 용접한다.
h = 7일때, 한 브라켓트당 용접길이 L = 40mm 이상 용접한다.

6. FOR REFERENCE

1) LOAD CHAIN 시험성적서

2) MOTOR DATA SHEET

3) HOIST 사용설명서(operation manual)

한국승강기안전기술원

Korea Elevator Safety Technology Institute

KITO CORPORATION

Date: 2009/04/14

Certificate of Compliance

We certify that the ER2 protection degrees conform to the IP rating as follows:

Hoist body - IP55 based on JIS C 4034-5, “Rotating electrical machines – Part5: Classification of degrees of protection provided by enclosures of rotating electrical machines (IP code)”.

Push button - IP65 based on JIS C 0920, “Tests to prove protection against ingress of water and degrees of protection against ingress of solid objects for electrical equipment".

Technical Control Group

한국승강기안전기술원

Korea Elevator Safety Technology Institute

Certificate No.: MM080011c
Date of Issue: 2009/3/4

Messrs. ____________

Motor Test Report for Electric Chain Hoist

Motor type : Three phase squirrel cage type induction motor.

Manufacturer : Yasukawa Electric Mfg. Co.

Production No. : -

Rating

Model	Output	Pole	Intermittent Rating	Voltage	Frequency
IBQ	0.9kW	4P	60%ED	220V	60Hz

Full load characteristics

Voltage Frequency	220V 60Hz
Load %	100
Current A	4.7
Speed rpm	1660

Insulation class E

The above characteristics are obtained from calculation where the motor is assembled with an electric chain hoist and the hoist is subjected to full load

KITO CORP.
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Certificate No.: MM080011d
Date of Issue: 2009/3/4

Messrs. ____________

Motor Test Report for Electric Chain Hoist

Motor type : Three phase squirrel cage type induction motor.

Manufacturer : Yasukawa Electric Mfg. Co.

Production No. : -

Rating

Model	Output	Pole	Intermittent Rating	Voltage	Frequency
IBQ	0.9kW	4P	40/20%ED	220V	Speed Control by Inverter

Full load characteristics

Voltage Frequency	220V Speed Control by Inverter
Load %	100
Current A	5.7
Speed rpm	~

Insulation class E

The above characteristics are obtained from calculation where the motor is assembled with an electric chain hoist and the hoist is subjected to full load

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Certificate No.: MM070011c
Date of Issue: 2008/03/21

Messrs. ______________

Motor Test Report for Electric Chain Hoist

Motor type : Three phase squirrel cage type induction motor.

Manufacturer : Yasukawa Electric Mfg. Co.

Production No. :

Rating

Model	Output	Pole	Intermittent Rating	Voltage	Frequency
IBQ	0.9kW	4P	60%ED	380 - 440V	60Hz

Full load characteristics

Voltage Frequency		380 - 440V 60Hz
Load	%	100
Current	A	2.6
Speed	rpm	1640

Insulation class B

The above characteristics are obtained from calculation where the motor is assembled with an electric chain hoist and the hoist is subjected to full load

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Motor Test Report for Electric Chain Hoist

Motor type : Three phase squirrel cage type induction motor.

Manufacturer : Yasukawa Electric Mfg. Co.

Production No. :

Rating

Model	Output	Pole	Intermittent Rating	Voltage	Frequency
IBQ	0.9kW	4P	60%ED	380 - 440V	Speed Control by Inverter

Full load characteristics

Voltage Frequency	380 - 440V Speed Control by Inverter
Load %	100
Current A	3.6
Speed rpm	~

Insulation class B

The above characteristics are obtained from calculation where the motor is assembled with an electric chain hoist and the hoist is subjected to full load

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Date of Issue: 2009/3/4

Messrs.

Motor Test Report for Electric Trolley

Motor type : Three phase squirrel cage type induction motor.

Manufacturer : Yasukawa Electric Mfg. Co.

Production No. : -

Rating

Model	Output	Pole	Intermittent Rating	Voltage	Frequency
IBQ-T	0.4kW	4P	40%ED	220V	60Hz

Full load characteristics

Voltage Frequency	220V 60Hz
Load %	100
Current A	3.0
Speed rpm	1685

Insulation class E

The above characteristics are obtained from calculation where the motor is assembled with an electric trolley and the trolley is subjected to full load

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Date of Issue: 2009/3/4

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Motor Test Report for Electric Trolley

Motor type : Three phase squirrel cage type induction motor.

Manufacturer : Yasukawa Electric Mfg. Co.

Production No. : -

Rating

Model	Output	Pole	Intermittent Rating	Voltage	Frequency
IBQ-T	0.4kW	4P	27/13%ED	220V	Speed Control by Inverter

Full load characteristics

Voltage Frequency	220V Speed Control by Inverter
Load %	100
Current A	3.0
Speed rpm	~

Insulation class E

The above characteristics are obtained from calculation where the motor is assembled with an electric trolley and the trolley is subjected to full load

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Certificate No.: MM070013a

Date of Issue: 2008/03/21

Messrs. ____________

Motor Test Report for End Carriage

Motor type : Three phase squirrel cage type induction motor.

Manufacturer : Yasukawa Electric Mfg. Co.

Production No. :

Rating

Model	Output	Pole	Intermittent Rating	Voltage	Frequency
IBQ-T	0.4kW	4P	40%ED	380 - 440V	60Hz

Full load characteristics

Voltage Frequency	380 - 440V 60Hz
Load %	100
Current A	2.2
Speed rpm	1670

Insulation class B

The above characteristics are obtained from calculation where the motor is assembled with an electric chain hoist and the hoist is subjected to full load

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Motor Test Report for End Carriage

Motor type : Three phase squirrel cage type induction motor.

Manufacturer : Yasukawa Electric Mfg. Co.

Production No. :

Rating

Model	Output	Pole	Intermittent Rating	Voltage	Frequency
IBQ-T	0.4kW	4P	40%ED	380 - 440V	Speed Control by Inverter

Full load characteristics

Voltage Frequency		220 – 230V Speed Control by Inverter
Load	%	100
Current	A	2.5
Speed	rpm	~

Insulation class B

The above characteristics are obtained from calculation where the motor is assembled with an electric chain hoist and the hoist is subjected to full load

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