■ 산업안전보건법 시행규칙 [별지 제10호의 5서식]

# 심사결과 통지서

| | | | | |
|---|---|---|---|---|
| 신청인 | 사업장명 | (주)KITO | 사업장관리번호 | 2010E110010 |
| | 사업자등록번호 | 010-E1-10010 | 대표자 성명 | KITO YOSHIO |
| | 소재지 | 2000,Tsuijiarai,Showa-Cho,Nakakoma-Gun,Yamanashi,Japan | | |

| | | | |
|---|---|---|---|
| 안전인증대상기계·기구명 | 호이스트 | | |
| 형식(규격) | KML-ER2-018 | 용량(등급) | 1.8 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

2014년 03월 31일

인증심사원　최 창 일　(서명 또는 인)

이 정 우　(서명 또는 인)

## 한국승강기안전기술원 이사장

【별지 제4호서식】

# 동 일 형 식 일 람 표

| 사업장명 | KITO CORP. | 개정일자 및 번호 | 2014.03.21 | 인증번호 |
|---|---|---|---|---|

| 형식 및 모델번호 | | 동일형식 항목 및 내역 | | | |
|---|---|---|---|---|---|
| 형식번호 | 모델번호 | 동일형식 항목1 | 동일형식 항목2 | 동일형식 항목3 | 동일형식 항목4 |
| KML-ER2-018 | KITO-ER2-018L | Lift max 30m | 권상모타 1.8kW | 횡행모타 없음 | Trolley고정형 |
| | KITO-ER2-018IL | | | | |
| | KITO-ER2SP018L | | 권상모타 1.8kW | | Trolley 있음 |
| | KITO-ER2SP018IL | | | | |
| | KITO-ER2SG018L | | 권상모타 1.8kW | | Trolley + 수동체인 |
| | KITO-ER2SG018IL | | | | |
| | KITO-ER2M018L-S | | 권상모타 1.8kW | 횡행모터 0.4kW<br>.S : 24m/min<br>.L: 12m/min<br>.IS:24/4m/min<br>.IL:12/2m/min | 전기Trolley 결합 type |
| | KITO-ER2M018L-L | | | | |
| | KITO-ER2M018L-IS | | | | |
| | KITO-ER2M018L-IL | | | | |
| | KITO-ER2M018IL-S | | 권상모타 1.8kW | | |
| | KITO-ER2M018IL-L | | | | |
| | KITO-ER2M018IL-IS | | | | |
| | KITO-ER2M018IL-IL | | | | |
| | KITO-C-ER2M018L-S | | 권상모타 1.8kW | | 전기Trolley 결합 Clean type |
| | KITO-C-ER2M018L-L | | | | |
| | KITO-C-ER2M018L-IS | | | | |
| | KITO-C-ER2M018L-IL | | | | |
| | KITO-C-ER2M018IL-S | | 권상모타 1.8kW | | |
| | KITO-C-ER2M018IL-L | | | | |
| | KITO-C-ER2M018IL-IS | | | | |
| | KITO-C-ER2M018IL-IL | | | | |
| | KITO-CZ-ER2M018L-S | | 권상모타 1.8kW | | 전기Trolley 결합 Clean 자바라 type |
| | KITO-CZ-ER2M018L-L | | | | |
| | KITO-CZ-ER2M018L-IS | | | | |
| | KITO-CZ-ER2M018L-IL | | | | |
| | KITO-CZ-ER2M018IL-S | | 권상모타 1.8kW | | |
| | KITO-CZ-ER2M018IL-L | | | | |
| | KITO-CZ-ER2M018IL-IS | | | | |
| | KITO-CZ-ER2M018IL-IL | | | | |

서면심사필 2014.03.31 한국승강기안전기술원

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**

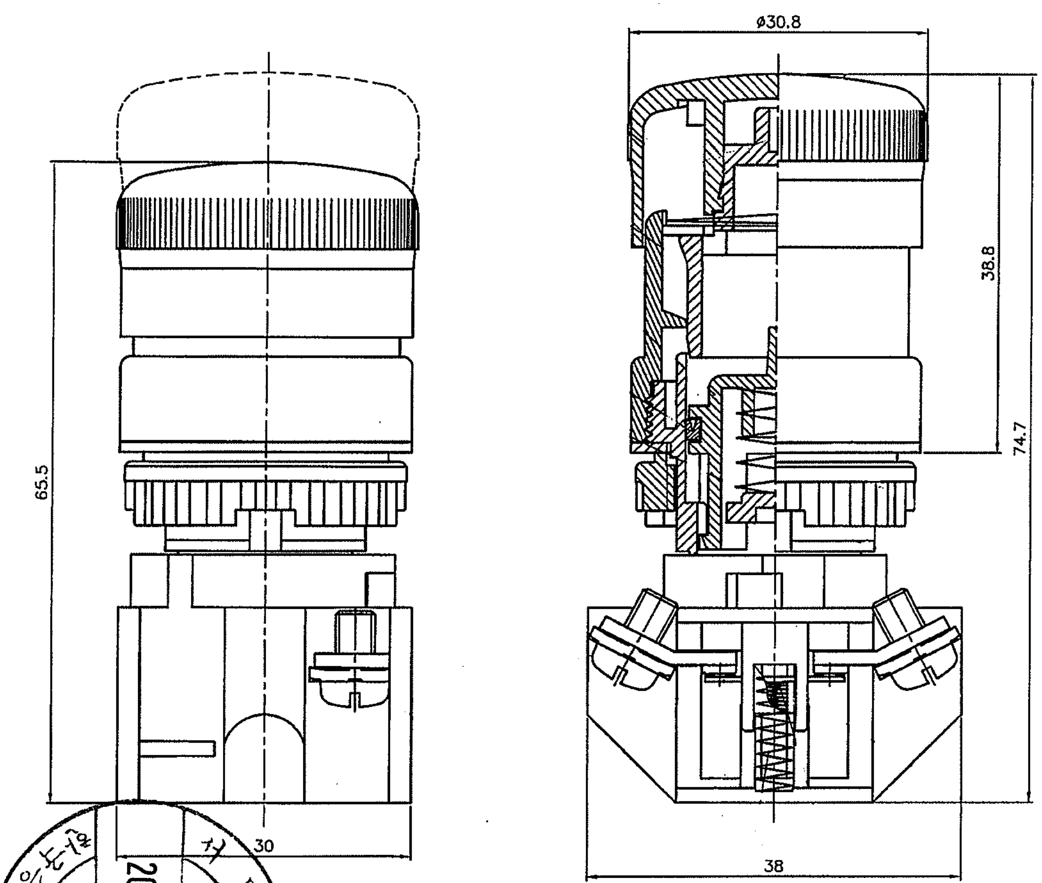
아래 주소에서 생산되는 제품에 한함.

정호엔지니어링, 경기도 광명시 노온사동 440-5

2012년 06월 11일

서면심사필 2014. 03. 31 안전기술원

한국산업안전보건공단 이사장




사 면 심 사
2014 .03. 31
한국승강기안전기술원

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 一般公差 | 0.2~30mm: ±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 | | 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 |
| | 前次修正 | | | | | | | | | | 投影法 | ⊕◁ | 顏 色 | | |

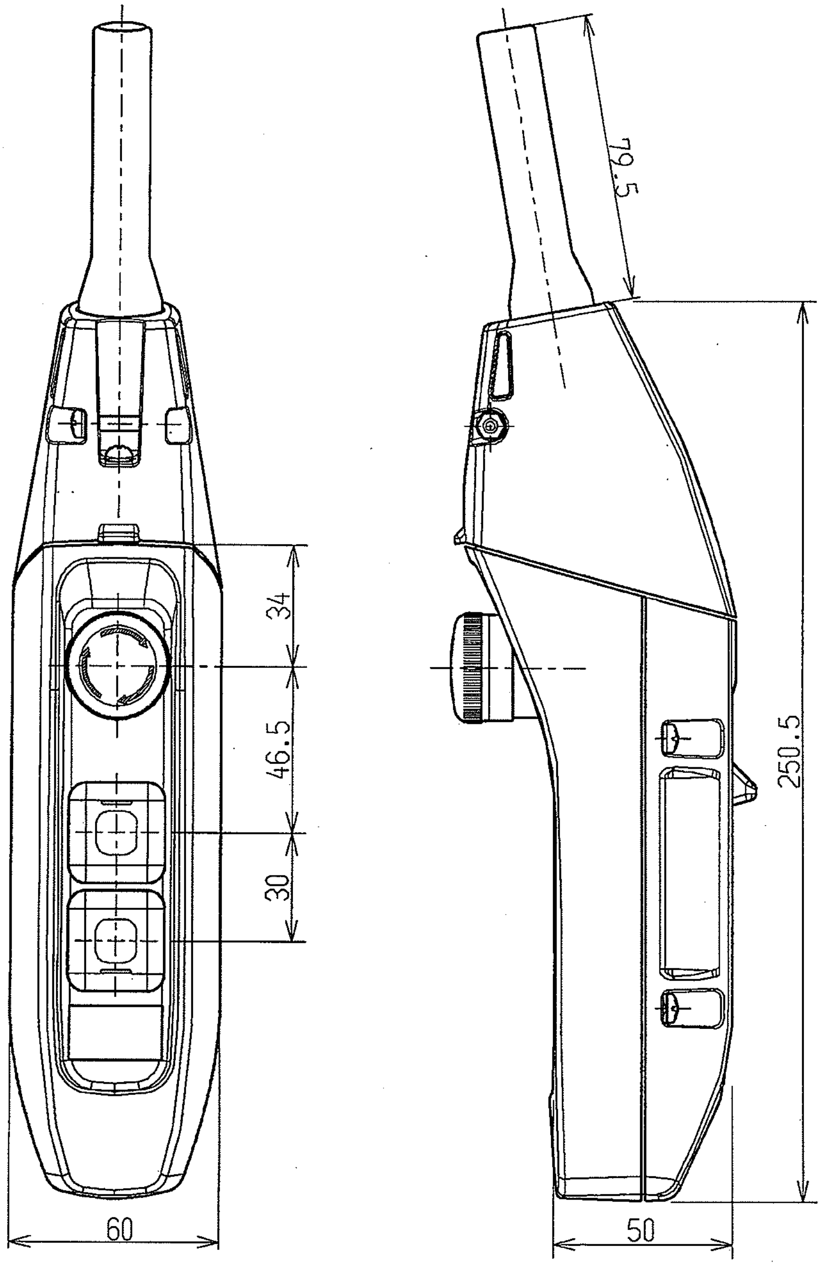
8 7 6 5 4 3 2 1

版序: A

14/201/T2/BKH/T2-BKH.dwg

様式:04KH-N001DA

| Revision | Incidence | Description | Date | Charge | Approved |
| --- | --- | --- | --- | --- | --- |
| | | | | | |




서 면 심 사 필

2014.03.31

| | |
| --- | --- |
| ⑥ | |
| ⑤ | |
| ④ | |
| ③ | |
| ② | |
| ① | |
| Date issued | |

NOTE

MATERIAL

NOS./UNIT

CODE

NAME: 3point Pendant control station MX subassembly

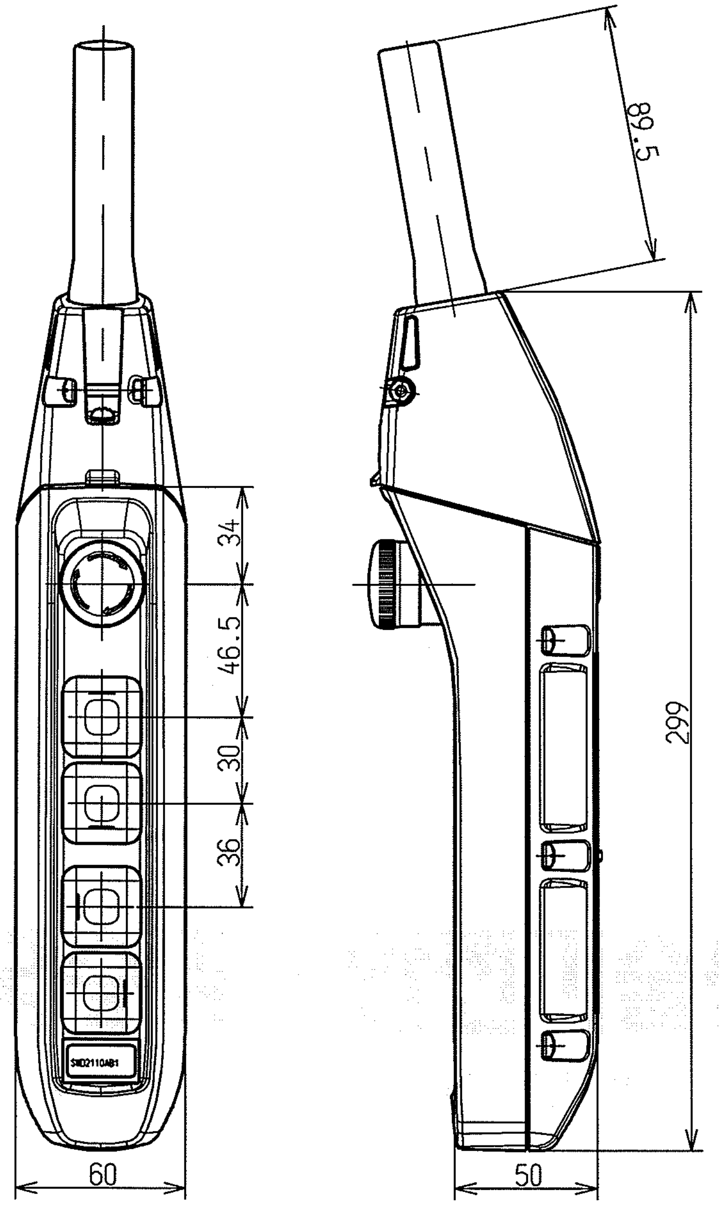
| APPROVED | ISHIKAWA 08.02.08 | CHECKED | FURIYA 08.02.08 | DESIGNED | KOBAYASHI 08.02.08 | DRAWN | KOBAYASHI 08.02.08 | SCALE | - | DWG.NO. | SWD2X00AA1 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

KITO CORPORATION

UNIT: mm

様式:04KH-N001DA

| 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.

2014.03.31

| | |
| --- | --- |
| NOTE | |
| MATERIAL | |
| NOS./UNIT | |
| CODE | |
| NAME | 3point Pendant control station MXX subassembly |

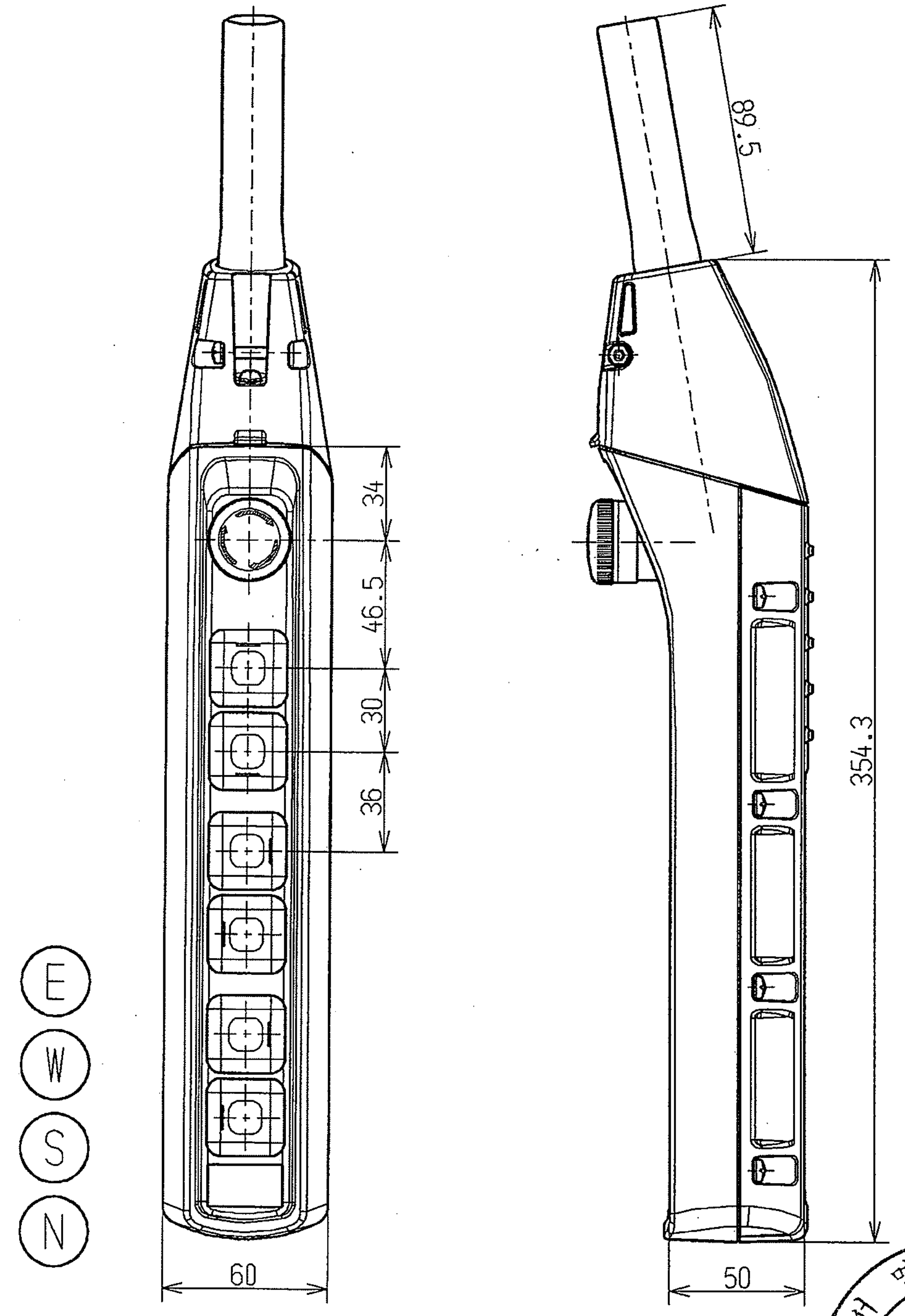
| APPROVED | CHECKED | DESIGNED | DRAWN | SCALE | DWG.NO. |
| --- | --- | --- | --- | --- | --- |
| H.FURIYA 09.04.21 | T.HATANO 09.04.21 | KOBAYASHI 09.04.21 | KOBAYASHI 09.04.21 | - | SWD2XX0AA1 |

| | |
| --- | --- |
| ⑥ | |
| ⑤ | |
| ④ | |
| ③ | |
| ② | |
| ① | |
| Date issued | |

KITO CORPORATION

様式:04KH-N001DA

| Revision | Incidence | Description | Date | Charge | Approved |
|---|---|---|---|---|---|
| | | | | | |



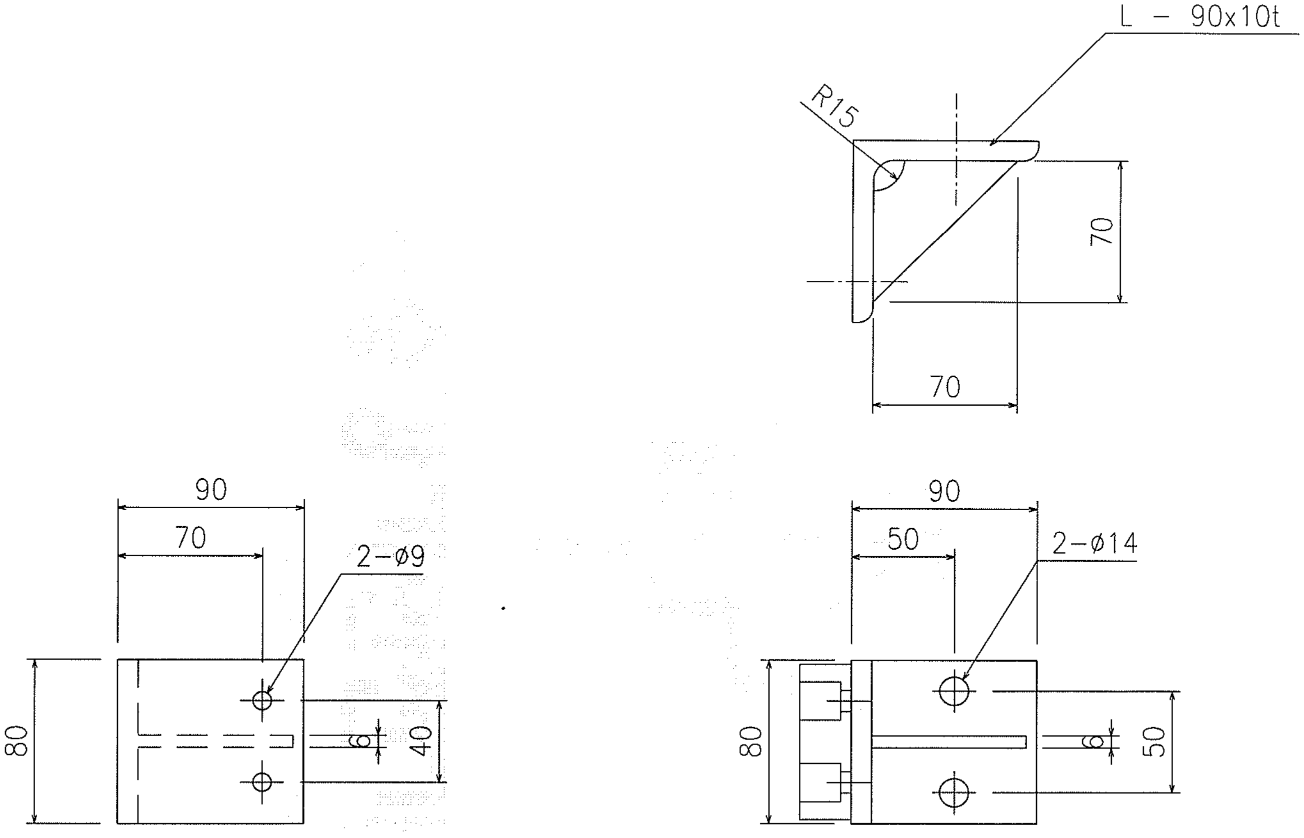

서 면 심 사 필
2014 .03. 31

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NOTE | | | | | MATERIAL | | CODE | |
| | | | | | NOS./UNIT | | NAME | 7points Pendant control station MXXX subassembly |
| APPROVED ISHIKAWA 08.02.08 | CHECKED FURIYA 08.02.08 | DESIGNED KOBAYASHI 08.02.08 | DRAWN KOBAYASHI 08.02.08 | SCALE - | DWG.NO. | SWD2XXXAA1 | | |

Date issued ⑥ ⑤ ④ ③ ② ①

KITO CORPORATION

UNIT: mm




서면심사필
2014 .03. 31
한국승강기안전기술원

| 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 |
|---|---|---|---|---|

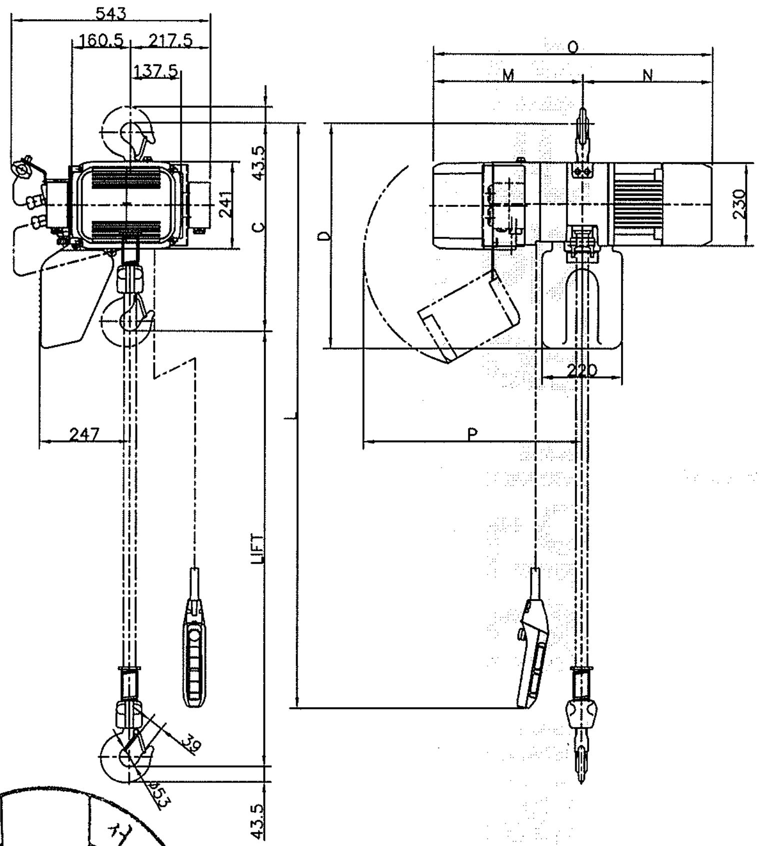
형식번호 : KML-ER2-018

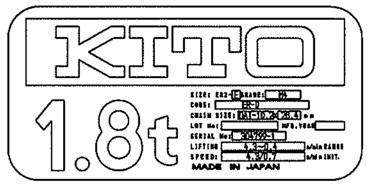
Model number.
KITO-ER2-018L
KITO-ER2-018IL

| Dimensions | M | N | O | P |
|---|---|---|---|---|
| 1속 저속 | 308 | 338 | 646 | 488 |
| 2속 저속 | 372 | | 710 | 561 |

諸元表 Particulars

| | | | |
|---|---|---|---|
| 基本本体 Size | | | ER2-E |
| 定格荷重 Nominal Capacity | | | 1.8t |
| 揚程 Lift | | | 3m(max 30m) |
| チェーンサイズ Chain size | | | ø10.2 x 1 |
| レール下面よりフックまでの最小距離 : C Min. Headroom | | | 575mm |
| 相数・電圧 Phase・Voltage | | | 3ø 220(208)V 60Hz<br>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 | 1.8kW x 4P |
| | | L | 1.8kW x 4P |
| 巻上速度 Lifting Speed | 2속형(인버터 적용) | IL | 4.3/0.7 m/min |
| | 1속형 저속 | L | 4.4 m/min |
| オシボタンコード長さ : L Push Button Cord | | | 2.5 m(max 29.5m) |
| キャブタイヤ給電ケーブル長さ Length of Power Supply Cable | | | - 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 | | | 630mm(max 1000) |
| | | | |
| トロリ最大巾 : G Max. Dimension of Trolley Width | | | 630mm |
| 質量 Mass | | | 約 74 kg |
| 塗装色 Pointing Color | | | マンセル 7.5YR7/14<br>Munsell 7.5YR7/14 |

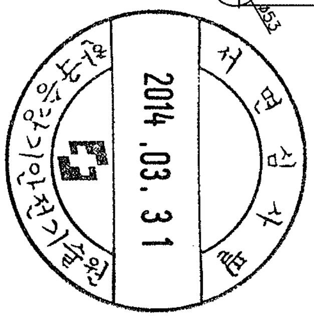


Name Plate For Chain Hoist

The trolley be installed on either topered or flot flange.
A figure in ( ) is availablo for only flat flange.

형식번호 : KML-ER2-018
*자바라는 옵션 사양임




| 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 |
|---|---|---|---|
| H.SAITO | NAITO | SHIMURA | SHIMURA |
| 10.07.13 | 10.07.13 | 10.07.13 | 10.07.13 |

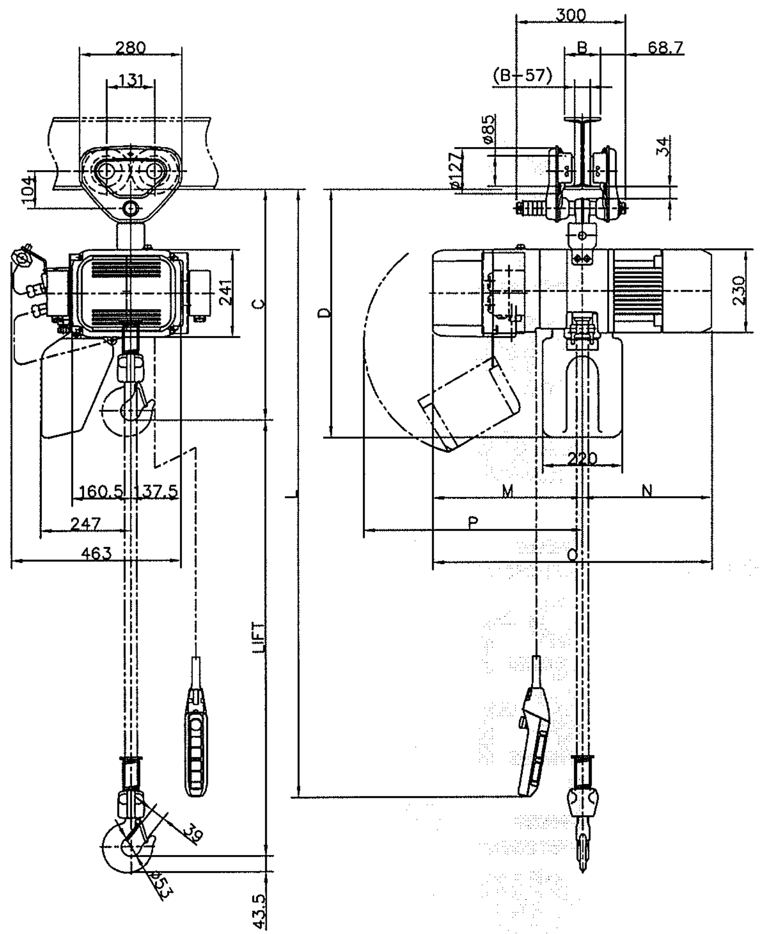
株式会社キトー KITO CORP

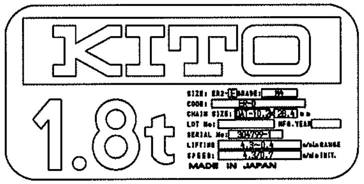
名称 TITLE 1.8t ER2 SERIES ELECTRIC CHAIN HOIST Standard

| | | | |
|---|---|---|---|
| 製造番号 CODE | ER2-S | 尺度 SCALE | NOT |
| 図番 DWG.NO. | KML-ER2-018-001 | 変更回数 REV. | 0 |

| 형식번호 : KML-ER2-018 | | | | |
|---|---|---|---|---|
| Model number. KITO-ER2SP018L KITO-ER2SP018IL | | | | |
| Dimensions | M | N | O | P |
| 1속 저속 | 308 | 338 | 646 | 488 |
| 2속 저속 | 372 | | 710 | 561 |

| 諸元表 Particulars | | |
|---|---|---|
| 基本本体 Size | | ER2-E |
| 定格荷重 Nominal Capacity | | 1.8t |
| 揚程 Lift | | 3m(max 30m) |
| チェーンサイズ Chain size | | ø10.2 x 1 |
| レール下面よりフックまでの最小距離 : C Min. Headroom | | 635mm |
| 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 | 1.8kW x 4P |
| | L | 1.8kW x 4P |
| 巻上速度 Lifting Speed — 2속형(인버터 적용) | IL | 4.3/0.7 m/min |
| 巻上速度 Lifting Speed — 1속형 저속 | L | 4.4 m/min |
| オシボタンコード長さ : L Push Button Cord | | 2.7 m(max 29.7m) |
| キャブタイヤ給電ケーブル長さ Length of Power Supply Cable | | (2.5)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 | | 690mm(max 1000) |
| 適用レール巾 : B Flange Width | | 82~153mm |
| トロリ最大巾 : G Max. Dimension of Trolley Width | | 630mm |
| 質量 Mass | | 約 91 kg |
| 塗装色 Painting Color | | マンセル 7.5YR7/14 Munsell 7.5YR7/14 |



Name Plate For Chain Hoist

The trolley be installed on either topered or flot flange.
A figure in ( ) is availablo for only flat flange.

형식번호 : KML-ER2-018
*자바라는 옵션 사양임

서면심사 필
2014 .03. 31
한국승강기안전기술원

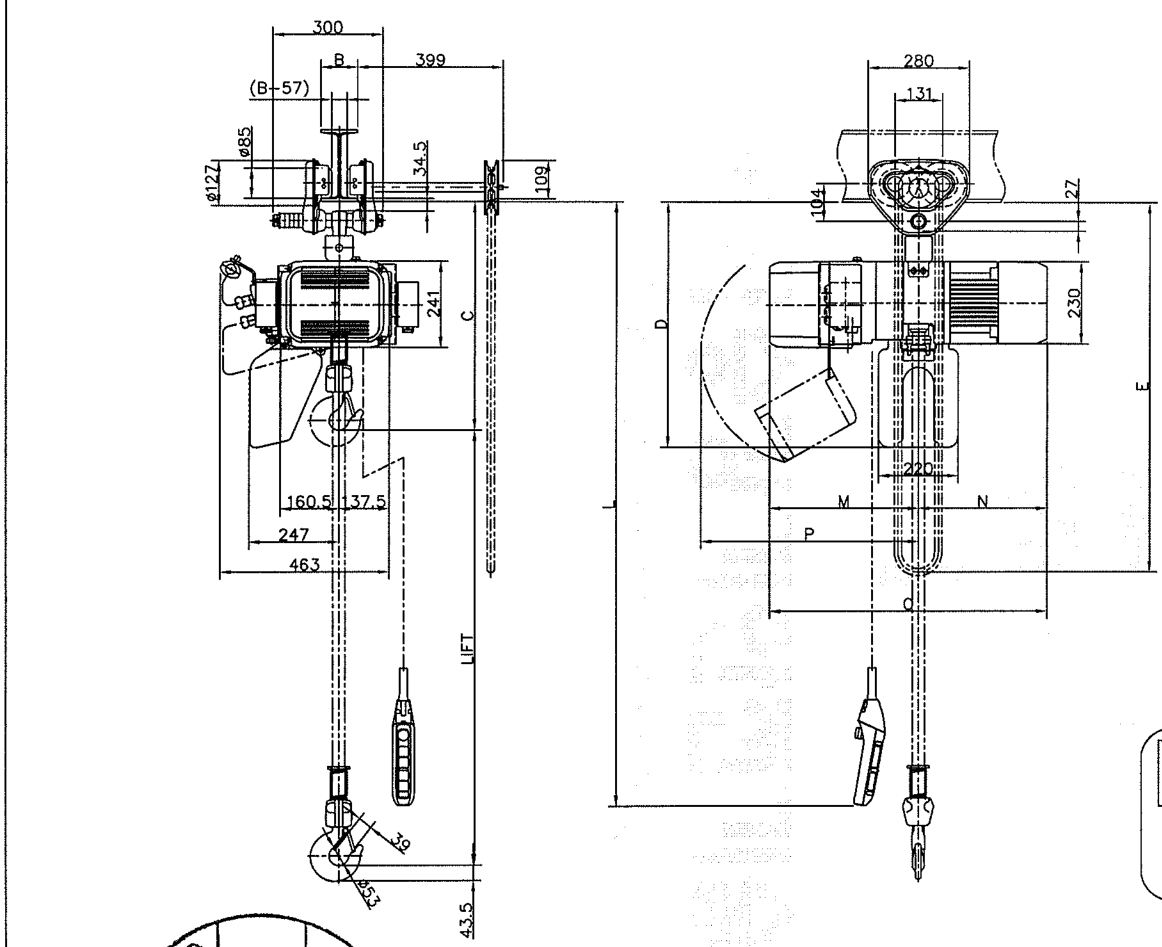
| 改訂 REV. | 数 QTY | 内容 CONTENTS | 年.月.日 DATE | 担当 DRAWN | 承認 APPROVED |
|---|---|---|---|---|---|

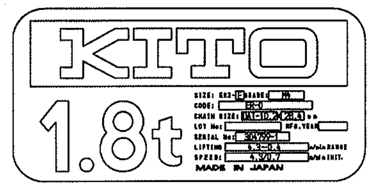
| 承認 APPROVED | 検図 CHECKED | 設計 DESIGNED | 製図 DRAWN |
|---|---|---|---|
| H.SAITO | NAITO | SHIMURA | SHIMURA |
| 10.07.13 | 10.07.13 | 10.07.13 | 10.07.13 |

株式会社 キトー KITO CORP

| | | | |
|---|---|---|---|
| 名称 TITLE | 1.8t ER2 SERIES ELECTRIC CHAIN HOIST WITH PLAN TROLLEY | | |
| 製造番号 CODE | ER2-S | 尺度 SCALE | NOT |
| 図番 DWG.NO. | KJ18L-ER2002 | 変更回数 REV. | 0 |

三角法 単位 : mm




Name Plate For Chain Hoist

| 형식번호 : KML-ER2-018 | | | | |
|---|---|---|---|---|
| Model number. KITO-ER2SG018L KITO-ER2SG018IL | | | | |
| Dimensions | M | N | O | P |
| 1속 지속 | 308 | 338 | 646 | 488 |
| 2속 지속 | 372 | | 710 | 561 |

| 諸元表 Particulars | | |
|---|---|---|
| 基本本体 Size | | ER2-E |
| 定格荷重 Nominal Capacity | | 1.8t |
| 揚程 Lift | | 3m(max 30m) |
| チェーンサイズ Chain size | | ø10.2 x 1 |
| レール下面よりフックまでの最小距離 : C Min. Headroom | | 635mm |
| 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 | 1.8kW x 4P |
| | L | 1.8kW x 4P |
| 巻上速度 Lifting Speed | 2속형(인버터 적용) IL | 4.3/0.7 m/min |
| | 1속형 지속 L | 4.4 m/min |
| オシボタンコード長さ : L Push Button Cord | | 2.7 m(max 29.7m) |
| キャブタイヤ給電ケーブル長さ Length of Power Supply Cable | | (2.5)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 | | 690mm(max 1000) |
| 適用レール巾 : B Flange Width | | 82~153mm |
| トロリ最大巾 : G Max. Dimension of Trolley Width | | 630mm |
| 質量 Mass | | 約 91 kg |
| 塗装色 Painting Color | | マンセル 7.5YR7/14 Munsell 7.5YR7/14 |

The trolley be installed on either topered or flot flange.
A figure in ( ) is availablo for only flat flange.

형식번호 : KML-ER2-018
*지비라는 옵션 사양임

| 承認 APPROVED | 検図 CHECKED | 設計 DESIGNED | 製図 DRAWN |
|---|---|---|---|
| H.SAITO | NAITO | SHIMURA | SHIMURA |
| 10.07.13 | 10.07.13 | 10.07.13 | 10.07.13 |

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

株式会社 キトー KITO CORP

名称 TITLE 1.8t ER2 SERIES ELECTRIC CHAIN HOIST WITH GEARED TROLLEY

| | | | |
|---|---|---|---|
| 製造番号 CODE | ER2-S | 尺度 SCALE | NOT |
| 図番 DWG.NO. | KJ18L-ER2003 | 変更回数 REV. | 0 |

三角法 単位 : mm

서면심사
2014.03.31
한국승강기안전기술원

형식번호 : KML-ER2-018

Model number.

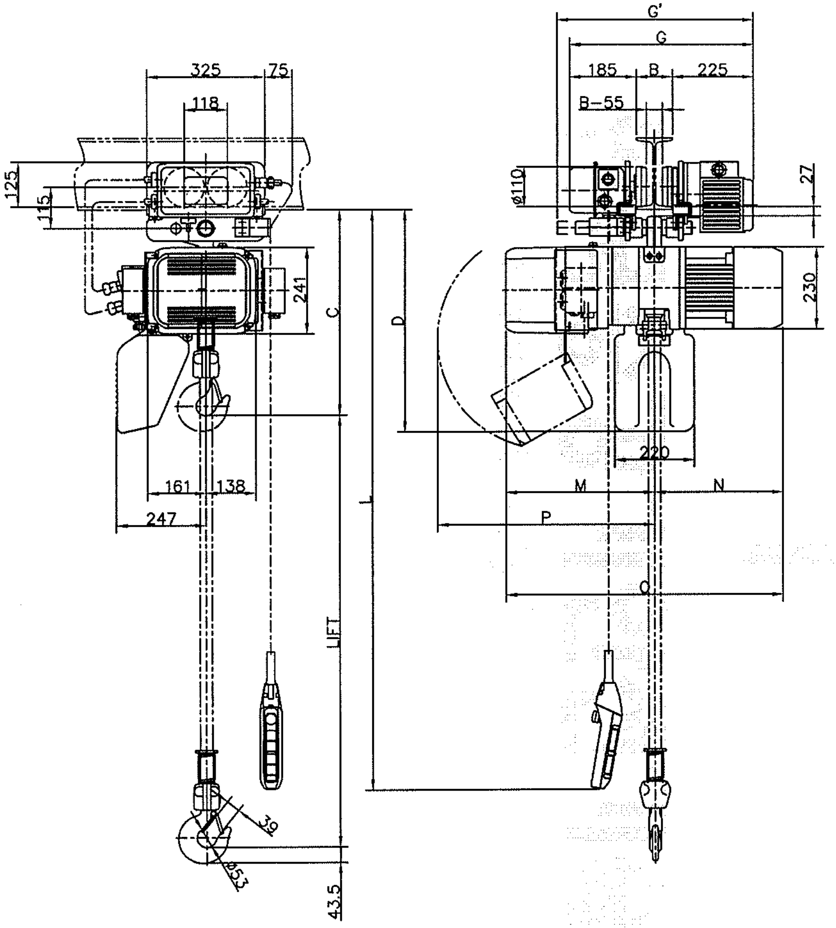
KITO-ER2M018L-S
KITO-ER2M018L-L
KITO-ER2M018L-IS
KITO-ER2M018L-IL

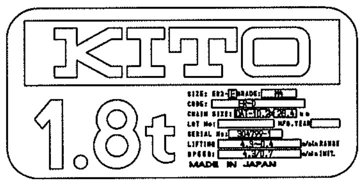
KITO-ER2M018IL-S
KITO-ER2M018IL-L
KITO-ER2M018IL-IS
KITO-ER2M018IL-IL

| Dimensions | M | N | O | P |
|---|---|---|---|---|
| 1속 저속 | 308 | 338 | 646 | 488 |
| 2속 저속 | 372 | | 710 | 561 |

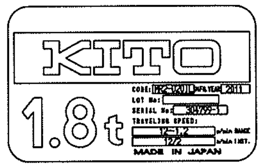
諸元表 Particulars

| | | | |
|---|---|---|---|
| 基本本体 Size | | | ER2-E |
| 定格荷重 Nominal Capacity | | | 1.8t |
| 揚程 Lift | | | 4m(max 30m) |
| チェーンサイズ Chain size | | | ø10.2 x 1 |
| レール下面よりフックまでの最小距離 : C Min. Headroom | | | 585mm |
| 相数・電圧 Phase・Voltage | | | 3ø 220(208)V 60Hz<br>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 | 1.8kW x 4P |
| | | L | 1.8kW x 4P |
| | 横行モータ for Traversing | IL,IS ,L,S | 0.4kW 4P |
| 巻上速度 Lifting Speed | 2속형(인버터 적용) | IL | 4.3/0.7 m/min |
| | 1속형 저속 | L | 4.4 m/min |
| 横行速度 Traversing Speed | 2속형(인버터 적용) | IL | 12/2 m/min |
| | | IS | 24/4 m/min |
| | 저속 | L | 12 m/min |
| | 고속 | S | 24 m/min |
| オシボタンコード長さ : L Push Button Cord | | | 3.8 m(max 29.8m) |
| キャブタイヤ給電ケーブル長さ Length of Power Supply Cable | | | 1.0 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 | | | 630mm(max 1000) |
| 適用レール巾 : B Flange Width | | | 82~178mm |
| トロリ最大巾 : G Max. Dimension of Trolley Width | | | 587mm |
| 質量 Mass | | | 約 133kg |
| 塗装色 Painting Color | | | マンセル 7.5YR7/14<br>Munsell 7.5YR7/14 |



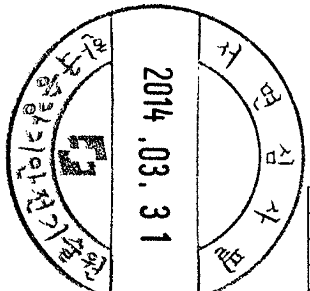

Name Plate For Chain Hoist




Name Preat for Trolley

형식번호 : KML-ER2-018

*자바라는 옵션 사양임




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

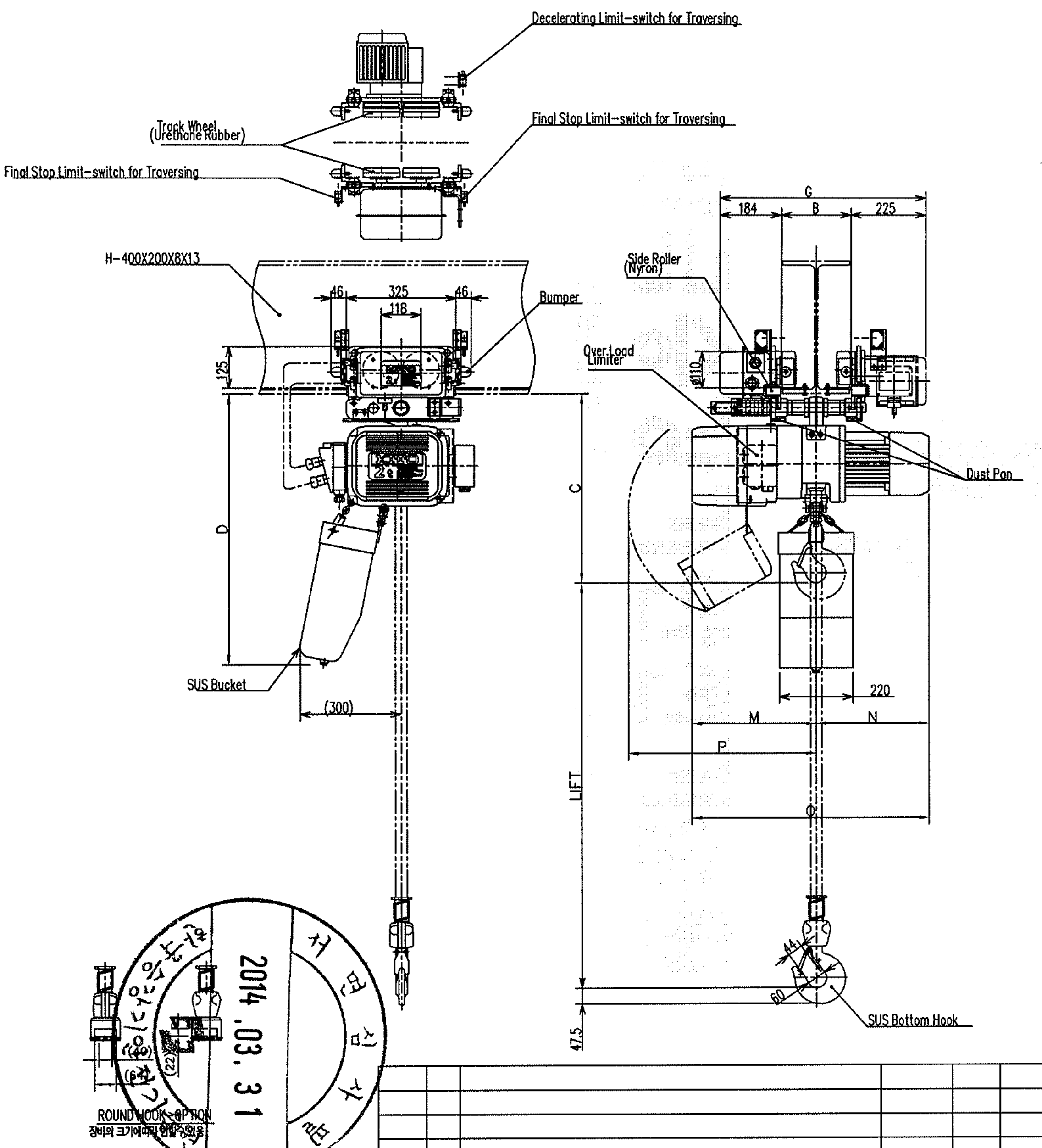
| 承認 APPROVED | 検図 CHECKED | 設計 DESIGNED | 製図 DRAWN |
|---|---|---|---|
| H.SAITO | NAITO | SHIMURA | SHIMURA |
| 10.07.13 | 10.07.13 | 10.07.13 | 10.07.13 |

株式会社キトー KITO CORP

名称 TITLE 1.8t ER2 SERIES ELECTRIC CHAIN HOIST WITH MOTORIZED TROLLEY

| | | | |
|---|---|---|---|
| 製造番号 CODE | ER2-S | 尺度 SCALE | NOT |
| 図番 DWG.NO. | KJ18L-ER2004 | 変更回数 REV. | 0 |

三角法 単位 : mm




형식번호 : KML-ER2-018

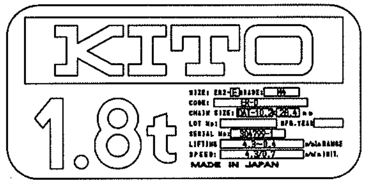
Model number.

KITO-C-ER2M018L-S
KITO-C-ER2M018L-L
KITO-C-ER2M018L-IS
KITO-C-ER2M018L-IL

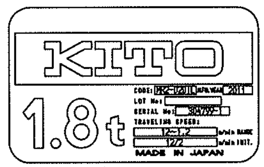
KITO-C-ER2M018IL-S
KITO-C-ER2M018IL-L
KITO-C-ER2M018IL-IS
KITO-C-ER2M018IL-IL

| Dimensions | M | N | O | P |
|---|---|---|---|---|
| 1속 저속 | 308 | 338 | 646 | 488 |
| 2속 저속 | 372 | | 710 | 561 |

| 諸元表 Particulars | | | |
|---|---|---|---|
| 基本本体 Size | | | ER2-E |
| 定格荷重 Nominal Capacity | | | 1.8t |
| 揚程 Lift | | | 5m(max 30m) |
| チェーンサイズ Chain size | | | ø10.2 x 1 |
| レール下面よりフックまでの最小距離 : C Min. Headroom | | | 590mm |
| 相数・電圧 Phase・Voltage | | | 3ø 220(208)V 60Hz<br>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 | 1.8kW x 4P |
| | | L | 1.8kW x 4P |
| | 横行モータ for Traversing | IL,IS ,L,S | 0.4kW 4P |
| 巻上速度 Lifting Speed | 2속형(인버터 적용) | IL | 4.3/0.7 m/min |
| | 1속형 저속 | L | 4.4 m/min |
| 横行速度 Traversing Speed | 2속형(인버터 적용) | IL | 12/2 m/min |
| | | IS | 24/4 m/min |
| | 저속 | L | 12 m/min |
| | 고속 | S | 24 m/min |
| オシボタンコード長さ : L Push Button Cord | | | 4.8 m(max 29.8m) |
| キャブタイヤ給電ケーブル長さ Length of Power Supply Cable | | | 1.0 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 | | | 830mm(max 1000) |
| 適用レール巾 : B Flange Width | | | 133~258mm |
| トロリ最大巾 : G Max. Dimension of Trolley Width | | | 542~667mm |
| 質量 Mass | | | 約 130kg |
| 塗装色 Painting Color | | | マンセル 7.5YR7/14<br>Munsell 7.5YR7/14 |



Name Plate For Chain Hoist



Name Preat for Trolley

1. Dust Pan - option

형식번호 : KML-ER2-018

*자바라는 옵션 사양임

| 承認 APPROVED | 検図 CHECKED | 設計 DESIGNED | 製図 DRAWN |
|---|---|---|---|
| H.SAITO | K.SUZUKI | K.NAKAMURA | K.NAKAMURA |
| 14.Feb'11 | 14.Feb'11 | 14.Feb'11 | 14.Feb'11 |

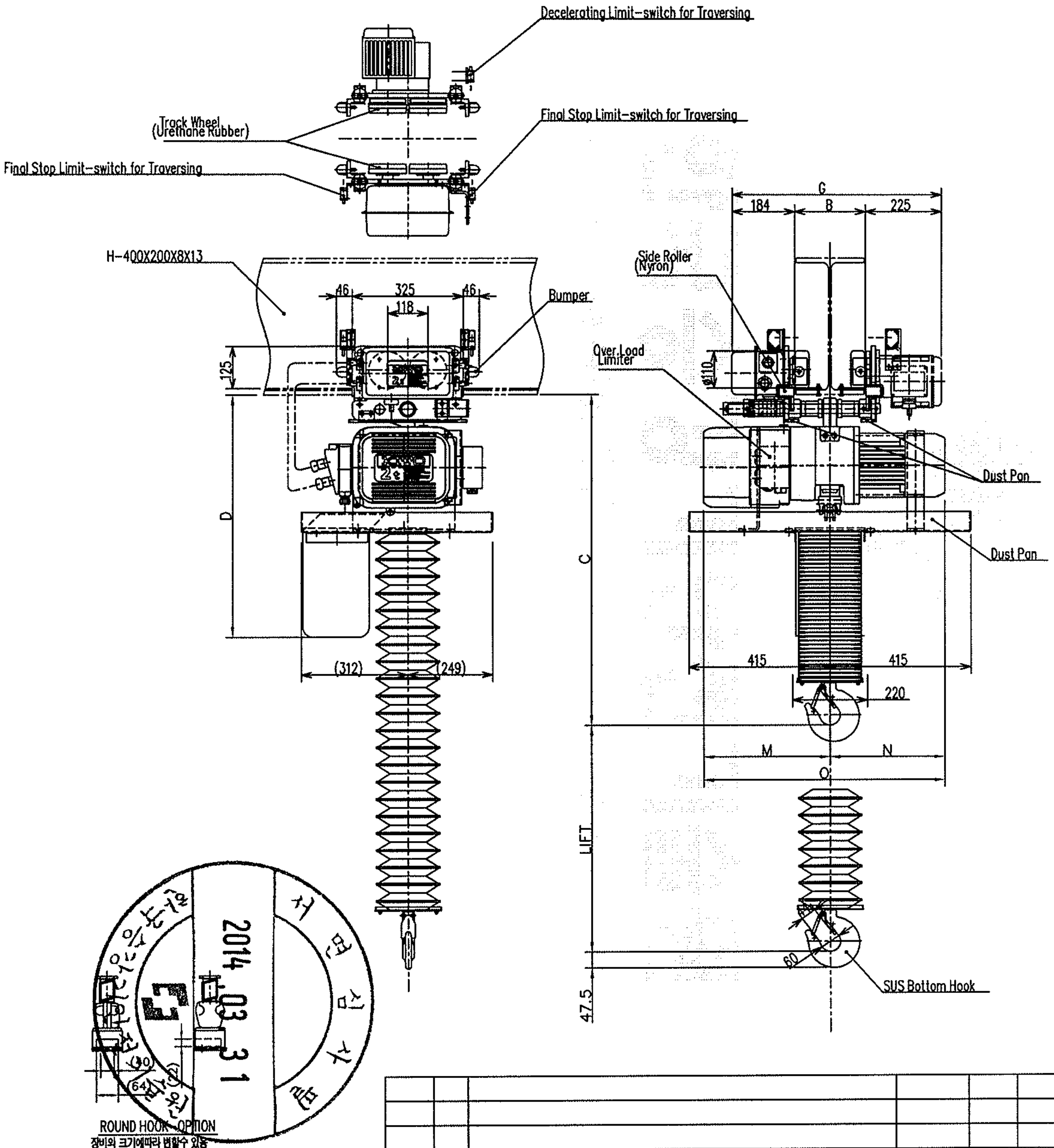
株式会社 キトー KITO CORP

名称 TITLE 1.8t ER2M SERIES ELECTRIC CHAIN HOIST(CLEAN) WITH MOTORIZED TROLLEY

| | | | |
|---|---|---|---|
| 製造番号 CODE | ER2-MC | 尺度 SCALE | NOT |
| 図番 DWG.NO. | KJ18L-ER2005 | 変更回数 REV. | 0 |

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

서면심사필
2014.03.31




형식번호 : KML-ER2-018

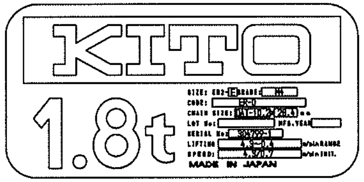
Model number.

- KITO-CZ-ER2M018L-S
- KITO-CZ-ER2M018L-L
- KITO-CZ-ER2M018L-IS
- KITO-CZ-ER2M018L-IL
- KITO-CZ-ER2M018IL-S
- KITO-CZ-ER2M018IL-L
- KITO-CZ-ER2M018IL-IS
- KITO-CZ-ER2M018IL-IL

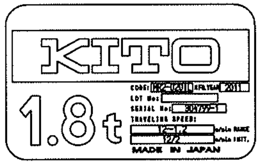
| Dimensions | M | N | O |
|---|---|---|---|
| 1속 저속 | 308 | 338 | 646 |
| 2속 저속 | 372 | | 710 |

諸元表 Particulars

| | | | |
|---|---|---|---|
| 基本本体 Size | | | ER2-E |
| 定格荷重 Nominal Capacity | | | 1.8t |
| 揚程 Lift | | | 6m(max 30m) |
| チェーンサイズ Chain size | | | ø10.2 x 1 |
| レール下面よりフックまでの最小距離 : C Min. Headroom | | | 1000mm |
| 相数・電圧 Phase・Voltage | | | 3ø 220(208)V 60Hz<br>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 | 1.8kW x 4P |
| | | L | 1.8kW x 4P |
| | 横行モータ for Traversing | IL,IS ,L,S | 0.4kW 4P |
| 巻上速度 Lifting Speed | 2속형(인버터 적용) | IL | 4.3/0.7 m/min |
| | 1속형 저속 | L | 4.4 m/min |
| 横行速度 Traversing Speed | 2속형(인버터 적용) | IL | 12/2 m/min |
| | | IS | 24/4 m/min |
| | 저속 | L | 12 m/min |
| | 고속 | S | 24 m/min |
| オシボタンコード長さ : L Push Button Cord | | | 6 m(max 30m) |
| キャブタイヤ給電ケーブル長さ Length of Power Supply Cable | | | 1.0 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 | | | 720mm(max 1000) |
| 適用レール巾 : B Flange Width | | | 133~258mm |
| トロリ最大巾 : G Max. Dimension of Trolley Width | | | 542~667mm |
| 質量 Mass | | | 約 160kg |
| 塗装色 Painting Color | | | マンセル 7.5YR7/14<br>Munsell 7.5YR7/14 |




Name Plate For Chain Hoist




Name Preat for Trolley

1. Dust Pan - option

형식번호 : KML-ER2-018

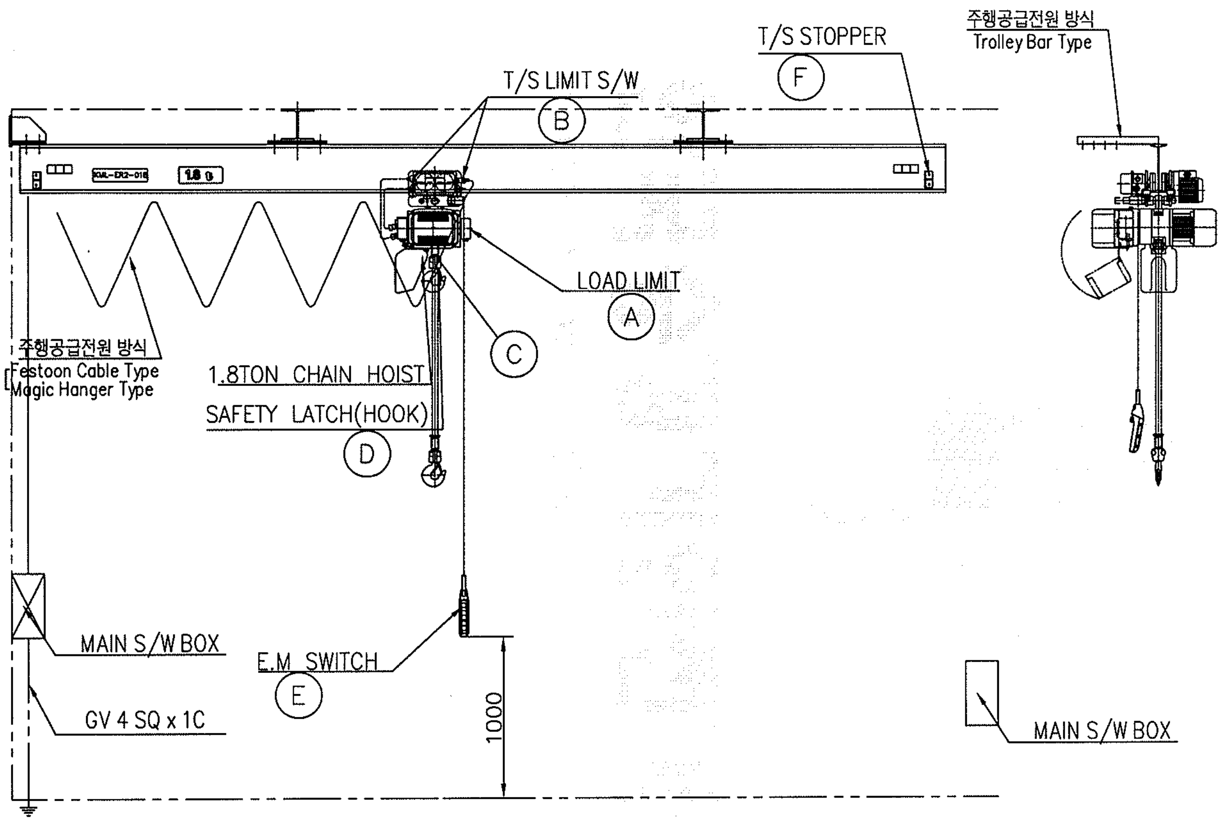
| 承認 APPROVED | 検図 CHECKED | 設計 DESIGNED | 製図 DRAWN |
|---|---|---|---|
| H.SAITO | K.SUZUKI | K.NAKAMURA | K.NAKAMURA |
| 14.Feb'11 | 14.Feb'11 | 14.Feb'11 | 14.Feb'11 |

株式会社 キトー KITO CORP

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

名称 TITLE 1.8t ER2M SERIES ELECTRIC CHAIN HOIST(CLEAN) WITH MOTORIZED TROLLEY

| | | | |
|---|---|---|---|
| 製造番号 CODE | ER2-MCJ | 尺度 SCALE | NOT |
| 図番 DWG.NO. | KJ18L-ER2006 | 変更回数 REV. | 0 |




## SPECIFICATION

| | | | |
|---|---|---|---|
| A | LOAD LIMIT | 1 | 1.8TON USE |
| B | T/S LIMIT S/W | 2 | |
| C | UPPER LIMIT S/W | 1 | 1.8TON USE |
| D | SAFETY LATCH(HOOK) | 1 | 1.8TON 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.

서면심사필 2014.03.31

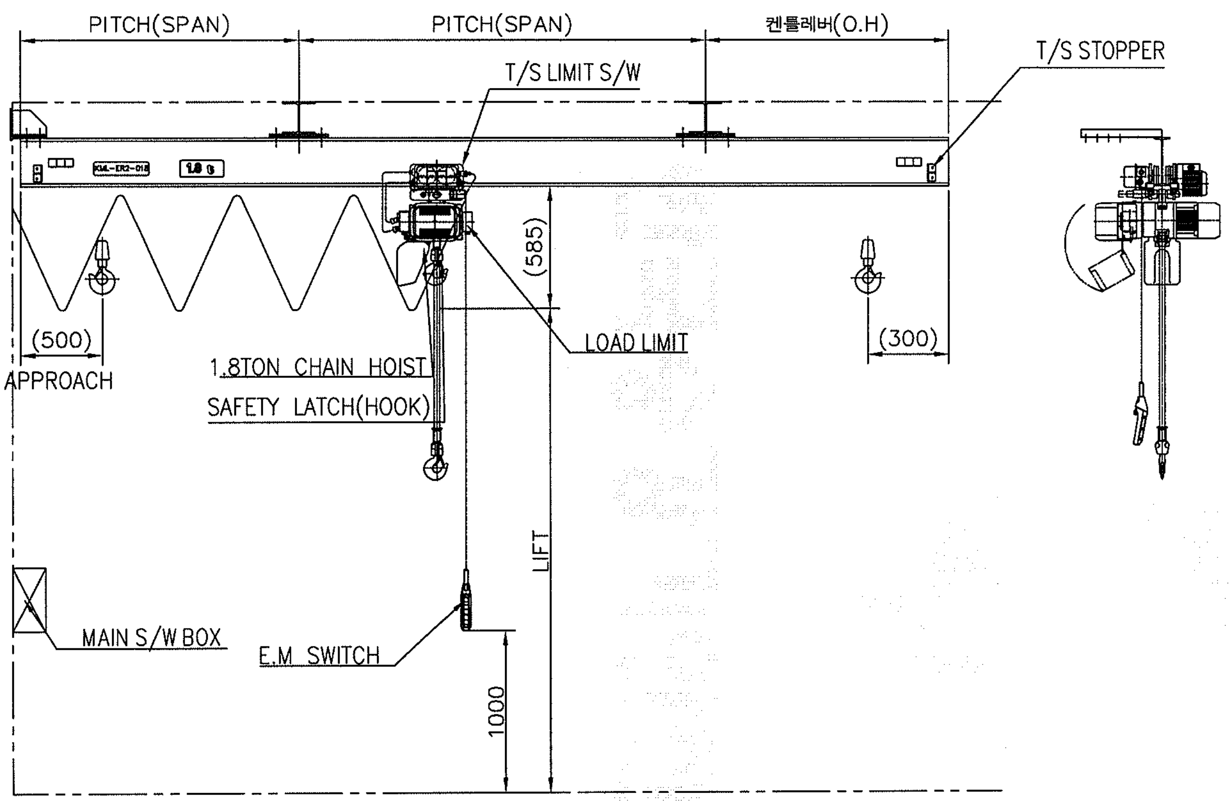
| 承認 APPROVED | 検図 CHECKED | 設計 DESIGNED | 製図 DRAWN |
|---|---|---|---|
| J.S.CHO | J.H.CHOI | EUN.WON HEE | EUN.WON HEE |

株式会社 키토 KITO CORP

| | |
|---|---|
| 名称 TITLE | 1.8t MONO RAIL HOIST SAFETY DRAWING |
| 製造番号 CODE | |
| 図番 DWG.NO. | MONO RAIL 0 |
| 尺度 SCALE | |
| 変更回数 REV. | |

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

三角法 単位 : mm




## SPECIFICATION

| BEAM 규격 | PITCH | O.H |
|---|---|---|
| I-200x100x7/10 | 3.2 m | 1.3 m |
| I-250x125x7.5/12.5 | 5 m | 1.8 m |
| I-300x150x10/18.5 | 7.5 m | 2.8 m |
| I-350x150x12/24 | 9.4 m | 3.4 m |
| I-400x150x12.5/25 | 11 m | 4 m |
| H-350x175x7/11 | 8 m | 3 m |
| H-400x200x8/13 | 10 m | 3.8 m |
| H-450x200x9/14 | 11 m | 4.2 m |
| 최소 반경 커브 | 1000 mm | |
| LOAD CHAIN | 10.2mm X 1 | |
| LIFT | Max 30m | |

NAME PLATE

| | |
|---|---|
| 정 격 하 중 | 1.8 ton |
| 전기 설비 정격 | V |
| 제 조 자 | |
| 제 조 년 월 | 20 . . |
| 안전인증 표시 | KCs |
| 형 식 번 호 | KML-ER2-018 |
| 제 조 번 호 | |

형식번호 : KML-ER2-018
Model number :
KITO-ER2M018IL-S
KITO-ER2M018IL-L
KITO-ER2M018IL-IS
KITO-ER2M018IL-IL
KITO-ER2M018IL-S
KITO-ER2M018IL-L
KITO-ER2M018IL-IS
KITO-ER2M018IL-IL

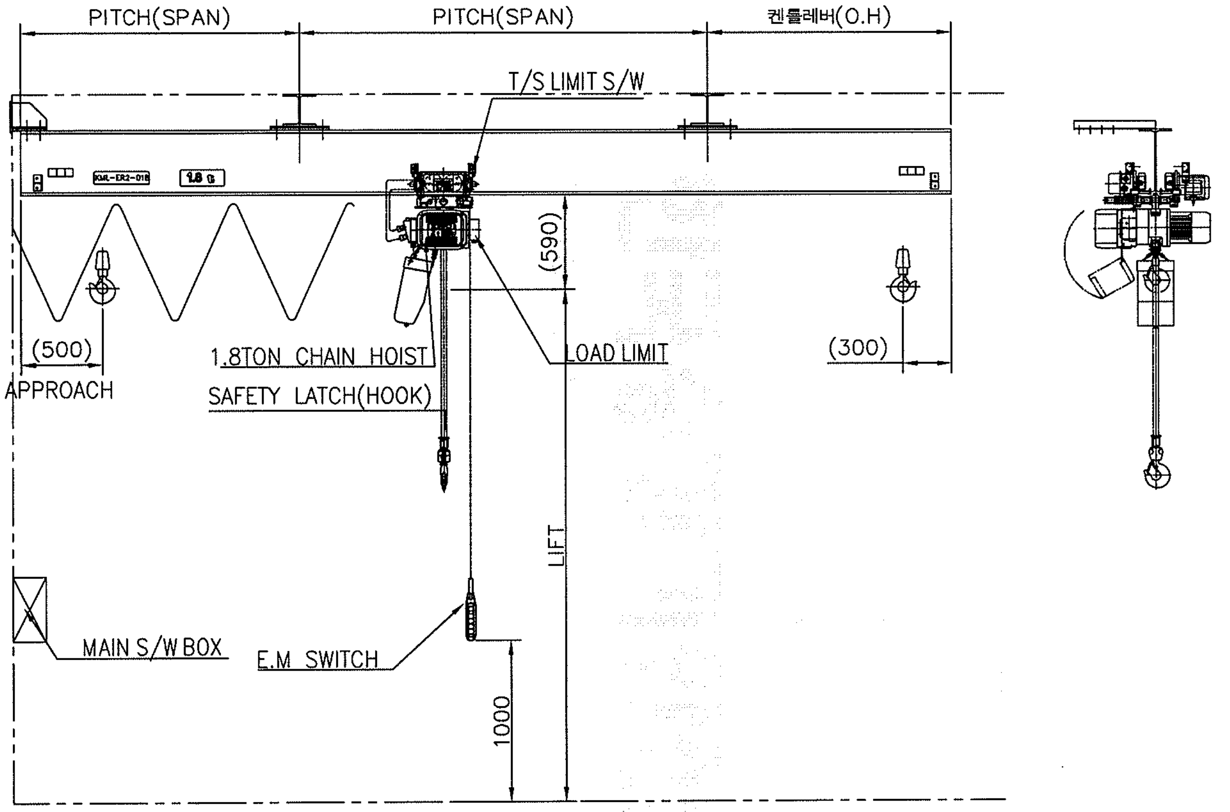
서면심사 2014.03.31

| 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 |

株式会社 キトー KITO CORP

名称 TITLE: 1.8t MONO RAIL HOIST GENERAL ASSEMBLY-1
製造番号 CODE:
尺度 SCALE:
図番 DWG.NO.: MONO RAIL 1
変更回数 REV.:
三角法 単位 : mm
様式 025P-10




## SPECIFICATION

| BEAM 규격 | PITCH | O.H |
|---|---|---|
| H-300x150x6.5/9 | 6 m | 2 m |
| H-350x175x7/11 | 8 m | 3 m |
| H-400x200x8/13 | 10 m | 3.8 m |
| H-450x200x9/14 | 11 m | 4.2 m |
| LOAD CHAIN | 10.2mm X 1 | |
| LIFT | Max 30m | |

NAME PLATE

| | |
|---|---|
| 정 격 하 중 | 1.8 ton |
| 전기 설비 정격 | V |
| 제 조 자 | |
| 제 조 년 월 | 20 . . |
| 안전인증 표시 | KCs |
| 형 식 번 호 | KML-ER2-018 |
| 제 조 번 호 | |

| 형식번호 : KML-ER2-018 | 형식번호 : KML-ER2-018 |
|---|---|
| Model number. | Model number. |
| KITO-C-ER2M018L-S | KITO-CZ-ER2M018L-S |
| KITO-C-ER2M018L-L | KITO-CZ-ER2M018L-L |
| KITO-C-ER2M018L-IS | KITO-CZ-ER2M018L-IS |
| KITO-C-ER2M018L-IL | KITO-CZ-ER2M018L-IL |
| KITO-C-ER2M018IL-S | KITO-CZ-ER2M018IL-S |
| KITO-C-ER2M018IL-L | KITO-CZ-ER2M018IL-L |
| KITO-C-ER2M018IL-IS | KITO-CZ-ER2M018IL-IS |
| KITO-C-ER2M018IL-IL | KITO-CZ-ER2M018IL-IL |

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

株式会社 キトー KITO CORP

名称 TITLE: 1.8t MONO RAIL HOIST GENERAL ASSEMBLY-2

製造番号 CODE:

尺度 SCALE:

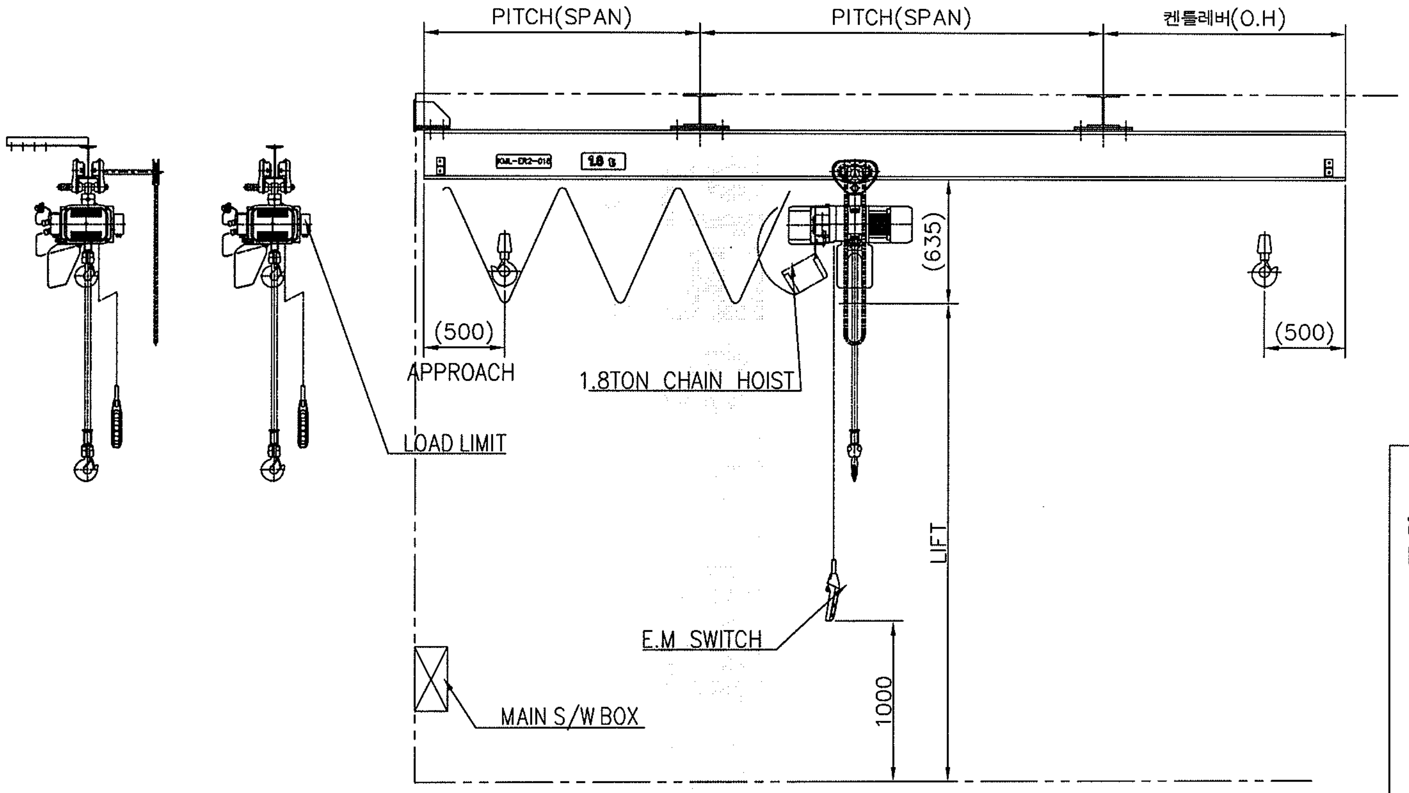
図番 DWG.NO.: MONO RAIL 2

変更回数 REV.:

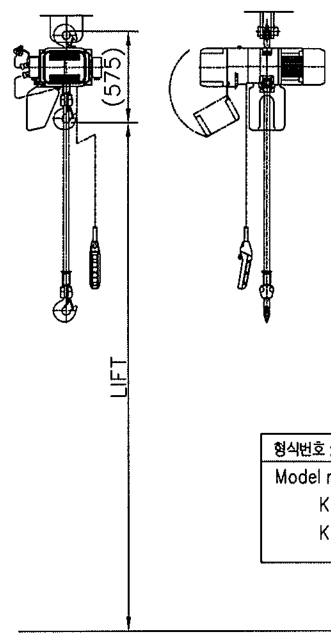
| 改訂 REV. | 数 QTY | 内容 CONTENTS | 年.月.日 DATE | 担当 DRAWN | 承認 APPROVED |
|---|---|---|---|---|---|

三角法 単位 : mm

2014.03.31




| SPECIFICATION | | |
|---|---|---|
| BEAM 규격 | PITCH | O.H |
| I-200x100x7/10 | 3.2 m | 1.3 m |
| I-250x125x7.5/12.5 | 5 m | 1.8 m |
| I-300x150x10/18.5 | 7.5 m | 2.8 m |
| I-350x150x12/24 | 9.4 m | 3.4 m |
| I-400x150x12.5/25 | 11 m | 4 m |
| H-350x175x7/11 | 8 m | 3 m |
| H-400x200x8/13 | 10 m | 3.8 m |
| H-450x200x9/14 | 11 m | 4.2 m |
| 최소 반경 커브 | 1500 mm | |
| LOAD CHAIN | 10.2mm X 1 | |
| LIFT | Max 30m | |




| 형식번호 : KML-ER2-018 |
|---|
| Model number. |
| KITO-ER2-018L |
| KITO-ER2-018IL |

고정형

| 형식번호 : KML-ER2-018 | 형식번호 : KML-ER2-018 |
|---|---|
| Model number. | Model number. |
| KITO-ER2SP018L | KITO-ER2SG018L |
| KITO-ER2SP018IL | KITO-ER2SG018IL |

NAME PLATE

| | |
|---|---|
| 정 격 하 중 | 1.8 ton |
| 전기 설비 정격 | V |
| 제 조 자 | |
| 제 조 년 월 | 20 . . |
| 안전인증표시 | KCs |
| 형 식 번 호 | KML-ER2-018 |
| 제 조 번 호 | |

2014.03.31

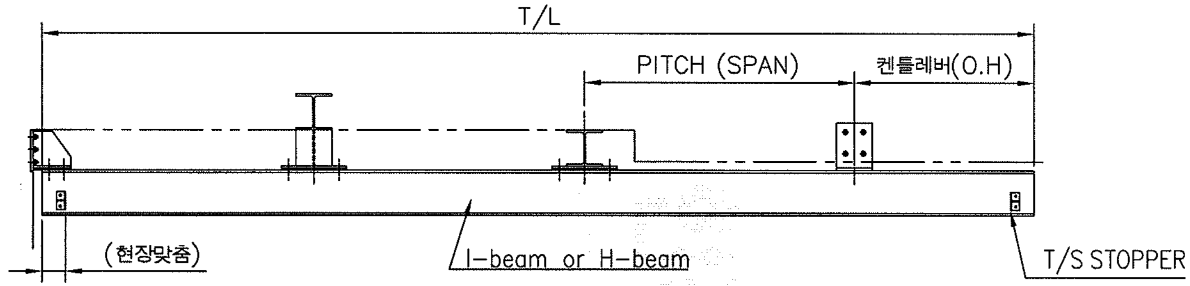
| 承認 APPROVED | 検図 CHECKED | 設計 DESIGNED | 製図 DRAWN |
|---|---|---|---|
| J.S.CHO | J.H.CHOI | EUN.WON HEE | EUN.WON HEE |

株式会社 キトー KITO CORP

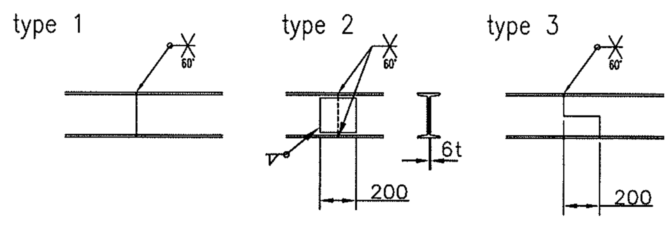
| | |
|---|---|
| 名称 TITLE | 1.8t MONO RAIL HOIST GENERAL ASSEMBLY-3 |
| 製造番号 CODE | |
| 尺度 SCALE | |
| 図番 DWG.NO. | MONO RAIL 3 |
| 変更回数 REV. | |

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

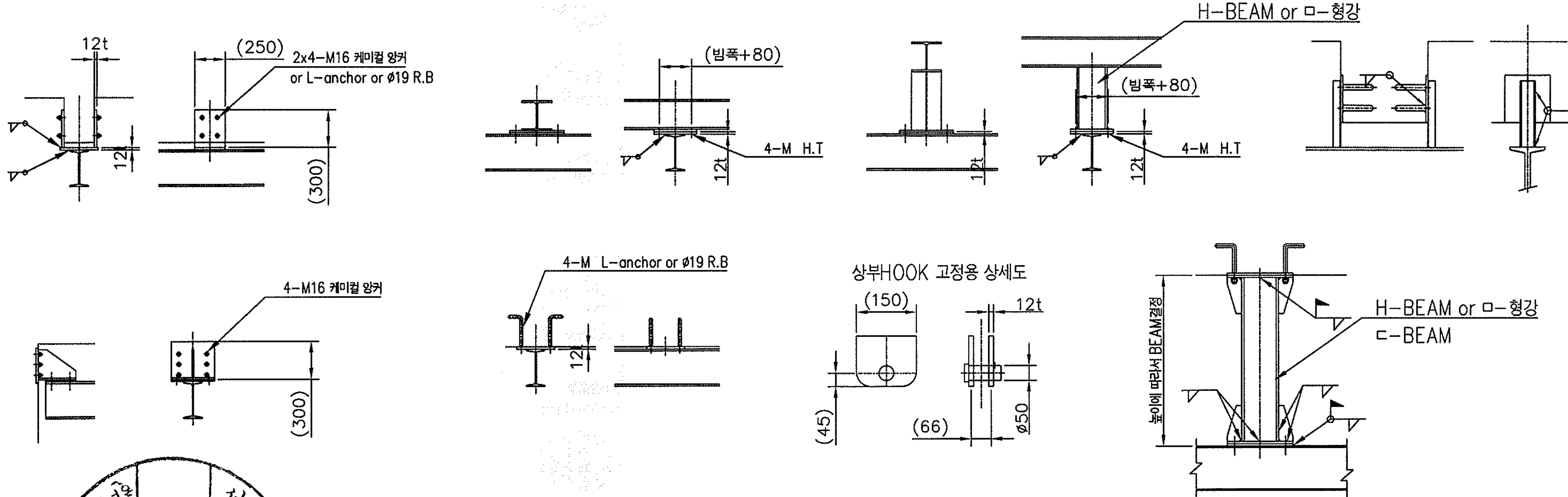
三角法 単位 : mm




beam Joint 부 상세도




beam 과 상부와의 연결종류




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

용접재원
각장은 높이 5일때 용접길이 L=90mm이상
각장은 높이 6일때 용접길이 L=70mm이상
각장은 높이 7일때 용접길이 L=60mm이상

특기사항
1. 지시없는 용접부는 얇은모재의 70%로 용접한다.

2014. 03. 31

| 改訂 REV. | 數 QTY | 內 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 |

株式会社 KITO CORP

| | | | |
|---|---|---|---|
| 名称 TITLE | 1.8t MONO RAIL HOIST GIRDER BEAM | | |
| 製造番号 CODE | | 尺度 SCALE | |
| 図番 DWG.NO. | MONO RAIL- D1 | 変更回数 REV. | |

三角法 単位 : mm

## 4. 전 기 도 면

1) ELECTRICAL SPECIFICATION

2) SYMBOL LIST

3) 배선배관도 & 접지계통도

4) 전기회로도

5) PANEL 관련도

# LOAD SUMMARY 1 – (ER2-018IL-IS/IL TYPE)

*POWER SOURCE : AC 3Φ 220(208)V

| OBJECT | HOISTING | TRAVERSING | CONTROL CIRCUIT |
|---|---|---|---|
| MOTOR OUTPUT | 1.8KW x 4P | 0.4KW x 4P | |
| FULL LOAD CURRENT | 11.2 (A) | 3 (A) | 0.5 (A) |

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

*** NOMAL 전류값 ***

권상과 횡행시 : HOISTING + TRAVERSING + CONTROL CIRCUIT = 14.7 A

*** PEAK 전류값 ***

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

NOMAL 전류값 * K = 14.7 * 1.25 = 18.3 A

*POWER SOURCE : AC 3Φ 380(440)V

| OBJECT | HOISTING | TRAVERSING | CONTROL CIRCUIT |
|---|---|---|---|
| MOTOR OUTPUT | 1.8KW x 4P | 0.4KW x 4P | |
| FULL LOAD CURRENT | 5.1 (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 = 8.1 A

*** PEAK 전류값 ***

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

NOMAL 전류값 * K = 8.1 * 1.25 = 10.125 A

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# LOAD SUMMARY 2 – (ER2-018IL TYPE)

*POWER SOURCE : AC 3Φ 220(208)V

| OBJECT | HOISTING | TRAVERSING | CONTROL CIRCUIT |
|---|---|---|---|
| MOTOR OUTPUT | 1.8KW x 4P | – | |
| FULL LOAD CURRENT | 11.2 (A) | 0 (A) | 0.5 (A) |

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

*** NOMAL 전류값 ***

권상시 : HOISTING + CONTROL CIRCUIT = 11.7 A

*** PEAK 전류값 ***

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

NOMAL 전류값 * K = 11.7 * 1.25 = 14.6 A

*POWER SOURCE : AC 3Φ 380(440)V

| OBJECT | HOISTING | TRAVERSING | CONTROL CIRCUIT |
|---|---|---|---|
| MOTOR OUTPUT | 1.8KW x 4P | – | |
| FULL LOAD CURRENT | 5.1 (A) | 0 (A) | 0.5 (A) |

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

*** NOMAL 전류값 ***

권상시 : HOISTING + CONTROL CIRCUIT = 5.6 A

*** PEAK 전류값 ***

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

NOMAL 전류값 * K = 5.6 * 1.25 = 7 A

# LOAD SUMMARY 3 – (ER2-018IL-S/L TYPE)

*POWER SOURCE : AC 3Φ 220(208)V

| OBJECT | HOISTING | TRAVERSING | CONTROL CIRCUIT |
|---|---|---|---|
| MOTOR OUTPUT | 1.8KW x 4P | 0.4KW x 4P | |
| FULL LOAD CURRENT | 11.2 (A) | 3 (A) | 0.5 (A) |

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

*** NOMAL 전류값 ***

권상시 : HOISTING + CONTROL CIRCUIT = 14.7 A

*** PEAK 전류값 ***

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

NOMAL 전류값 * K = 14.7 * 1.25 = 18.3 A

*POWER SOURCE : AC 3Φ 380(440)V

| OBJECT | HOISTING | TRAVERSING | CONTROL CIRCUIT |
|---|---|---|---|
| MOTOR OUTPUT | 1.8KW x 4P | 0.4KW x 4P | |
| FULL LOAD CURRENT | 5.1 (A) | 2.2 (A) | 0.5 (A) |

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

*** NOMAL 전류값 ***

권상시 : HOISTING + CONTROL CIRCUIT = 7.8 A

*** PEAK 전류값 ***

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

NOMAL 전류값 * K = 7.8 * 1.25 = 9.7 A

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# LOAD SUMMARY 4 - (ER2-018L-L/S TYPE)

*POWER SOURCE : AC 3Φ 220(208)V

| OBJECT | HOISTING | TRAVERSING | CONTROL CIRCUIT |
|---|---|---|---|
| MOTOR OUTPUT | 1.8KW x 4P | 0.4KW x 4P | |
| FULL LOAD CURRENT | 8.4<br>(A) | 3<br>(A) | 0.5<br>(A) |

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

*** NOMAL 전류값 ***

권상과 횡행시 : HOISTING + TRAVERSING + CONTROL CIRCUIT = 11.9 A

*** PEAK 전류값 ***

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

NOMAL 전류값 * K = 11.9 * 1.25 = 14.8 A

*POWER SOURCE : AC 3Φ 380(440)V

| OBJECT | HOISTING | TRAVERSING | CONTROL CIRCUIT |
|---|---|---|---|
| MOTOR OUTPUT | 1.8KW x 4P | 0.4KW x 4P | |
| FULL LOAD CURRENT | 4.6<br>(A) | 2.2<br>(A) | 0.5<br>(A) |

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

*** NOMAL 전류값 ***

권상과 횡행시 : HOISTING + TRAVERSING + CONTROL CIRCUIT = 7.3 A



*** PEAK 전류값 ***

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

NOMAL 전류값 * K = 7.3 * 1.25 = 9.125 A

# LOAD SUMMARY 5 – (ER2-018L TYPE)

*POWER SOURCE : AC 3Φ 220(208)V

| OBJECT | HOISTING | TRAVERSING | CONTROL CIRCUIT |
|---|---|---|---|
| MOTOR OUTPUT | 1.8KW x 4P | – | |
| FULL LOAD CURRENT | 8.4 (A) | 0 (A) | 0.5 (A) |

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

*** NOMAL 전류값 ***

권상시 : HOISTING + CONTROL CIRCUIT = 8.9 A

*** PEAK 전류값 ***

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

NOMAL 전류값 * K = 8.9 * 1.25 = 11.1 A

*POWER SOURCE : AC 3Φ 380(440)V

| OBJECT | HOISTING | TRAVERSING | CONTROL CIRCUIT |
|---|---|---|---|
| MOTOR OUTPUT | 1.8KW x 4P | – | |
| FULL LOAD CURRENT | 4.6 (A) | 0 (A) | 0.5 (A) |

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

*** NOMAL 전류값 ***

권상시 : HOISTING + CONTROL CIRCUIT = 5.1 A

*** PEAK 전류값 ***

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

NOMAL 전류값 * K = 5.1 * 1.25 = 6.3 A

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# LOAD SUMMARY 6 – (ER2-018L-IL/IS TYPE)

*POWER SOURCE : AC 3Φ 220(208)V

| OBJECT | HOISTING | TRAVERSING | CONTROL CIRCUIT |
|---|---|---|---|
| MOTOR OUTPUT | 1.8KW x 4P | 0.4KW x 4P | |
| FULL LOAD CURRENT | 8.4 (A) | 3 (A) | 0.5 (A) |

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

*** NOMAL 전류값 ***

권상시 : HOISTING + CONTROL CIRCUIT = 11.9 A

*** PEAK 전류값 ***

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

NOMAL 전류값 * K = 11.9 * 1.25 = 14.8 A

*POWER SOURCE : AC 3Φ 380(440)V

| OBJECT | HOISTING | TRAVERSING | CONTROL CIRCUIT |
|---|---|---|---|
| MOTOR OUTPUT | 1.8KW x 4P | 0.4KW x 4P | |
| FULL LOAD CURRENT | 4.6 (A) | 2.5 (A) | 0.5 (A) |

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

*** NOMAL 전류값 ***

권상시 : HOISTING + CONTROL CIRCUIT = 7.6 A

*** PEAK 전류값 ***

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

NOMAL 전류값 * K = 7.6 * 1.25 = 9.5 A

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2014.03.31
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## 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

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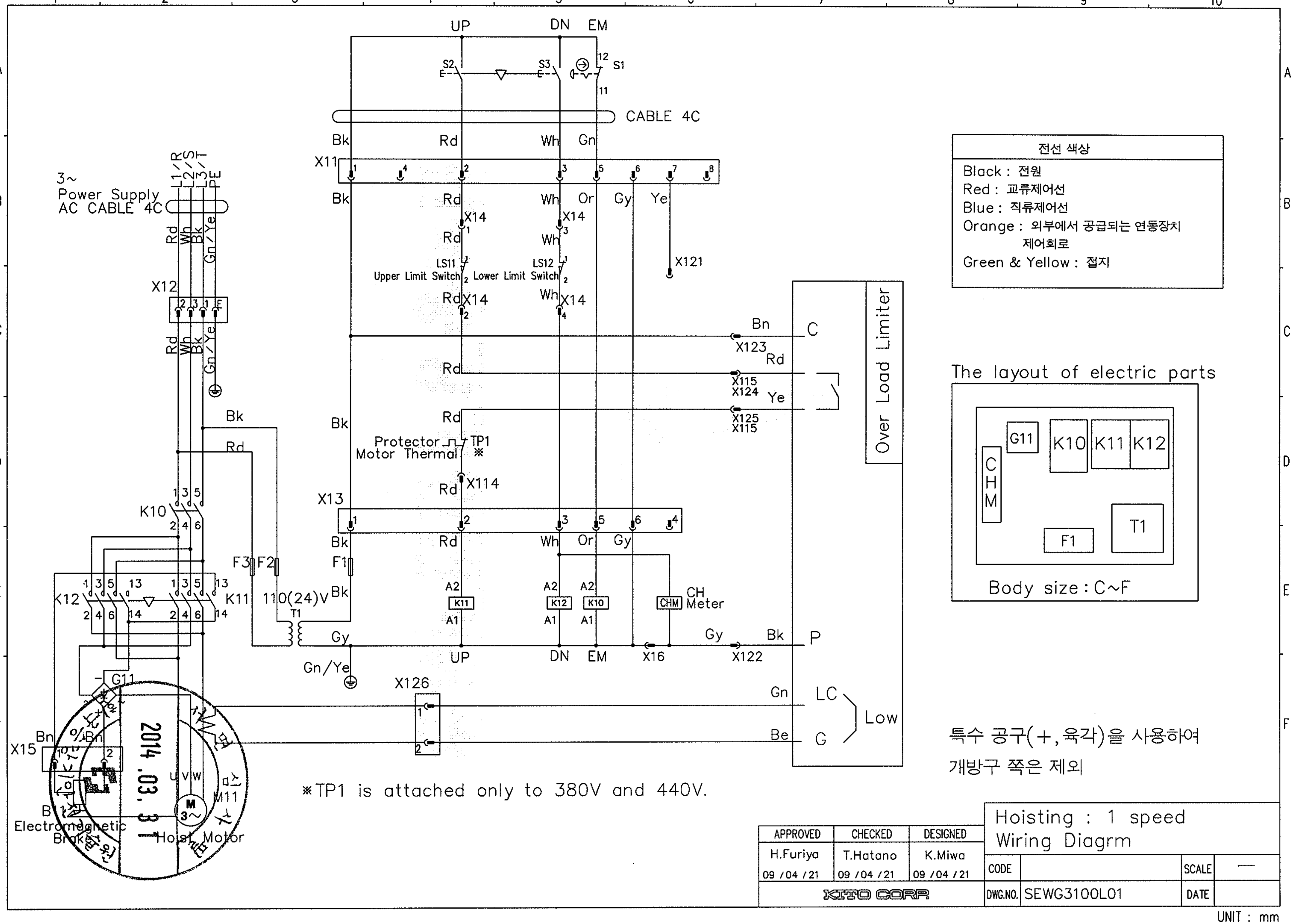
2014 .03. 31
한국승강기안전기술원

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

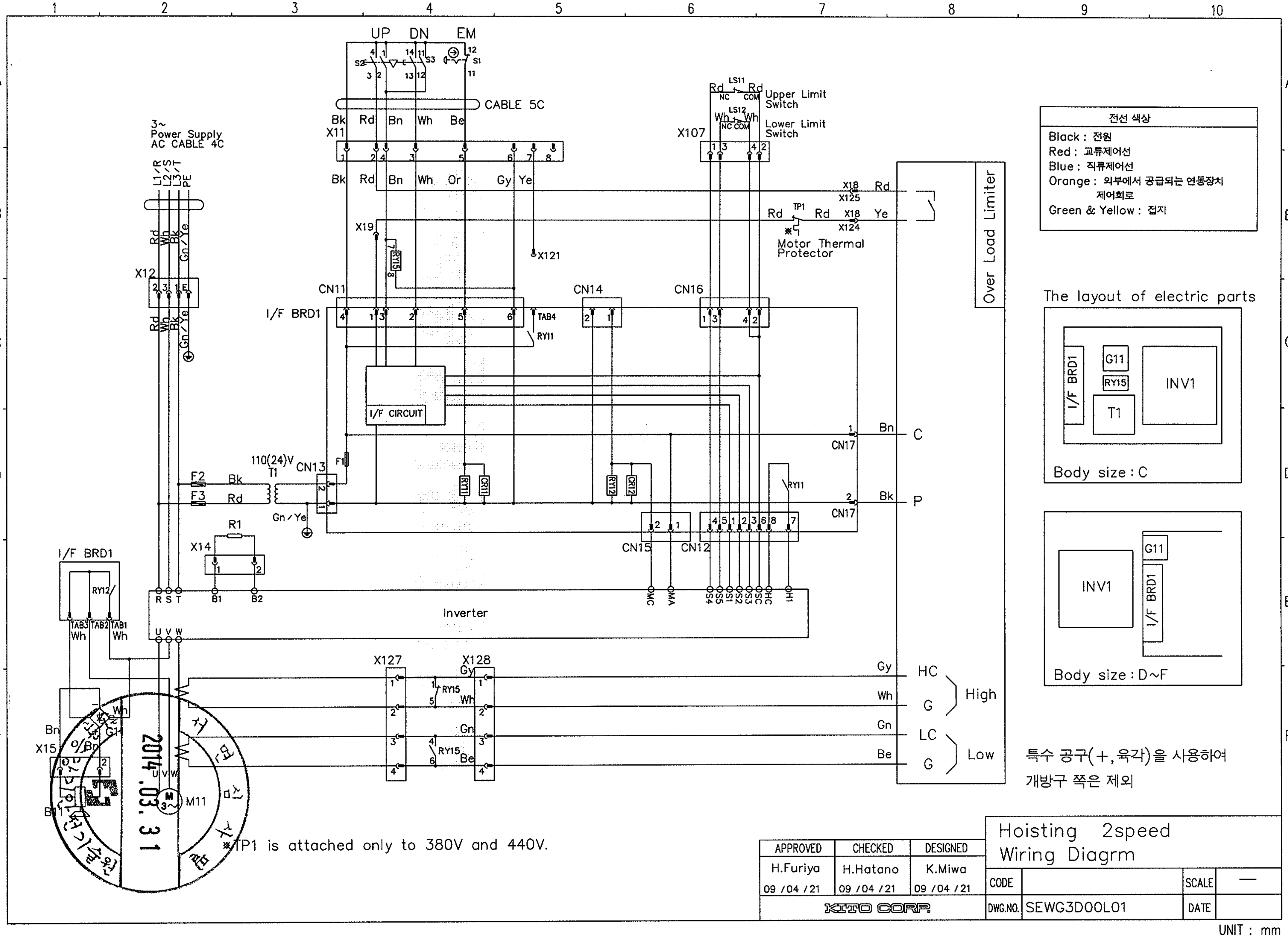
## (1) 2점식 전기도면

. 1속형 hoisting

. 2속형(INVERTER) hoisting



UP
DN
EM
S1
S2
S3
CABLE 4C
X11
X12
X13
X14
X114
X121
X122
X123
X124
X125
X115
X126
X16
X15
3~
Power Supply
AC CABLE 4C
L1/R
L2/S
L3/T
PE
Rd
Wh
Bk
Gn/Ye
Gn
Or
Gy
Ye
Bn
Be
LS11
Upper Limit Switch
LS12
Lower Limit Switch
Protector
Motor Thermal
TP1 ※
K10
K11
K12
A1
A2
CHM
CH Meter
F1
F2
F3
110(24)V
T1
G11
M11
Hoist Motor
Electromagnetic Brake
Over Load Limiter
C
P
LC
G
Low
전선 색상
Black : 전원
Red : 교류제어선
Blue : 직류제어선
Orange : 외부에서 공급되는 연동장치 제어회로
Green & Yellow : 접지
The layout of electric parts
CHM
G11
K10
K11
K12
F1
T1
Body size : C~F
특수 공구(+, 육각)을 사용하여
개방구 쪽은 제외
※TP1 is attached only to 380V and 440V.
2014.03.31
APPROVED
H.Furiya
09 /04 /21
CHECKED
T.Hatano
09 /04 /21
DESIGNED
K.Miwa
09 /04 /21
KITO CORP.
Hoisting : 1 speed
Wiring Diagrm
CODE
SCALE
—
DWG.NO. SEWG3100L01
DATE
UNIT : mm



UP DN EM
CABLE 5C
3~ Power Supply AC CABLE 4C
L1/R L2/S L3/T PE
Upper Limit Switch
Lower Limit Switch
LS11
LS12
X107
X11
X12
X14
X15
X19
X121
X18 X125
X18 X124
Rd Ye
TP1
Motor Thermal Protector
Over Load Limiter
전선 색상
Black : 전원
Red : 교류제어선
Blue : 직류제어선
Orange : 외부에서 공급되는 연동장치 제어회로
Green & Yellow : 접지
The layout of electric parts
I/F BRD1
G11
RY15
T1
INV1
Body size : C
Body size : D~F
CN11
CN12
CN13
CN14
CN15
CN16
CN17
I/F CIRCUIT
TAB4
RY11
RY12
CR11
CR12
110(24)V T1
F1
F2
F3
R1
B1 B2
Gn/Ye
Inverter
R S T
U V W
MC MA S4 S5 S1 S2 S3 SC HC H1
TAB3 TAB2 TAB1
X127
X128
HC G High
LC G Low
C P
Bn Bk
Gy Wh Gn Be
M11
특수 공구(+,육각)을 사용하여
개방구 쪽은 제외
※TP1 is attached only to 380V and 440V.
APPROVED H.Furiya 09 /04 /21
CHECKED H.Hatano 09 /04 /21
DESIGNED K.Miwa 09 /04 /21
KITO CORP.
Hoisting 2speed
Wiring Diagrm
CODE
SCALE —
DWG.NO. SEWG3D00L01
DATE
UNIT : mm
2014.03.31

(2) 4점식이상 전기도면

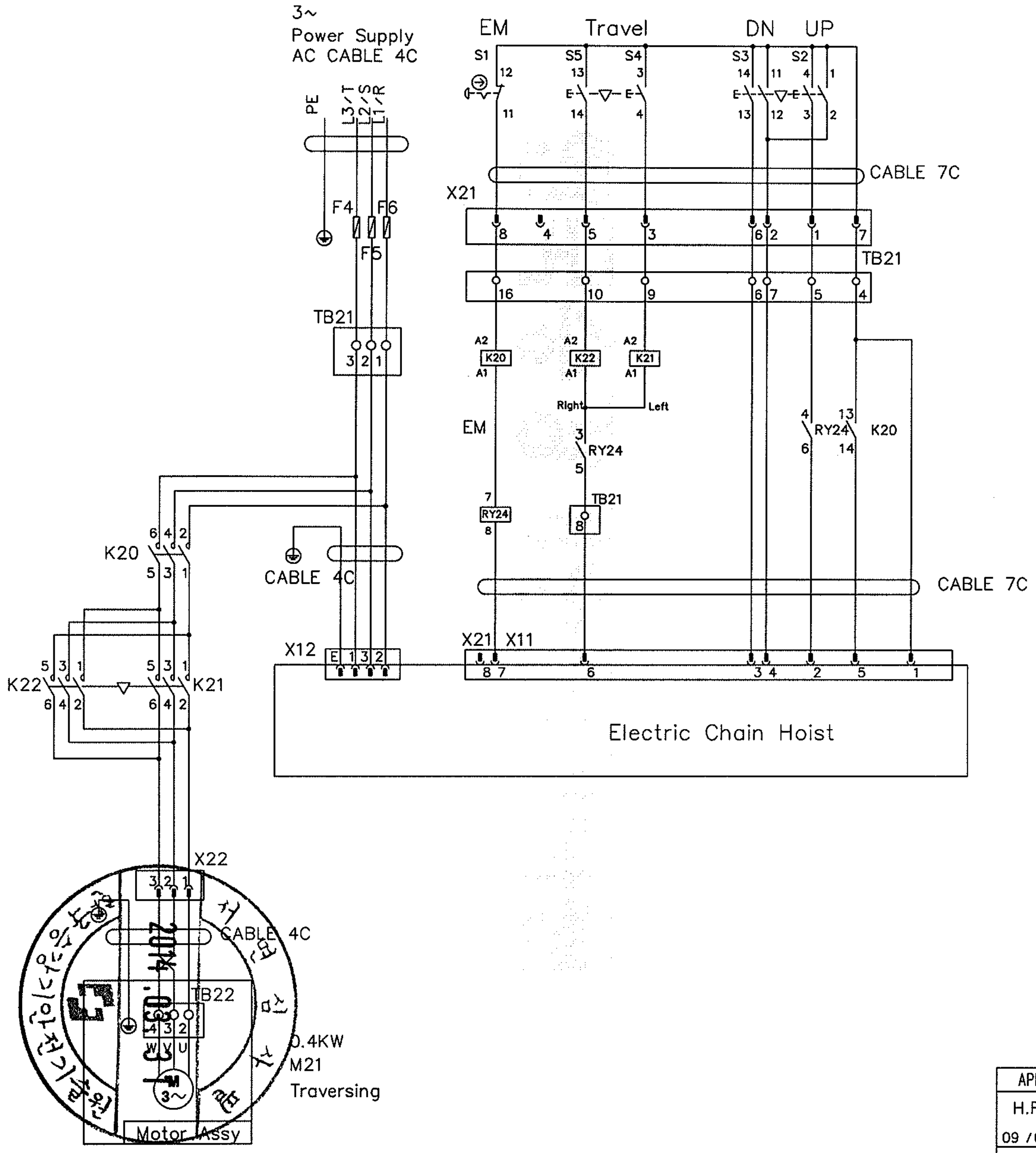
. 1속형 traversing

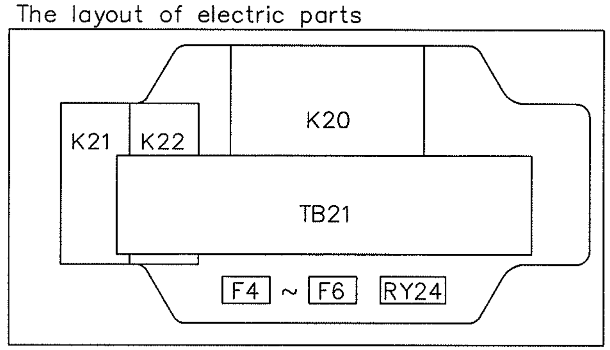
. 2속형(INVERTER) traversing

. 1속형 hoisting

. 2속형(INVERTER) hoisting

. 1속형 hoisting/. 1속형 traversing




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

특수 공구(+,육각)을 사용하여
개방구 쪽은 제외

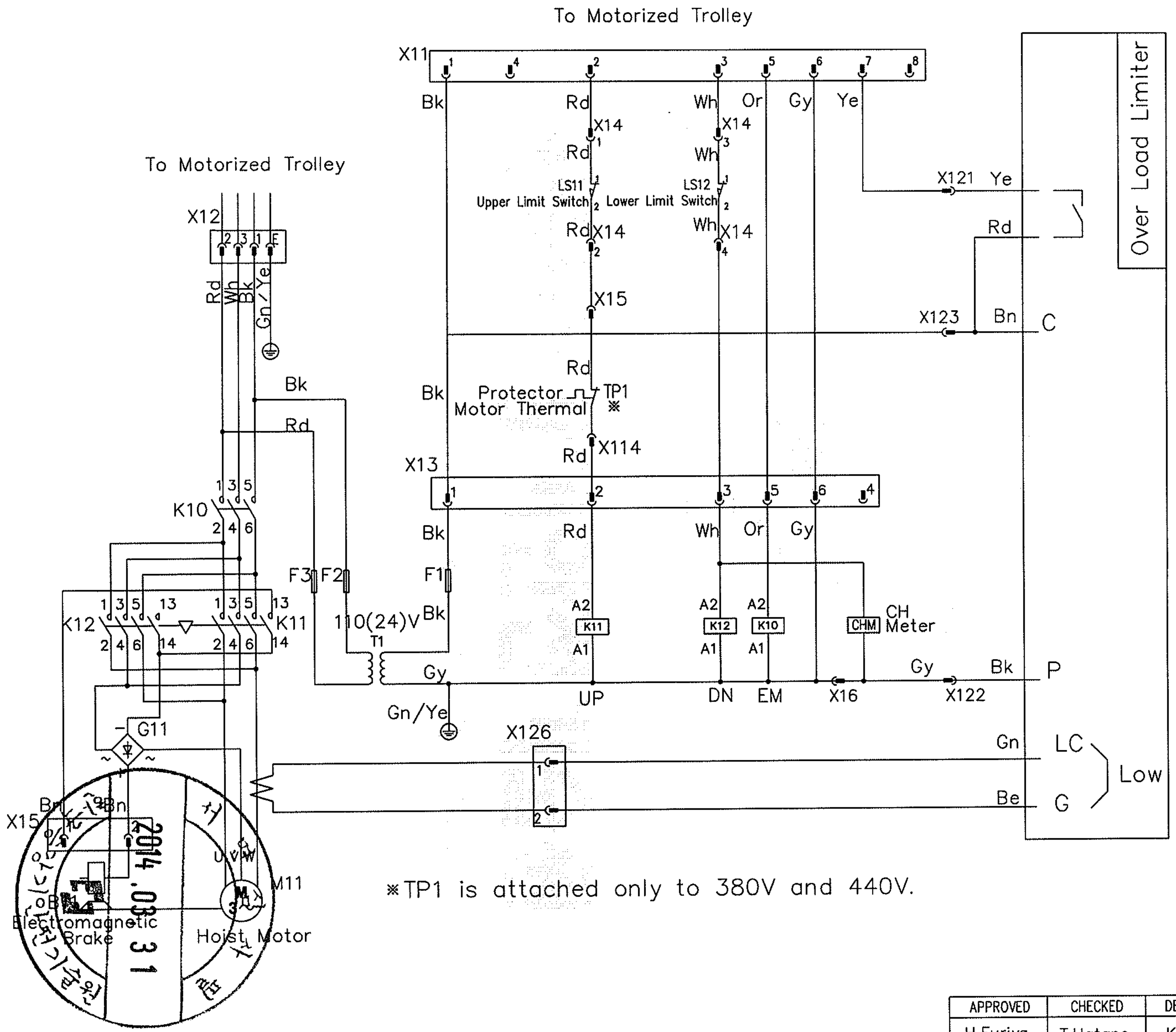
| APPROVED | CHECKED | DESIGNED |
|---|---|---|
| H.Furiya | H.Hatano | K.Miwa |
| 09 /04 /21 | 09 /04 /21 | 09 /04 /21 |

KITO CORP.

Traversing 1speed
Wiring Diagrm

| CODE | | SCALE | — |
|---|---|---|---|
| DWG.NO. | SEWG3DD0L01 | DATE | |

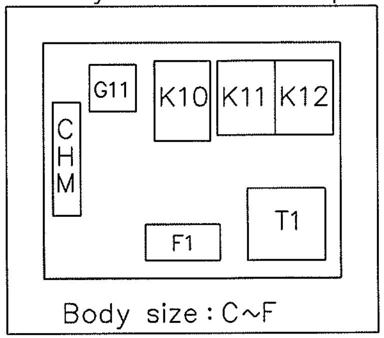
UNIT : mm




※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

For MR connection

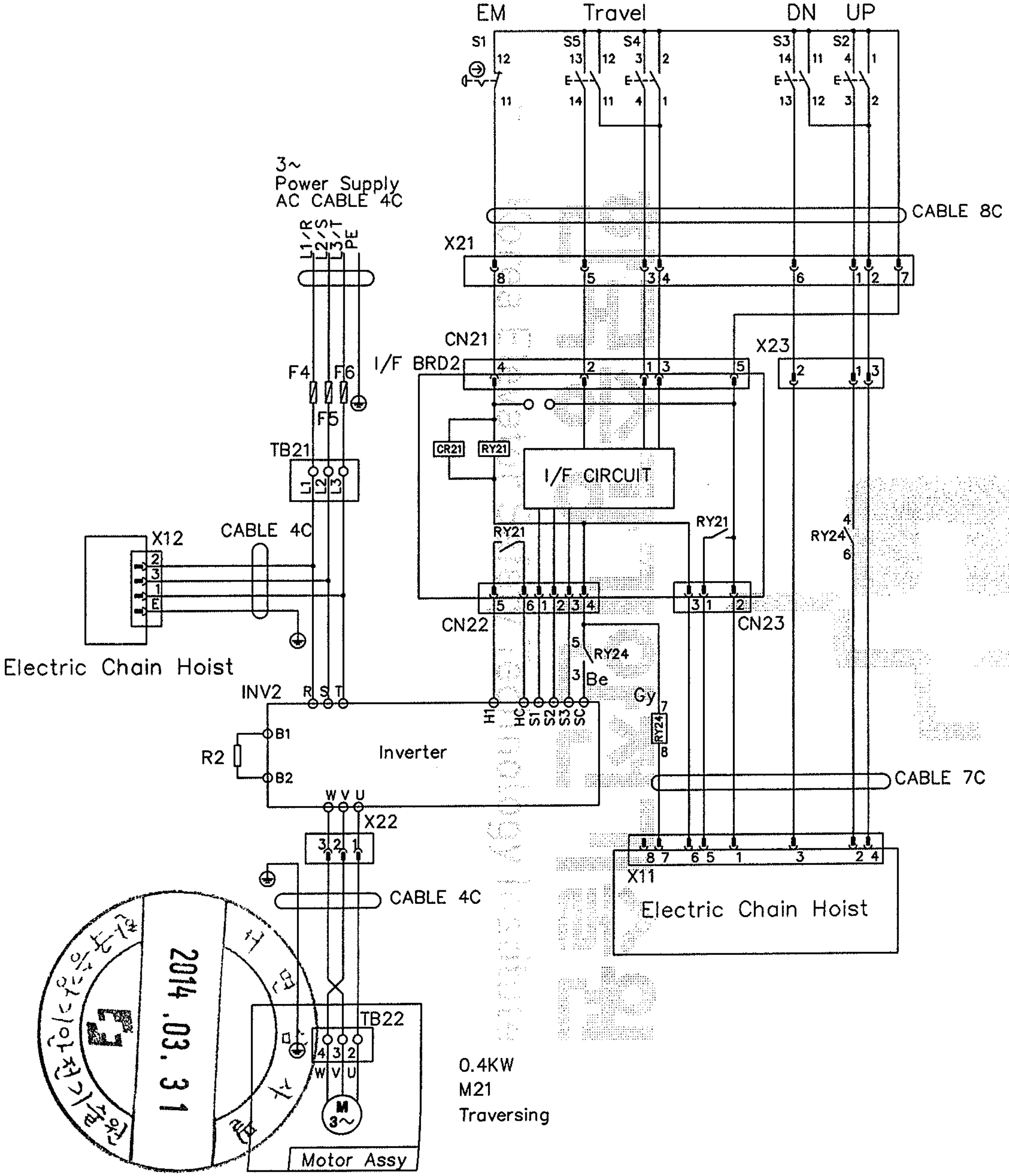
| APPROVED | CHECKED | DESIGNED |
| --- | --- | --- |
| H.Furiya | T.Hatano | K.Miwa |
| 09 /04 /21 | 09 /04 /21 | 09 /04 /21 |

KITO CORP.

| | |
| --- | --- |
| Hoisting 1speed Traversing Wiring Diagrm | |
| CODE | SCALE — |
| DWG.NO. SEWG3100L01_MR | DATE |

UNIT : mm

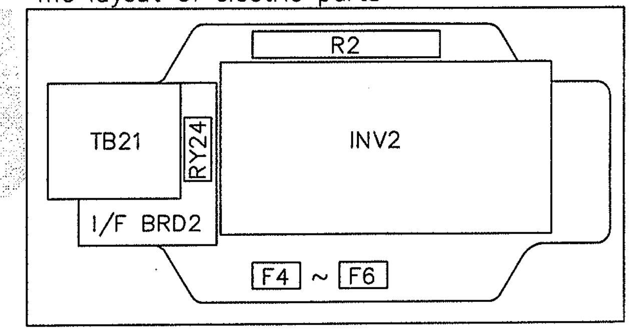
. 1속형 hoisting/. 2속형 traversing




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<br>09 /04 /21 | H.Hatano<br>09 /04 /21 | K.Miwa<br>09 /04 /21 |

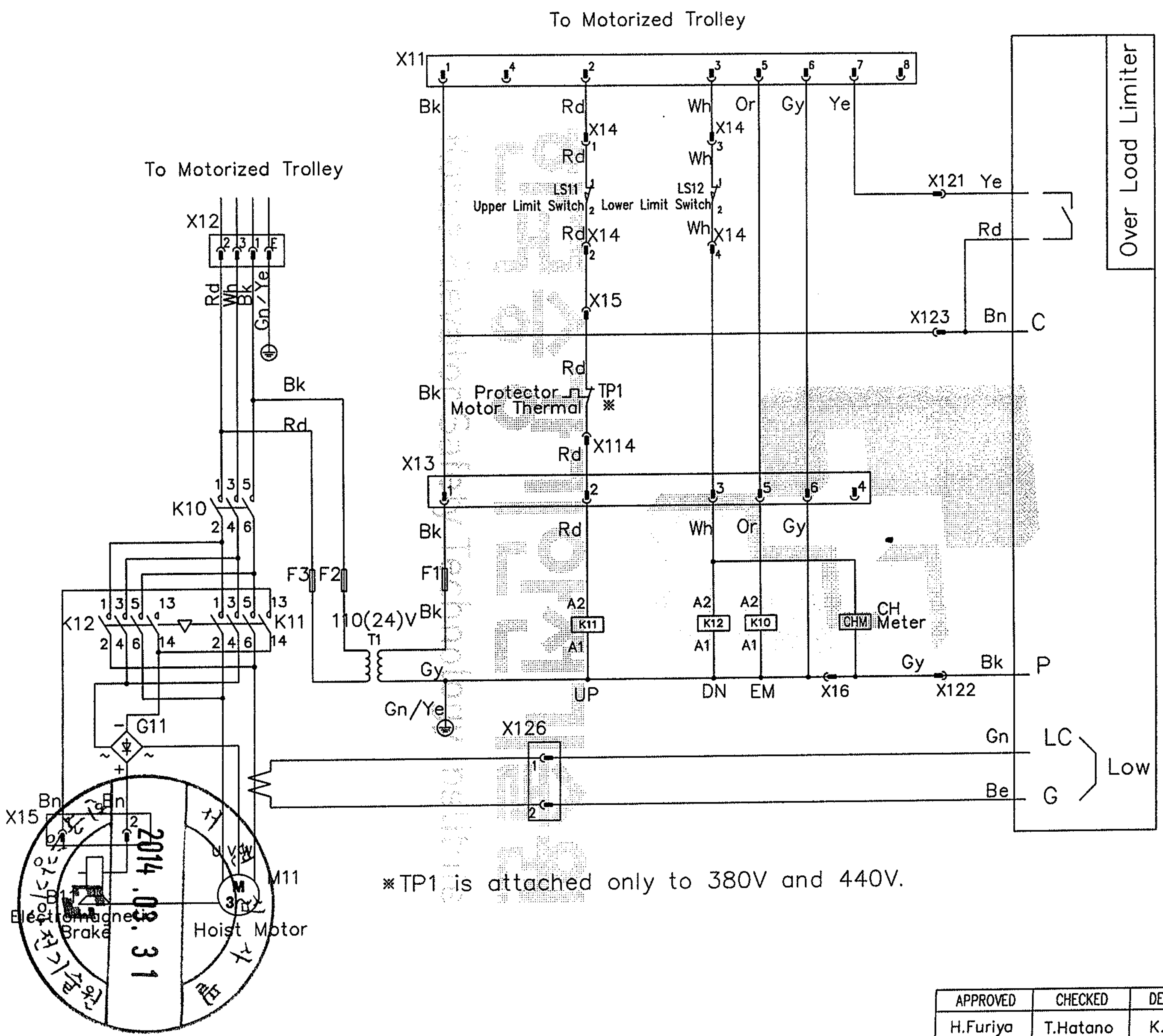
KITO CORP.

Traversing 2speed Wiring Diagrm

| | | | |
| --- | --- | --- | --- |
| CODE | | SCALE | — |
| DWG.NO. | SEWG3DDOL01 | DATE | |

UNIT : mm

2014 .03. 31

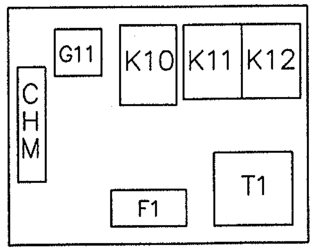



※TP1 is attached only to 380V and 440V.

**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

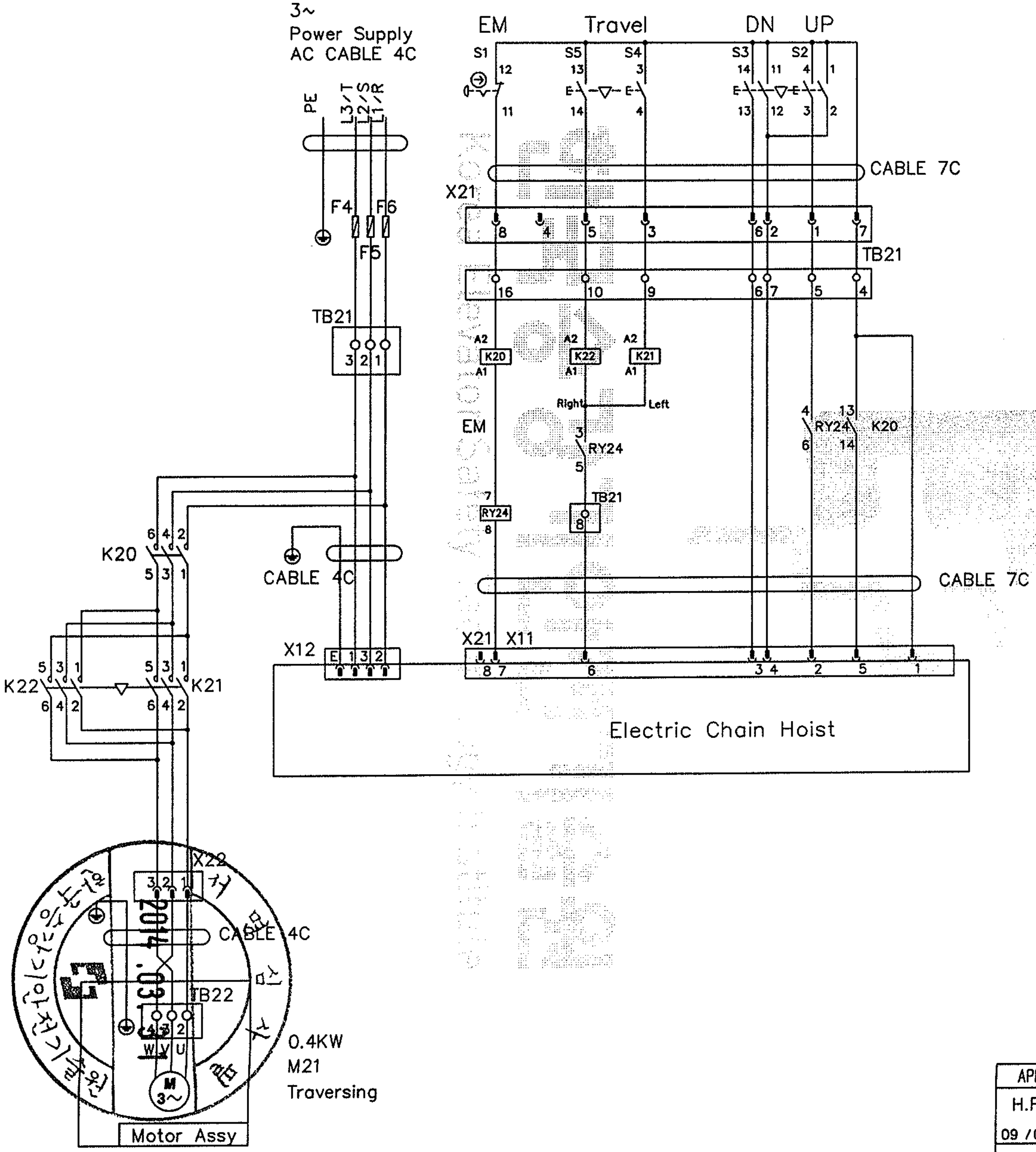
특수 공구(+, 육각)을 사용하여
개방구 쪽은 제외

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 |

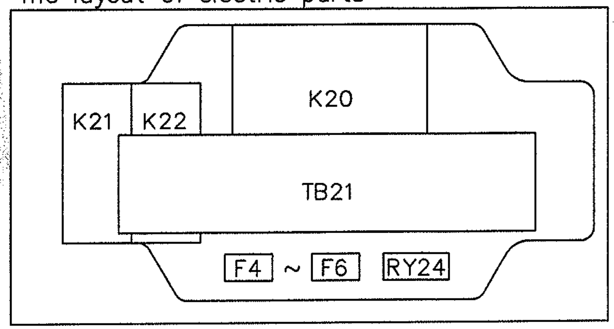
UNIT : mm

. 2속형 hoisting/. 1속형 traversing




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

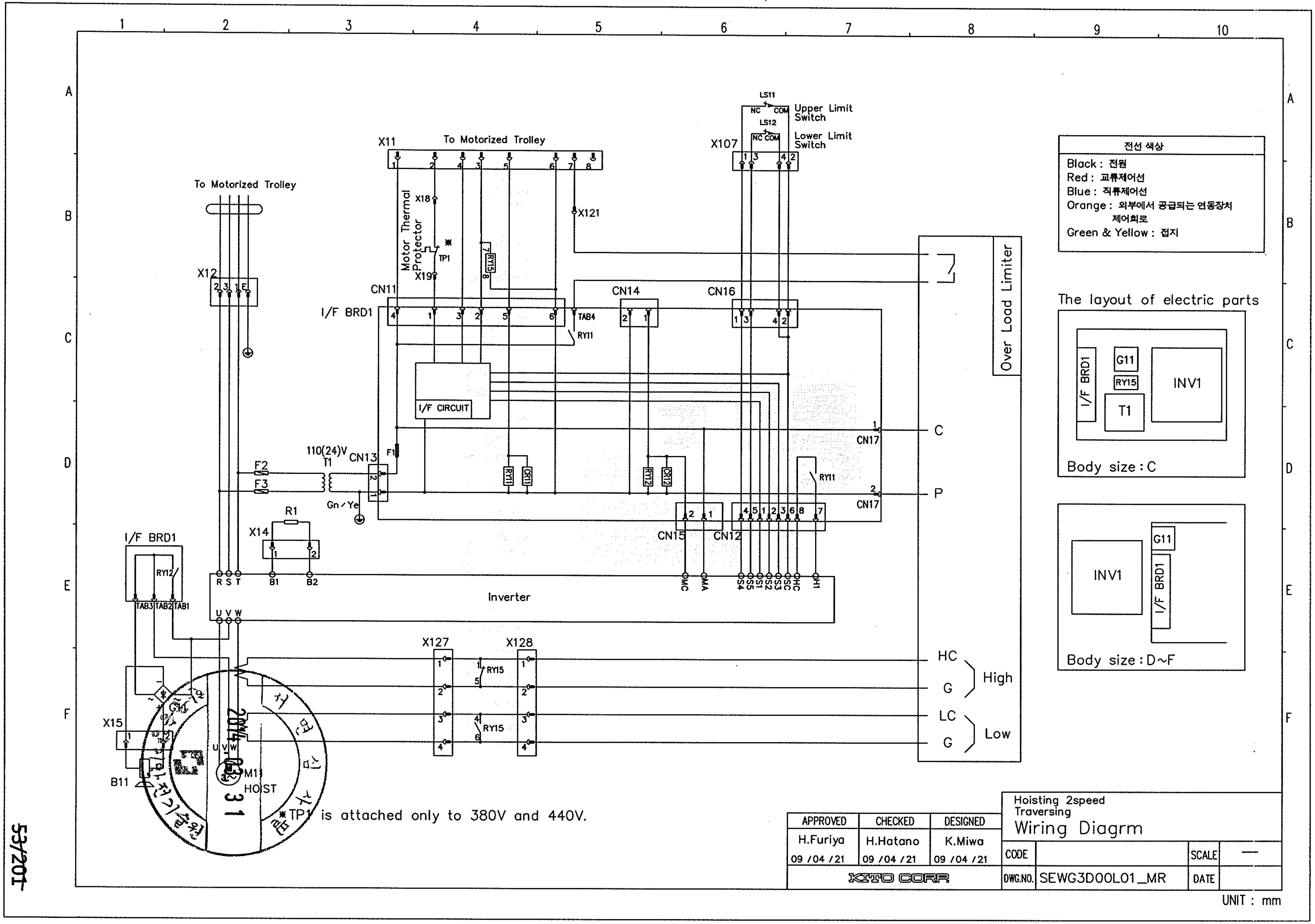
The layout of electric parts



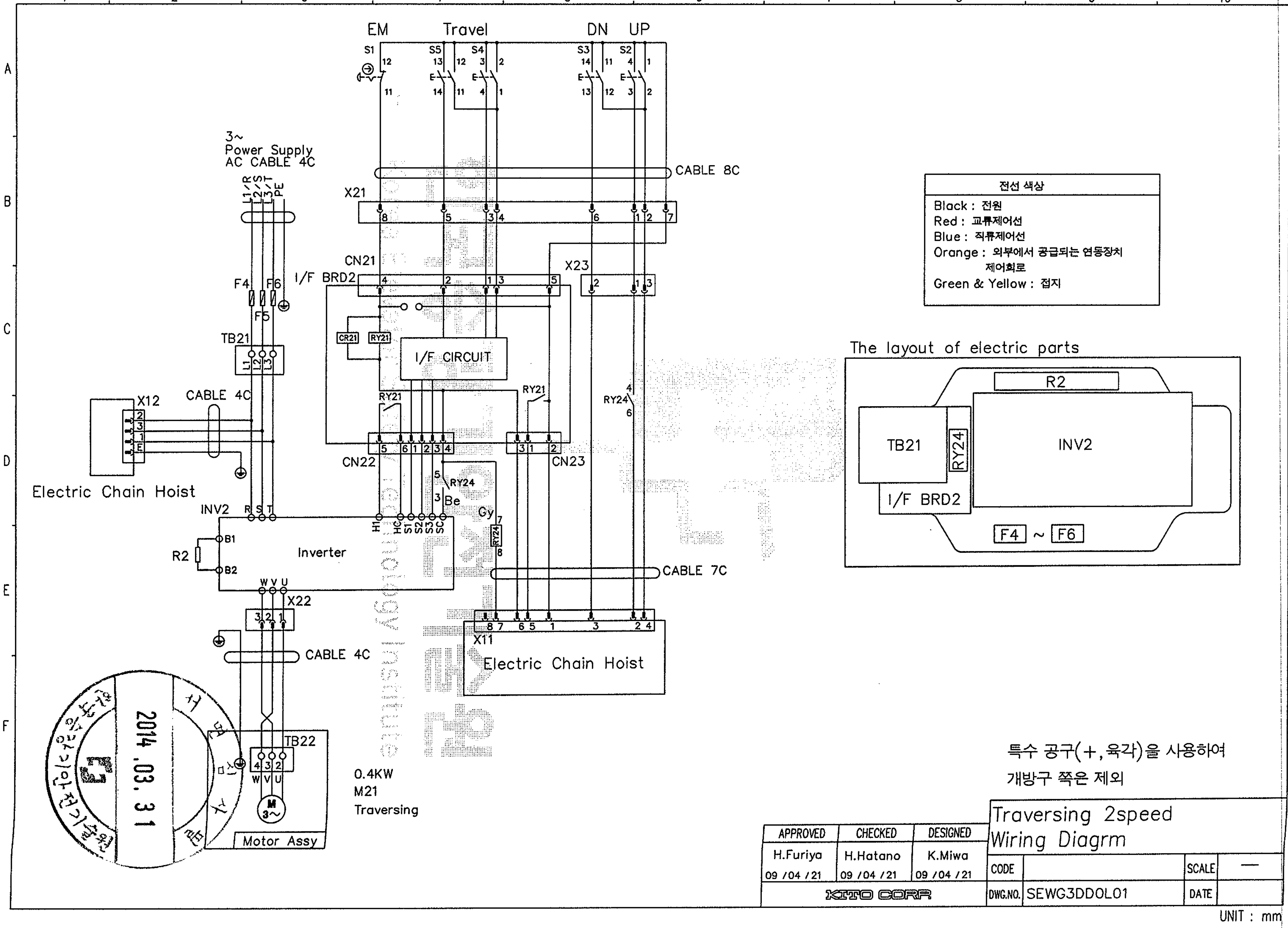

특수 공구(+,육각)을 사용하여
개방구 쪽은 제외

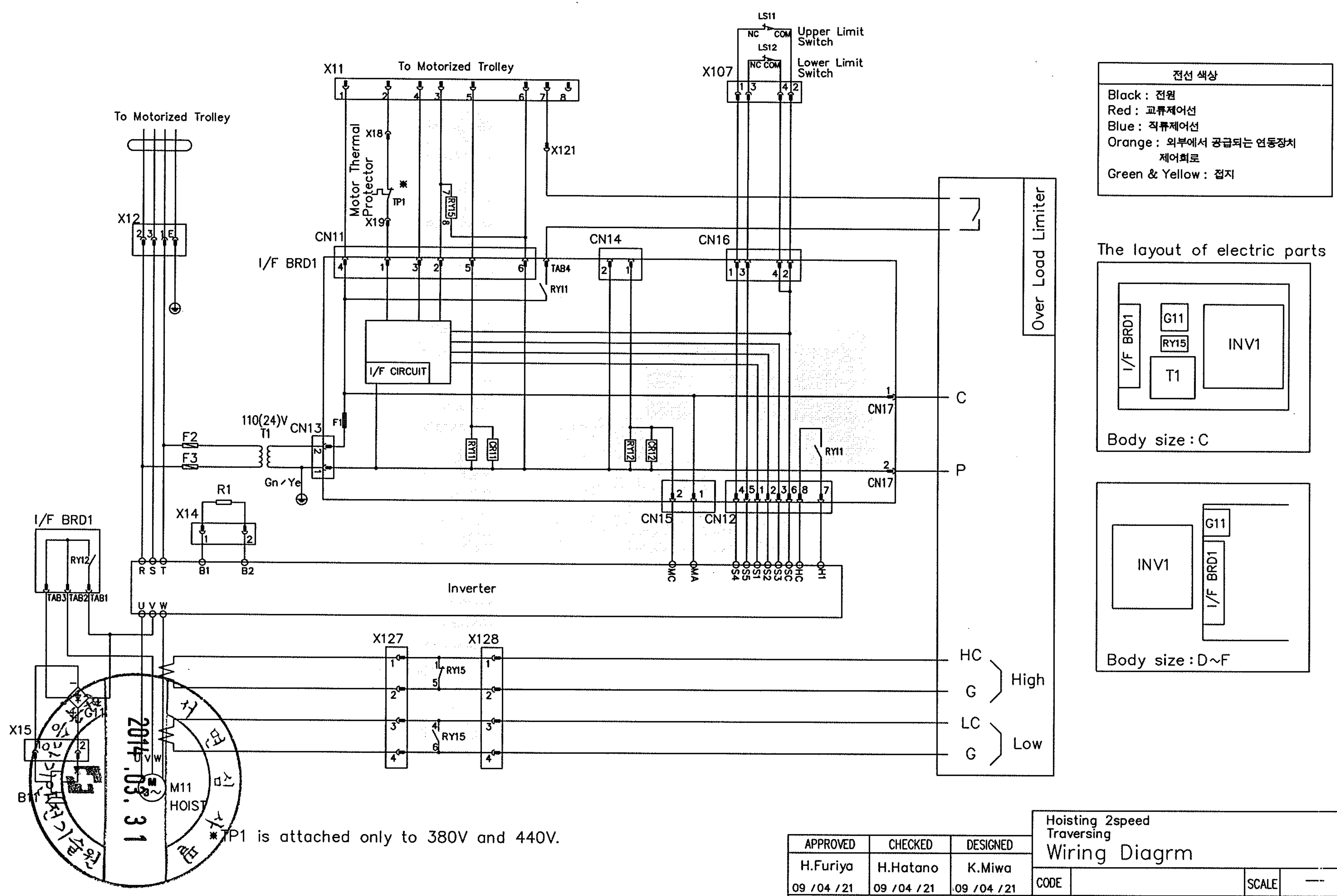
| APPROVED | CHECKED | DESIGNED | Traversing 1speed Wiring Diagrm | | |
| --- | --- | --- | --- | --- | --- |
| H.Furiya 09 /04 /21 | H.Hatano 09 /04 /21 | K.Miwa 09 /04 /21 | CODE | | SCALE — |
| KITO CORP | | | DWG.NO. | SEWG3DDOL01 | DATE |

UNIT : mm


To Motorized Trolley
X11
X12
X18
X19
X121
Motor Thermal Protector
TP1
RY15
CN11
I/F BRD1
TAB4
RY11
CN14
CN16
X107
LS11
LS12
NC COM
Upper Limit Switch
Lower Limit Switch
I/F CIRCUIT
110(24)V
T1
CN13
F1
F2
F3
Gn／Ye
CR11
RY12
CR12
CN15
CN12
CN17
C
P
Over Load Limiter
R1
X14
R S T
B1 B2
MC MA S4 S5 S1 S2 S3 SC HC H1
Inverter
U V W
TAB3 TAB2 TAB1
X127
X128
HC
G
High
LC
Low
X15
B11
M11
HOIST
2014 03 31
*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
G11
INV1
Body size : C
Body size : D~F
APPROVED
CHECKED
DESIGNED
H.Furiya
H.Hatano
K.Miwa
09 /04 /21
KITO CORP.
Hoisting 2speed
Traversing
Wiring Diagrm
CODE
SCALE
DWG.NO. SEWG3D00L01_MR
DATE
UNIT : mm

. 2속형 hoisting/. 2속형 traversing


EM
Travel
DN
UP
S1
S5
S4
S3
S2
3~
Power Supply
AC CABLE 4C
L1/R
L2/S
L3/T
PE
CABLE 8C
X21
CN21
I/F BRD2
X23
F4
F5
F6
TB21
CR21
RY21
I/F CIRCUIT
X12
CABLE 4C
RY24
CN22
CN23
Electric Chain Hoist
INV2
R2
B1
B2
Inverter
Be
Gy
CABLE 7C
X22
X11
CABLE 4C
TB22
Motor Assy
0.4KW
M21
Traversing
전선 색상
Black : 전원
Red : 교류제어선
Blue : 직류제어선
Orange : 외부에서 공급되는 연동장치 제어회로
Green & Yellow : 접지
The layout of electric parts
TB21
RY24
I/F BRD2
INV2
F4 ~ F6
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
2014 .03. 31




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

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

KITO CORP.

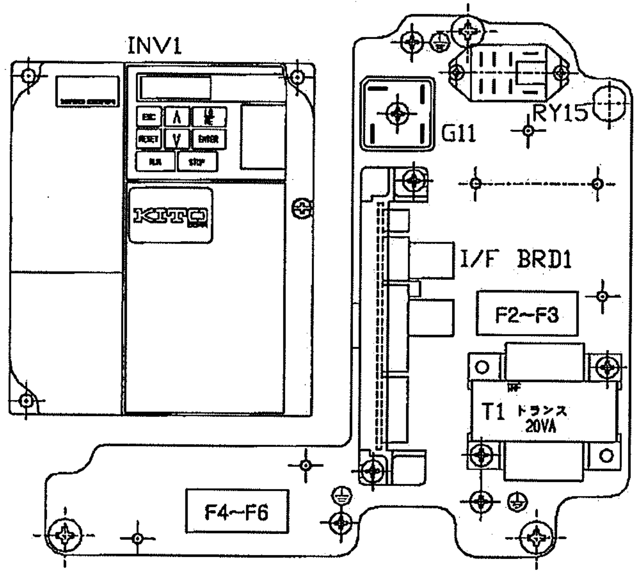
Hoisting 2speed
Traversing
Wiring Diagrm

| | | | |
|---|---|---|---|
| CODE | | SCALE | — |
| DWG.NO. | SEWG3D00L01_MR | DATE | |

UNIT : mm

. 호이스트 CONTROL BOX 배치도(ER2-018IL)

HOISTING CONTROL BOX



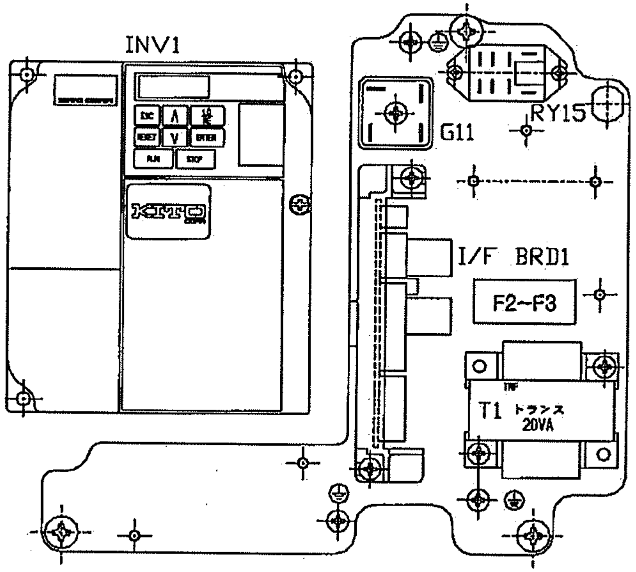

ENCLOSURE : HOIST BODY – IP55
PUSH BUTTON – IP65

| 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 20VA | 380V/24V 20VA | 440V/24V 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 | 20A | 10A | 10A | 3 | FUJI | |
| RY15 | RELAY | 24V | 24V | 24V | 1 | OMRON | HIGH/LOW |

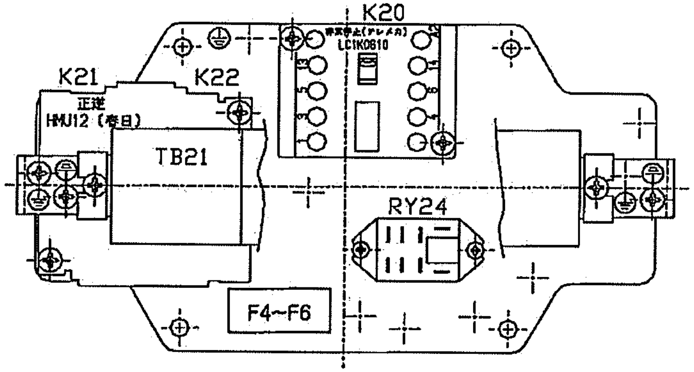
2014. 03. 3

## . 호이스트 CONTROL BOX 배치도(ER2-018IL-S/L)

### HOISTING CONTROL BOX




### TRAVERSING CONTROL BOX



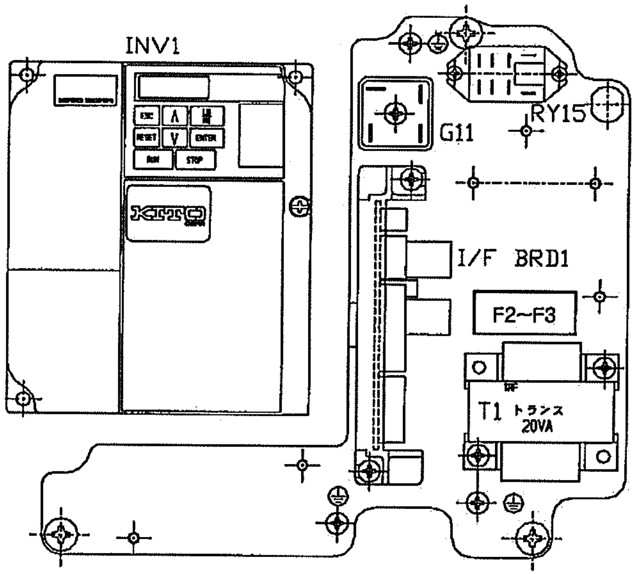

ENCLOSURE : HOIST BODY – IP55
PUSH BUTTON – IP65

| 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 20VA | 380V/24V 20VA | 440V/24V 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 | 20A | 10A | 10A | 3 | FUJI | |
| RY15 | RELAY | 24V | 24V | 24V | 1 | OMRON | HIGH/LOW |
| K20 | MAGNET CONTACTOR | LC1K0610B7 | LC1K0610B7 | LC1K0610B7 | 1 | TELEMECANIQUE | EMERGENCY STOP |
| K21,K22 | MAGNET CONTACTOR | HMU12 | HMU12 | HMU12 | 1 | KASUGA | RIGHT/LEFT |
| RY24 | RELAY | 24V | 24V | 24V | 1 | OMRON | EMERGENCY STOP |
| TB21 | TERMINAL BOARD 21 | 10~15A | 10~15A | 10~15A | 1 | KITO | |

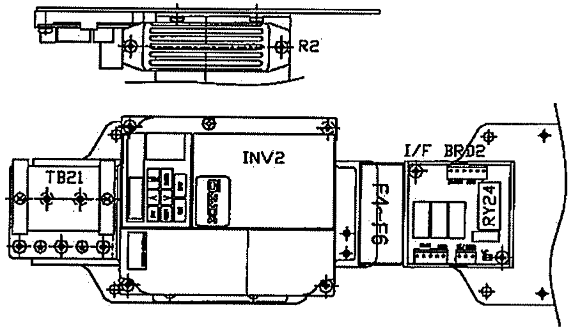
한국승강기안전기술원 2014. 02. 11

## . 호이스트 CONTROL BOX 배치도(ER2-018IL-IS/IL)

### HOISTING CONTROL BOX




### TRAVERSING CONTROL BOX

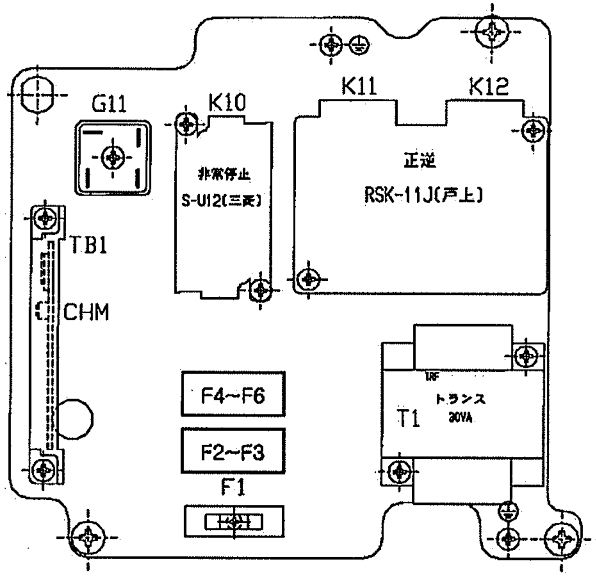



ENCLOSURE : HOIST BODY – IP55
PUSH BUTTON – IP65

| 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 20VA | 380V/24V 20VA | 440V/24V 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 | 20A | 10A | 10A | 3 | FUJI | |
| RY15 | RELAY | 24V | 24V | 24V | 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 | 24V | 24V | 24V | 1 | OMRON | EMERGENCY STOP |
| TB21 | TERMINAL BOARD 21 | 10~15A | 10~15A | 10~15A | 1 | KITO | |

## . 호이스트 CONTROL BOX 배치도(ER2-018L)

### HOISTING CONTROL BOX

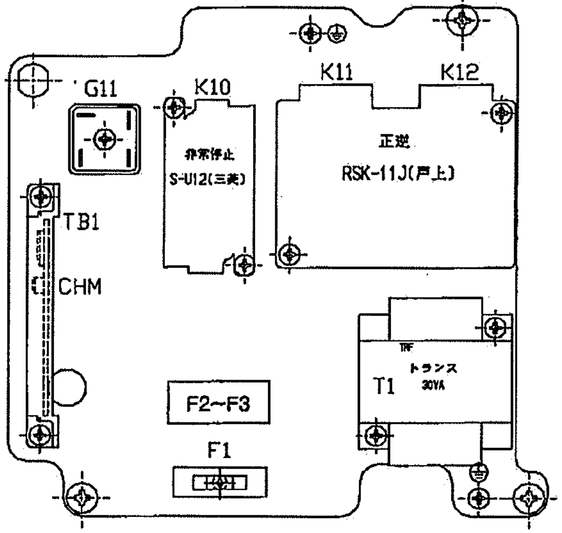



ENCLOSURE : HOIST BODY – IP55
PUSH BUTTON – IP65

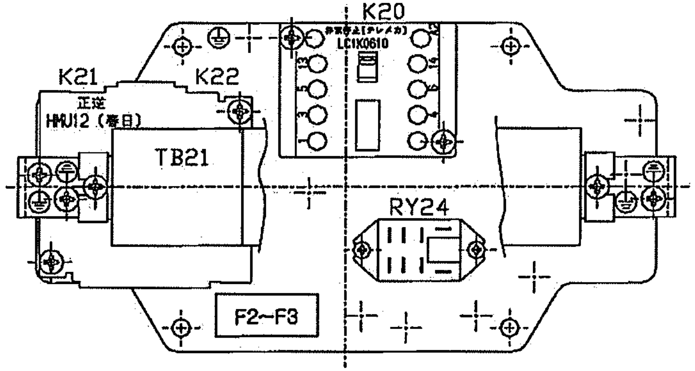
| MARK | DESCRIPTION | TYPE OF MODEL | | | Q'TY | MAKER | REMARKS |
|---|---|---|---|---|---|---|---|
| | | 220V | 380V | 440V | | | |
| K10 | MAGNET CONTACTOR | S-U12 | S-U12 | S-U12 | 1 | MITSUBISHI | EMERGENCY STOP |
| K11,K12 | MAGNET CONTACTOR | RSK-11J-S95 | RSK-11J-S95 | RSK-11J-S95 | 1 | TOGAMI | UP/DOWN |
| T1 | TRANSFORMER | 220V/24V 30VA | 380V/24V 30VA | 440V/24V 30VA | 1 | KITO | CONTROL CIRCUIT |
| F1 | GLASS FUSE | 2A | 2A | 2A | 1 | FUJI | |
| F2~F3 | GLASS FUSE | 10A | 10A | 10A | 2 | FUJI | |
| F4~F6 | GLASS FUSE | 20A | 10A | 10A | 3 | FUJI | |
| G11 | BRIDGE DIODE | S15VB60 | S15VB60 | S15VB60 | 1 | SHINDENGEN | |
| TB | TERMINAL BOARD | 10~15A | 10~15A | 10~15A | 1 | KITO | |
| CHM | COUNTER HOUR METER | ECP91CHAA1-3 | ECP91CHAA1-3 | ECP91CHAA1-3 | 1 | OTEC | 사용회수, 시간 기록 |

# . 호이스트 CONTROL BOX 배치도(ER2-018L-L/S)

## HOISTING CONTROL BOX




## TRAVERSING CONTROL BOX

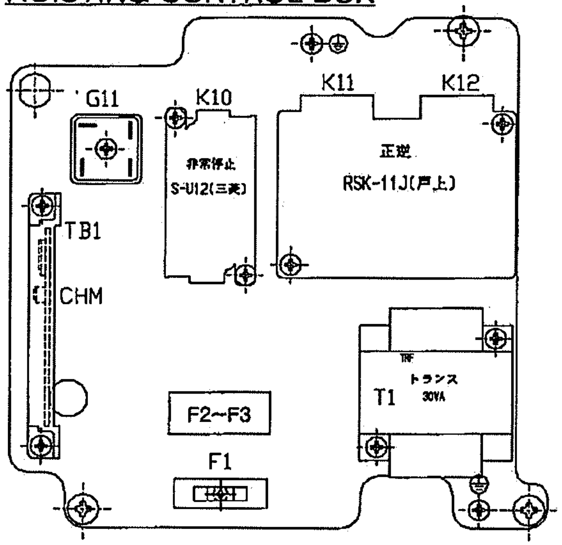



ENCLOSURE : HOIST BODY – IP55
PUSH BUTTON – IP65

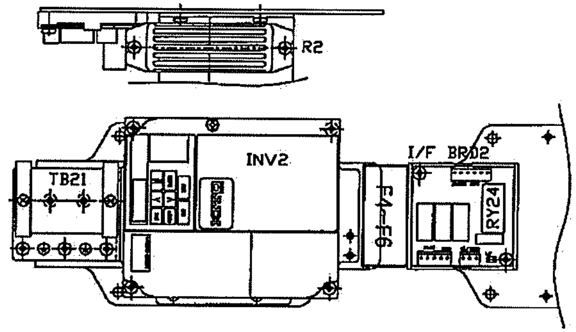
| MARK | DESCRIPTION | TYPE OF MODEL | | | Q'TY | MAKER | REMARKS |
|---|---|---|---|---|---|---|---|
| | | 220V | 380V | 440V | | | |
| K10 | MAGNET CONTACTOR | S-U12 | S-U12 | S-U12 | 1 | MITSUBISHI | EMERGENCY STOP |
| K11,K12 | MAGNET CONTACTOR | RSK-11J-S95 | RSK-11J-S95 | RSK-11J-S95 | 1 | TOGAMI | UP/DOWN |
| T1 | TRANSFORMER | 220V/24V 30VA | 380V/24V 30VA | 440V/24V 30VA | 1 | KITO | CONTROL CIRCUIT |
| F1 | GLASS FUSE | 2A | 2A | 2A | 1 | FUJI | |
| F2~F3 | GLASS FUSE | 10A | 10A | 10A | 2 | FUJI | |
| F4~F6 | GLASS FUSE | 20A | 10A | 10A | 3 | FUJI | |
| G11 | BRIDGE DIODE | S15VB60 | S15VB60 | S15VB60 | 1 | SHINDENGEN | |
| TB | TERMINAL BOARD | 10~15A | 10~15A | 10~15A | 1 | KITO | |
| CHM | COUNTER HOUR METER | ECP91CHAA1-3 | ECP91CHAA1-3 | ECP91CHAA1-3 | 1 | OTEC | 사용회수, 시간 기록 |
| K20 | MAGNET CONTACTOR | LC1K0610B7 | LC1K0610B7 | LC1K0610B7 | 1 | TELEMECANIQUE | EMERGENCY STOP |
| K21,K22 | MAGNET CONTACTOR | HMU12 | HMU12 | HMU12 | 1 | KASUGA | RIGHT/LEFT |
| RY24 | RELAY | 24V | 24V | 24V | 1 | OMRON | EMERGENCY STOP |
| TB21 | TERMINAL BOARD 21 | 10~15A | 10~15A | 10~15A | 1 | KITO | |

## . 호이스트 CONTROL BOX 배치도(ER2-018L-IS/IL)

### HOISTING CONTROL BOX



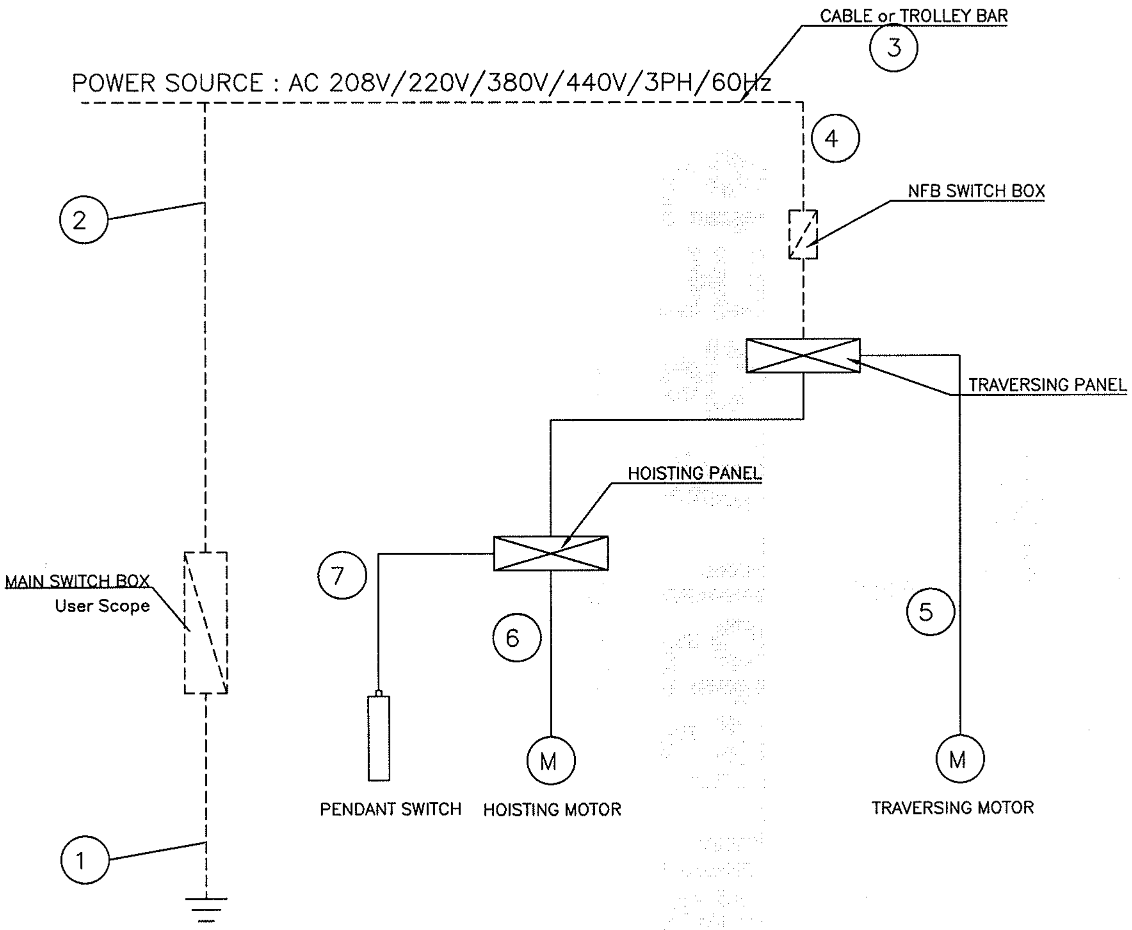

### TRAVERSING CONTROL BOX




ENCLOSURE : HOIST BODY – IP55
PUSH BUTTON – IP65

| MARK | DESCRIPTION | TYPE OF MODEL | | | Q'TY | MAKER | REMARKS |
|---|---|---|---|---|---|---|---|
| | | 220V | 380V | 440V | | | |
| K10 | MAGNET CONTACTOR | S-U12 | S-U12 | S-U12 | 1 | MITSUBISHI | EMERGENCY STOP |
| K11,K12 | MAGNET CONTACTOR | RSK-11J-S95 | RSK-11J-S95 | RSK-11J-S95 | 1 | TOGAMI | UP/DOWN |
| T1 | TRANSFORMER | 220V/24V 30VA | 380V/24V 30VA | 440V/24V 30VA | 1 | KITO | CONTROL CIRCUIT |
| F1 | GLASS FUSE | 2A | 2A | 2A | 1 | FUJI | |
| F2~F3 | GLASS FUSE | 10A | 10A | 10A | 2 | FUJI | |
| F4~F6 | GLASS FUSE | 20A | 10A | 10A | 3 | FUJI | |
| G11 | BRIDGE DIODE | S15VB60 | S15VB60 | S15VB60 | 1 | SHINDENGEN | |
| TB | TERMINAL BOARD | 10~15A | 10~15A | 10~15A | 1 | KITO | |
| CHM | COUNTER HOUR METER | ECP91CHAA1-3 | ECP91CHAA1-3 | ECP91CHAA1-3 | 1 | OTEC | 사용회수, 시간 기록 |
| INV2 | INVERTER | V1000 | V1000 | V1000 | 1 | YASKAWA | RIGHT/LEFT |
| I/F BRD2 | INTERFACE BOARD | 10~15A | 10~15A | 10~15A | 1 | KITO | |
| RY24 | RELAY | 24V | 24V | 24V | 1 | OMRON | EMERGENCY STOP |
| TB21 | TERMINAL BOARD 21 | 10~15A | 10~15A | 10~15A | 1 | KITO | |

2014 .08 .13




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 1.25SQ x 4C | (G-1Core) |
| 7 | Push Button Switch | VCT 1.25SQ x 8C | (G-1Core) |
| 8 | | | |

서면심사필
2014 .03. 31
한국승강기안전기술원

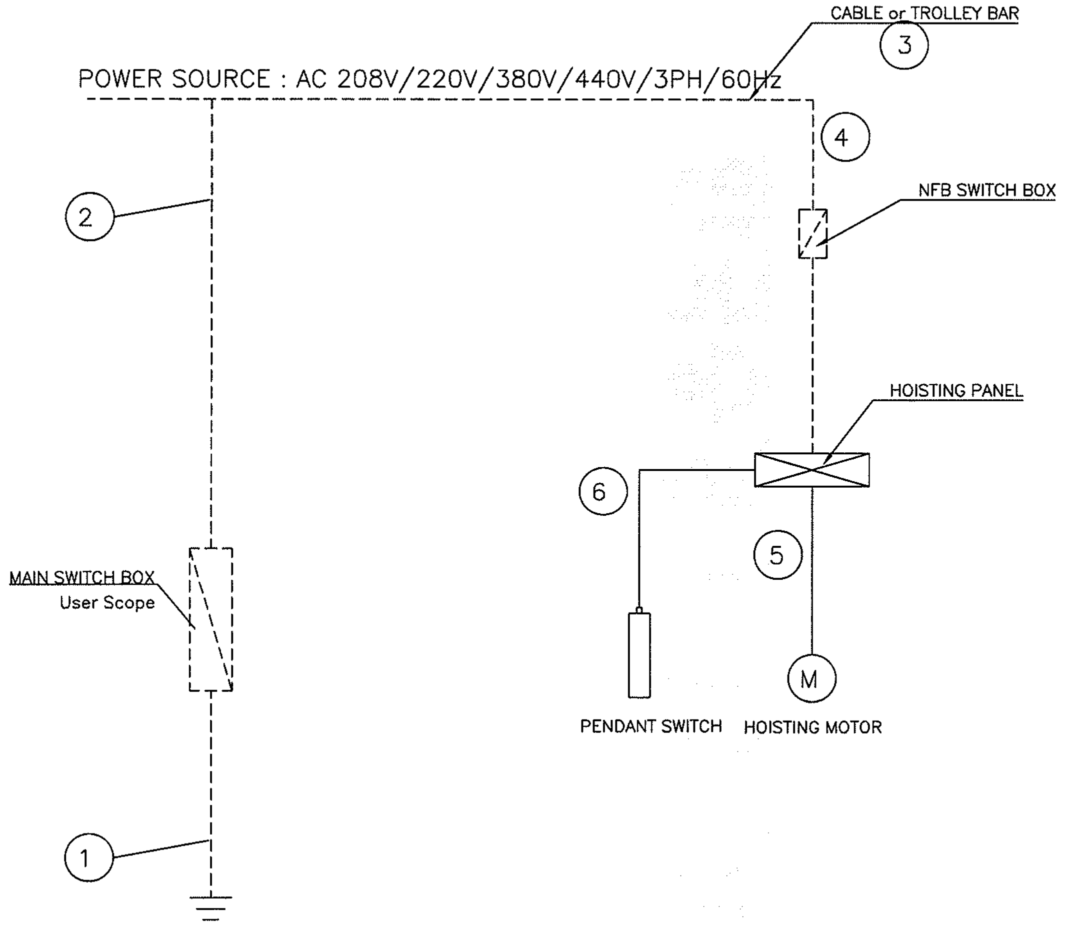
| REV. | QTY | CONTENTS | DATE | DRAWN | APPROVED |
|---|---|---|---|---|---|

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

KITO CORPORATION

| TITLE | 1.8t MOTORIZED-4점식 케이블 구성도 및 접지계통도 | | |
|---|---|---|---|
| MDL. | 942513 | SCALE | NOT |
| DWG. NO. | 3NNU942513 | REV. | 0 |

UNIT : mm




접지설비 시공방법

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

단,방폭지역은 전압관계없이 10 Ω이하일것

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## 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) |
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| 6 | Push Button Switch | VCT 1.25SQ x 8C | (G-1Core) |
| 7 | | | |
| 8 | | | |

서면심사
2014 .03. 31
한국승강기안전기술원

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

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

KITO CORPORATION

TITLE 1.8t MOTORIZED-2점식 케이블 구성도 및 접지계통도

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

# CABLE 구성도 및 사양 - 권상 용량 1.8kW

## CABLE SPECIFICATION FOR ER2M – 4점

| NO | ITEM | TYPE | ER2M018 |
|---|---|---|---|
| | | | SIZE |
| ① | Power Line | VCT | 2sq x 4C |
| ② | Push Button Switch | VCT | 1.25sq x 8C |
| ③ | Load Limit | VCT | 0.75sq x 8C |
| ④ | Power Line for ER | VCT | 1.25sq x 4C |
| ⑤ | Control Line for ER | VCT | 1.25sq x 6C |
| ⑥ | Traversing Motor With Earth | VCT | 1.25sq x 4C |

## CABLE SPECIFICATION FOR ER2M – 2점

| NO | ITEM | TYPE | ER2M018 |
|---|---|---|---|
| | | | SIZE |
| ① | Power Line | VCT | 2sq x 4C |
| ② | Push Button Switch | VCT | 1.25sq x 8C |
| ③ | Load Limit | VCT | 0.75sq x 8C |
| ④ | Power Line for ER | VCT | 1.25sq x 4C |
| ⑤ | Control Line for ER | VCT | 1.25sq x 6C |

(3Φ 220(208)V / 380V / 440V 60Hz)

# 허용 최대 SPAN 적용표 (I-BEAM, H-BEAM)

PROJECT NAME : KML-ER2-018
RATED LOAD : 1.8 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 cm | E kg/cm² | Φ | Ψ | Σσ1 | Σσ2 | Σσ3 | Σσ4 | δ1<L/800->O.K | | δ2<L1/500->O.K | | 결 과 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | TON/cm² | | | | δ1 | L/800 | δ2 | L1/500 | |
| I - BEAM | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 200x100x7/10t | 2170 | 138 | 217 | 27.7 | 33.06 | 26 | 0.16 | 0.083 | 0.034 | 320 | 130 | 30 | 13.2 | 2100000 | 1.11 | 1.1 | 0.927 | 1.215 | 0.505 | 0.816 | 0.301 | 0.400 | 0.1454 | 0.26 | O.K |
| 2 | 250x125x7.5/12.5t | 5180 | 337 | 414 | 53.9 | 48.79 | 38.3 | 0.16 | 0.192 | 0.069 | 500 | 180 | 30 | 13.2 | 2100000 | 1.11 | 1.1 | 0.804 | 0.962 | 0.553 | 0.630 | 0.498 | 0.625 | 0.2073 | 0.36 | O.K |
| 3 | 300x150x10/18.5t | 12700 | 886 | 849 | 118 | 83.47 | 65.5 | 0.16 | 0.491 | 0.183 | 750 | 280 | 30 | 13.2 | 2100000 | 1.11 | 1.1 | 0.638 | 0.802 | 0.472 | 0.515 | 0.747 | 0.938 | 0.4016 | 0.56 | O.K |
| 4 | 350x150x12/24t | 22400 | 1180 | 1280 | 158 | 111.1 | 87.2 | 0.16 | 0.82 | 0.296 | 940 | 340 | 30 | 13.2 | 2100000 | 1.11 | 1.1 | 0.582 | 0.686 | 0.516 | 0.504 | 0.910 | 1.175 | 0.4447 | 0.68 | O.K |
| 5 | 400x150x12.5/25t | 31700 | 1240 | 1580 | 165 | 122.1 | 95.8 | 0.16 | 1.054 | 0.383 | 1100 | 400 | 30 | 13.2 | 2100000 | 1.11 | 1.1 | 0.590 | 0.693 | 0.613 | 0.630 | 1.091 | 1.375 | 0.5431 | 0.80 | O.K |
| H - BEAM | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 300x150x6.5/9t | 7210 | 508 | 481 | 67.7 | 40.8 | 32 | 0.16 | 0.192 | 0.064 | 600 | 200 | 30 | 13.2 | 2100000 | 1.11 | 1.1 | 0.839 | 0.931 | 0.602 | 0.573 | 0.618 | 0.750 | 0.2162 | 0.40 | O.K |
| 7 | 350x175x7/11t | 13500 | 984 | 771 | 112 | 62.91 | 49.4 | 0.16 | 0.395 | 0.148 | 800 | 300 | 30 | 13.2 | 2100000 | 1.11 | 1.1 | 0.732 | 0.945 | 0.517 | 0.596 | 0.830 | 1.000 | 0.4712 | 0.60 | O.K |
| 8 | 400x200x8/13t | 23500 | 1740 | 1170 | 174 | 83.37 | 65.4 | 0.16 | 0.654 | 0.249 | 1000 | 380 | 30 | 13.2 | 2100000 | 1.11 | 1.1 | 0.640 | 0.827 | 0.464 | 0.536 | 1.000 | 1.250 | 0.6022 | 0.76 | O.K |
| 9 | 450x200x9/14t | 32900 | 1870 | 1460 | 187 | 95.43 | 74.9 | 0.16 | 0.824 | 0.315 | 1100 | 420 | 30 | 13.2 | 2100000 | 1.11 | 1.1 | 0.594 | 0.761 | 0.501 | 0.576 | 0.993 | 1.375 | 0.6031 | 0.84 | 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 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"

AREA CLASSIFICATION : IN DOOR or OUT DOOR

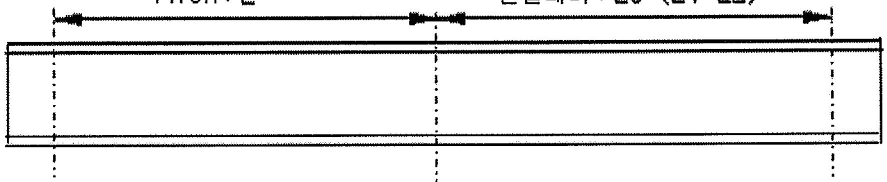
2014.03.31

# 1. I-BEAM 최대허용 가능 SPAN 계산

## 1. SPECIFICATION

| | | | | |
|---|---|---|---|---|
| .정격하중 | ------------------------------ | Q = | 1.8 | ton |
| .SPAN (PITCH) | ------------------------------ | L= | 320 | cm |
| .켄틸리버 | -------------------- | L1= | 130 | cm |
| .TROLLEY WHEEL BASE | -------------------- | B= | 13.2 | cm |
| .WEIGHT OF HOIST | -------------------- | Wh= | 0.16 | ton |
| .PITCH내의 GIRDER 무게 | -------------------- | Wg= | 0.083 | ton |
| .켄틸리버의 GIRDER 무게 | -------------------- | Wg1= | 0.034 | 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 = 1.8 + 0.16 = 1.96 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*1.96*(320-13.2/2)^2/(4*320)

= 183.6 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.96*(130-30) = 239.32 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.083*320 / 8 = 3.685 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.034*130 / 2 = 2.45 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 187.3 ton.cm

Mmax2 = Mh2 + Mt2 = 241.8 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) 0.25 m

PITCH내 풍하중 = F x L x H x q x 1.4 =1.11x3.2x0.25x19.9x1.4 = 25 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.3 =1.11x1.3x0.25x19.9x1.3 = 9 kg

$$M_{FGG} = \frac{0.025 \times 320}{8} - \frac{0.009 \times 130}{2} = 0.415 \text{ ton.cm}$$

$$M_{FG1} = \frac{0.009 \times 130}{2} = 0.585 \text{ ton.cm}$$

(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 320 / 4 = 1360 kg.cm = 1.36 ton.cm

*켄틀레버 풍하중

$M_{FH1}=$ 17 x 130 = 2210 kg.cm = 2.21 ton.cm



7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 0.415+1.36= 1.775 ton.cm

*켄틀레버

$M_{HC1}$= $M_{FG1}$ + $M_{FH1}$ = 0.585+2.21= 2.795 ton.cm

## 8. BENDING STRESS

### A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 187.3 / 217 = 0.863 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 241.8 / 217 = 1.114 ton/㎠

### B. 수평 최대 응력

1. PITCH 내

σv3= $M_{HCG}$/Zy= 1.775 / 27.7 = 0.064 ton/㎠

2. 켄틀레버

σv4= $M_{HC1}$/Zy= 2.795 / 27.7 = 0.101 ton/㎠

## 9. 합성 응력

Σσ1 = σv1+ σv3= 0.927

0.927 < 1.279 ton/cm$^2$ ☞ O.K

Σσ2 = σv2+σv4= 1.215

1.215 < 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 $^4\sqrt{h}$ = 67.5 x $^4\sqrt{30}$ = 158.0 kg/㎡

M= V² /30 = 67.5

***휴지시 풍하중에 의한 수평하중**

PITCH내 풍하중 = F x L x H x q x 1.4 =1.11x3.2x0.25x158x1.4 = 196 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.3 =1.11x1.3x0.25x158x1.3 = 74 kg

$$MM_{G1} = \frac{0.196 \times 320}{8} - \frac{0.074 \times 130}{2} = \quad 3.03 \text{ ton.cm}$$

$$MM_{1} = \frac{0.074 \times 130}{2} = \quad 4.81 \text{ ton.cm}$$

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

*PITCH내 $MM_{H0=}$ 137 x 320 / 4= 43840 KG.CM = 10.96 ton.cm

*켄틀레버 $MM_{H1=}$ 137 x 130 = 17810 KG.CM = 17.8 ton.cm

* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 3.03 + 10.96 = 13.99 ton.cm

$MM_4 = MM_1 + MM_{H1} =$ 4.81 + 17.8 = 22.61 ton.cm

* BENDING STRESS

$\Sigma\sigma 3 = MM_2 / Zy =$ 13.99 / 27.7 = 0.505 $ton/cm^2$ < 1.447 ton/cm^2--O.K

$\Sigma\sigma 4 = MM_4 / Zy =$ 22.61 / 27.7 = 0.816 $ton/cm^2$ < 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

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\,Ix} = 0.2936 \text{ cm}$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\, L^3}{384 \times E \times Ix} = 0.0078 \text{ cm}$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 0.301 cm

RATIO : D3/L = 1/ 1062 < 800 ------ O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\,Ix} = 0.1434 \text{ cm}$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\, L1^3}{8 \times E \times Ix} = 0.0020 \text{ cm}$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 0.1454 cm

RATIO : D3/L = 1/ 894 < 500 ------ O.K

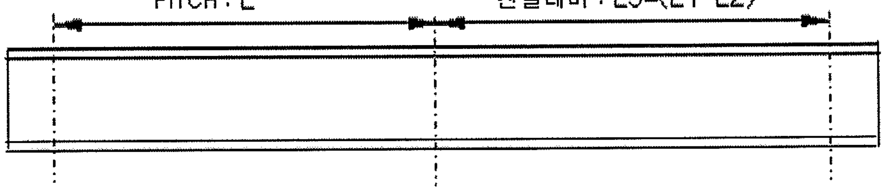
서면심사필
2014.03.31
한국승강기안전기술원

## 2. I-BEAM 최대허용 가능 SPAN 계산

### 1. SPECIFICATION

| | | | | |
|---|---|---|---|---|
| .정격하중 | ------------------------------ | Q = | 1.8 | ton |
| .SPAN (PITCH) | ------------------------------ | L= | 500 | cm |
| .켄틸리버 | -------------------- | L1= | 180 | cm |
| .TROLLEY WHEEL BASE | -------------------- | B= | 13.2 | cm |
| .WEIGHT OF HOIST | -------------------- | Wh= | 0.16 | ton |
| .PITCH내의 GIRDER 무게 | -------------------- | Wg= | 0.192 | ton |
| .켄틸리버의 GIRDER 무게 | -------------------- | Wg1= | 0.069 | 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 = 1.8 + 0.16 = 1.96 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*1.96*(500-13.2/2)^2/(4*500)

= 291.3 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.96*(180−30) = 358.97 ton.cm

4. 자중에 의한 BENDING MOMENT(I−BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.192*500 / 8 = 13.32 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.069*180 / 2 = 6.89 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 304.6 ton.cm

Mmax2 = Mh2 + Mt2 = 365.9 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) 0.25 m

PITCH내 풍하중 = F x L x H x q x 1.6 =1.11x5x0.25x19.9x1.6 = 44 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.3 =1.11x1.8x0.25x19.9x1.3 = 13 kg

$M_{FGG} = \dfrac{0.044 \times 500}{8} - \dfrac{0.013 \times 180}{2} =$ 1.58 ton.cm

$M_{FG1} = \dfrac{0.013 \times 180}{2} =$ 1.17 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 500 / 4 = 2125 kg.cm = 2.125 ton.cm

*켄틀레버 풍하중

$M_{FH1=}$ 17 x 180 = 3060 kg.cm = 3.06 ton.cm



7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 1.58+2.125= 3.705 ton.cm

*켄틀레버

$M_{HC1}$= $M_{FG1}$ + $M_{FH1}$ = 1.17+3.06= 4.230 ton.cm

8. BENDING STRESS

A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 304.6 / 414 = 0.736 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 365.9 / 414 = 0.884 ton/㎠

B. 수평 최대 응력

1. PITCH 내

σv3= $M_{HCG}$/Zy= 3.705 / 53.9 = 0.069 ton/㎠

2. 켄틀레버

σv4= $M_{HC1}$/Zy= 4.23 / 53.9 = 0.078 ton/㎠

9. 합성 응력

Σσ1 = σv1+ σv3= 0.804

0.804 < 1.279 $ton/cm^2$ ☞ O.K

Σσ2 = σv2+σv4= 0.962

0.962 < 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 =1.11x5x0.25x158x1.6 = 351 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.3 =1.11x1.8x0.25x158x1.3 = 103 kg

$$MM_{G1} = \frac{0.351x500}{8} - \frac{0.103 x 180}{2} =$$ 12.6675 ton.cm

$$MM_{1} = \frac{0.103 x 180}{2} =$$ 9.27 ton.cm

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

*PITCH내 $MM_{H0=}$ 137 x 500 / 4= 68500 KG.CM = 17.125 ton.cm

*켄틀레버 $MM_{H1=}$ 137 x 180 = 24660 KG.CM = 24.7 ton.cm

* COMBINED MOMENT

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$MM_2 = MM_{G1} + MM_{H0} =$ 12.6675 + 17.125 = 29.7925 ton.cm
$MM_4 = MM_1 + MM_{H1} =$ 9.27 + 24.7 = 33.97 ton.cm

* BENDING STRESS

$\Sigma\sigma 3 = MM_2 / Zy =$ 29.7925 / 53.9 = 0.553 ton/$cm^2$ < 1.447 ton/cm^2--O.K
$\Sigma\sigma 4 = MM_4 / Zy =$ 33.97 / 53.9 = 0.630 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

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\ Ix} = 0.4692\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\ L^3}{384 \times E \times Ix} = 0.0287\ cm$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 0.498 cm

RATIO : D3/L = 1/ 1004 < 800 ------ O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\ Ix} = 0.2027\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\ L1^3}{8 \times E \times Ix} = 0.0046\ cm$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 0.2073 cm

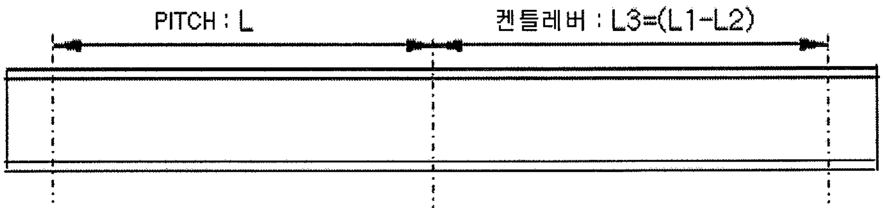
RATIO : D3/L = 1/ 868 < 500 ------ O.K

# 3. I-BEAM 최대허용 가능 SPAN 계산

## 1. SPECIFICATION

| | | | | |
|---|---|---|---|---|
| .정격하중 | ---------------------------------- | Q = | 1.8 | ton |
| .SPAN (PITCH) | ---------------------------------- | L= | 750 | cm |
| .켄틸리버 | ----------------------- | L1= | 280 | cm |
| .TROLLEY WHEEL BASE | ----------------------- | B= | 13.2 | cm |
| .WEIGHT OF HOIST | ----------------------- | Wh= | 0.16 | ton |
| .PITCH내의 GIRDER 무게 | ----------------------- | Wg= | 0.491 | ton |
| .켄틸리버의 GIRDER 무게 | ----------------------- | Wg1= | 0.183 | ton |
| .I-BEAM SIZE | ----------------------- | 300x150x10/18.5t | | |
| | | Ix = | 12700 | $cm^4$ |
| | | Iy = | 886 | $cm^4$ |
| | | Zx = | 849 | $cm^3$ |
| | | Zy = | 118 | $cm^3$ |
| | | A = | 83.47 | $cm^2$ |
| | | Wb = | 65.5 | 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 = 1.8 + 0.16 = 1.96 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*1.96*(750-13.2/2)^2/(4*750)

= 440.9 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.96*(280-30) = 598.29 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.491*750 / 8 = 51.095 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.183*280 / 2 = 28.44 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 491.9 ton.cm

Mmax2 = Mh2 + Mt2 = 626.7 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 =1.11x7.5x0.25x19.9x1.7 = 70 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.3 =1.11x2.8x0.25x19.9x1.3 = 20 kg

$M_{FGG} = \dfrac{0.07 \times 750}{8} - \dfrac{0.02 \times 280}{2} =$ 3.763 ton.cm

$M_{FG1} = \dfrac{0.02 \times 280}{2} =$ 2.8 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 750 / 4 = 3187.5 kg.cm = 3.1875 ton.cm

*켄틀레버 풍하중

$M_{FH1} =$ 17 x 280 = 4760 kg.cm = 4.76 ton.cm



7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 3.763+3.1875= 6.951 ton.cm

*켄틀레버

$M_{HC1}$= $M_{FG1}$ + $M_{FH1}$ = 2.8+4.76= 7.560 ton.cm

## 8. BENDING STRESS

### A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 491.9 / 849 = 0.579 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 626.7 / 849 = 0.738 ton/㎠

### B. 수평 최대 응력

1. PITCH 내

σv3= $M_{HCG}$/Zy= 6.9505 / 118 = 0.059 ton/㎠

2. 켄틀레버

σv4= $M_{HC1}$/Zy= 7.56 / 118 = 0.064 ton/㎠

## 9. 합성 응력

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Σσ1 = | σv1+ σv3= | 0.638 | | | | | |
| | | 0.638 | < | 1.279 | ton/$cm^2$ | ☞ | O.K |
| Σσ2 = | σv2+σv4= | 0.802 | | | | | |
| | | 0.802 | < | 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 =1.11x7.5x0.25x158x1.7 = 559 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.3 =1.11x2.8x0.25x158x1.3 = 160 kg

$$MM_{G1} = \frac{0.559x750}{8} - \frac{0.16 x 280}{2} = 30.00625 \text{ ton.cm}$$

$$MM_{1} = \frac{0.16 x 280}{2} = 22.4 \text{ ton.cm}$$

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

*PITCH내 $MM_{H0}$= 137 x 750 / 4= 102750 KG.CM = 25.6875 ton.cm

*켄틀레버 $MM_{H1}$= 137 x 280 = 38360 KG.CM = 38.4 ton.cm



* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 30.00625 + 25.6875 = 55.69375 ton.cm

$MM_4 = MM_1 + MM_{H1} =$ 22.4 + 38.4 = 60.80 ton.cm

* BENDING STRESS

$\Sigma\sigma 3 = MM_2 / Zy =$ 55.69375 / 118 = 0.472 $ton/cm^2$ < 1.447 ton/cm^2--O.K

$\Sigma\sigma 4 = MM_4 / Zy =$ 60.8 / 118 = 0.515 $ton/cm^2$ < 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

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\ Ix} = 0.6459\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\ L^3}{384 \times E \times Ix} = 0.1011\ cm$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 0.747 cm

RATIO : D3/L = 1/ 1004 < 800 ------ O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\ Ix} = 0.3828\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\ L1^3}{8 \times E \times Ix} = 0.0188\ cm$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 0.4016 cm

RATIO : D3/L = 1/ 697 < 500 ------ O.K

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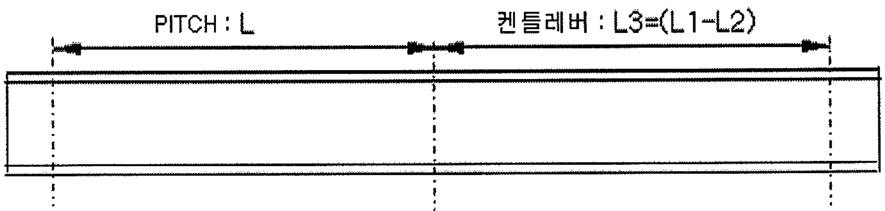
2014.03.31
한국승강기안전기술원

# 4. I-BEAM 최대허용 가능 SPAN 계산

## 1. SPECIFICATION

| | | | |
|---|---|---|---|
| .정격하중 | Q = | 1.8 | ton |
| .SPAN (PITCH) | L= | 940 | cm |
| .켄틸리버 | L1= | 340 | cm |
| .TROLLEY WHEEL BASE | B= | 13.2 | cm |
| .WEIGHT OF HOIST | Wh= | 0.16 | ton |
| .PITCH내의 GIRDER 무게 | Wg= | 0.82 | ton |
| .켄틸리버의 GIRDER 무게 | Wg1= | 0.296 | ton |
| .I-BEAM SIZE | 350x150x12/24t | | |
| | Ix = | 22400 | $cm^4$ |
| | Iy = | 1180 | $cm^4$ |
| | Zx = | 1280 | $cm^3$ |
| | Zy = | 158 | $cm^3$ |
| | A = | 111.1 | $cm^2$ |
| | Wb = | 87.2 | 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

$P = Q + Wh = 1.8 + 0.16 = 1.96$ ton

## 3. 수직하중에 의한 BENDING MOMENT

1) PITCH 지점내 BENDING MOMENT

$Mh1 = F \times M \times P \times (L-B/2)^2 / (4 \times L)$

$= 1.11*1.1*1.96*(940-13.2/2)^2/(4*940)$

= 554.5 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.96*(340-30) = 741.88 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.82*940 / 8 = 106.949 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.296*340 / 2 = 55.86 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 661.5 ton.cm

Mmax2 = Mh2 + Mt2 = 797.7 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 =1.11x9.4x0.25x19.9x1.7 = 88 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.3 =1.11x3.4x0.25x19.9x1.3 = 24 kg

$$M_{FGG} = \frac{0.088 \times 940}{8} - \frac{0.024 \times 340}{2} = 6.26 \text{ ton.cm}$$

$$M_{FG1} = \frac{0.024 \times 340}{2} = 4.08 \text{ ton.cm}$$

(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 940 / 4 = 3995 kg.cm = 3.995 ton.cm

*켄틀레버 풍하중

$M_{FH1}=$ 17 x 340 = 5780 kg.cm = 5.78 ton.cm



7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 6.26+3.995= 10.255 ton.cm

*켄틀레버

$M_{HC1}$= $M_{FG1}$ + $M_{FH1}$ = 4.08+5.78= 9.860 ton.cm

## 8. BENDING STRESS

### A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 661.5 / 1280 = 0.517 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 797.7 / 1280 = 0.623 ton/㎠

### B. 수평 최대 응력

1. PITCH 내

σv3= $M_{HCG}$/Zy= 10.255 / 158 = 0.065 ton/㎠

2. 켄틀레버

σv4= $M_{HC1}$/Zy= 9.86 / 158 = 0.062 ton/㎠

## 9. 합성 응력

Σσ1 = σv1+ σv3= 0.582

0.582 < 1.279 ton/$cm^2$ ☞ O.K

Σσ2 = σv2+σv4= 0.686

0.686 < 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 =1.11x9.4x0.25x158x1.7 = 701 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.3 =1.11x3.4x0.25x158x1.3 = 194 kg

$$MM_{G1} = \frac{0.701 \times 940}{8} - \frac{0.194 \times 340}{2} = 49.3875 \text{ ton.cm}$$

$$MM_{1} = \frac{0.194 \times 340}{2} = 32.98 \text{ ton.cm}$$

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

*PITCH내 $MM_{H0}$= 137 x 940 / 4= 128780 KG.CM = 32.195 ton.cm

*켄틀레버 $MM_{H1}$= 137 x 340 = 46580 KG.CM = 46.6 ton.cm

* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 49.3875 + 32.195 = 81.5825 ton.cm

$MM_4 = MM_1 + MM_{H1} =$ 32.98 + 46.6 = 79.58 ton.cm

* BENDING STRESS

$\Sigma\sigma3 = MM_2 / Zy =$ 81.5825 / 158 = 0.516 $ton/cm^2$ < 1.447 ton/cm^2--O.K

$\Sigma\sigma4 = MM_4 / Zy =$ 79.58 / 158 = 0.504 $ton/cm^2$ < 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

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\ Ix} = 0.7210\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wg x\ L^3}{384 \times E \times Ix} = 0.1885\ cm$$

3) TOTAL DEFLECTION

$.\delta1 = D1 + D2 =$ 0.910 cm

RATIO : D3/L = 1/ 1034 < 800 ------- O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\ Ix} = 0.4138\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\ L1^3}{8 \times E \times Ix} = 0.0309\ cm$$

3) TOTAL DEFLECTION

$.\delta2 = D1 + D2 =$ 0.4447 cm

RATIO : D3/L = 1/ 765 < 500 ------- O.K

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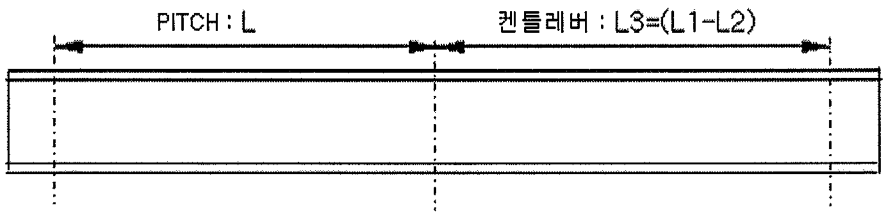
# 5. I-BEAM 최대허용 가능 SPAN 계산

## 1. SPECIFICATION

| | | | | |
|---|---|---|---|---|
| .정격하중 | ------------------------------ | Q = | 1.8 | ton |
| .SPAN (PITCH) | ------------------------------ | L= | 1100 | cm |
| .켄틸리버 | -------------------- | L1= | 400 | cm |
| .TROLLEY WHEEL BASE | -------------------- | B= | 13.2 | cm |
| .WEIGHT OF HOIST | -------------------- | Wh= | 0.16 | ton |
| .PITCH내의 GIRDER 무게 | -------------------- | Wg= | 1.054 | ton |
| .켄틸리버의 GIRDER 무게 | -------------------- | Wg1= | 0.383 | ton |
| .I-BEAM SIZE | -------------------- | 400x150x12.5/25t | | |
| | | Ix = | 31700 | $cm^4$ |
| | | Iy = | 1240 | $cm^4$ |
| | | Zx = | 1580 | $cm^3$ |
| | | Zy = | 165 | $cm^3$ |
| | | A = | 122.1 | $cm^2$ |
| | | Wb = | 95.8 | 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 = 1.8 + 0.16 = 1.96 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*1.96*(1100-13.2/2)^2/(4*1100)

= 650.3 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.96*(400-30) = 885.47 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*1.054*1100 / 8 = 160.867 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.383*400 / 2 = 85.03 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 811.1 ton.cm

Mmax2 = Mh2 + Mt2 = 970.5 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 =1.11x11x0.25x19.9x1.7 = 103 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.4 =1.11x4x0.25x19.9x1.4 = 31 kg

$$M_{FGG} = \frac{0.103 \times 1100}{8} - \frac{0.031 \times 400}{2} = 7.963 \text{ ton.cm}$$

$$M_{FG1} = \frac{0.031 \times 400}{2} = 6.2 \text{ ton.cm}$$

(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 1100 / 4 = 4675 kg.cm = 4.675 ton.cm

*켄틀레버 풍하중

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



7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 7.963+4.675= 12.638 ton.cm

*켄틀레버

$M_{HC1}$ = $M_{FG1}$ + $M_{FH1}$ = 6.2+6.8= 13.000 ton.cm

## 8. BENDING STRESS

### A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 811.1 / 1580 = 0.513 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 970.5 / 1580 = 0.614 ton/㎠

### B. 수평 최대 응력

1. PITCH 내

σv3= $M_{HCG}$/Zy= 12.638 / 165 = 0.077 ton/㎠

2. 켄틀레버

σv4= $M_{HC1}$/Zy= 13 / 165 = 0.079 ton/㎠

## 9. 합성 응력

Σσ1 = σv1+ σv3= 0.590

0.590 < 1.279 ton/cm$^2$ ☞ O.K

Σσ2 = σv2+σv4= 0.693

0.693 < 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 =1.11x11x0.25x158x1.7 = 820 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.4 =1.11x4x0.25x158x1.4 = 246 kg

$$MM_{G1} = \frac{0.82 \times 1100}{8} - \frac{0.246 \times 400}{2} = 63.55 \text{ ton.cm}$$

$$MM_{1} = \frac{0.246 \times 400}{2} = 49.2 \text{ ton.cm}$$

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

*PITCH내 $MM_{H0=}$ 137 x 1100 / 4= 150700 KG.CM = 37.675 ton.cm

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



* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 63.55 + 37.675 = 101.225 ton.cm

$MM_4 = MM_1 + MM_{H1} =$ 49.2 + 54.8 = 104.00 ton.cm

* BENDING STRESS

| | | | | |
|---|---|---|---|---|
| $\Sigma\sigma 3 = MM_2 / Zy =$ | 101.225 / 165 = | 0.613 $ton/cm^2$ | < 1.447 | ton/cm^2--O.K |
| $\Sigma\sigma 4 = MM_4 / Zy =$ | 104 / 165 = | 0.630 $ton/cm^2$ | < 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

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\,Ix} = \quad 0.8164 \text{ cm}$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\,L^3}{384 \times E \times Ix} = \quad 0.2744 \text{ cm}$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 1.091 cm

RATIO : D3/L = 1/ 1008 < 800 ------ O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\,Ix} = \quad 0.4971 \text{ cm}$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\,L1^3}{8 \times E \times Ix} = \quad 0.0460 \text{ cm}$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 0.5431 cm

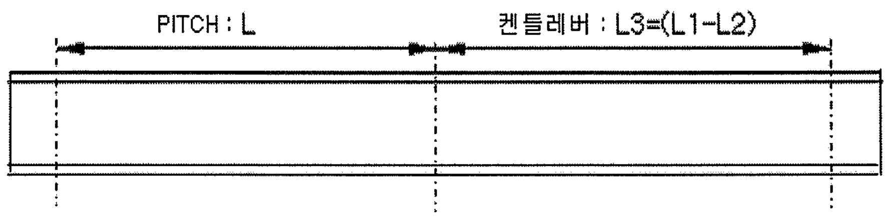
RATIO : D3/L = 1/ 737 < 500 ------ O.K

# 6. H-BEAM 최대허용 가능 SPAN 계산

## 1. SPECIFICATION

| | | | | |
|---|---|---|---|---|
| .정격하중 | ------------------------------ | Q = | 1.8 | ton |
| .SPAN (PITCH) | ------------------------------ | L= | 600 | cm |
| .켄틸리버 | -------------------- | L1= | 200 | cm |
| .TROLLEY WHEEL BASE | -------------------- | B= | 13.2 | cm |
| .WEIGHT OF HOIST | -------------------- | Wh= | 0.16 | ton |
| .PITCH내의 GIRDER 무게 | -------------------- | Wg= | 0.192 | ton |
| .켄틸리버의 GIRDER 무게 | -------------------- | Wg1= | 0.064 | 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 = 1.8 + 0.16 = 1.96 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*1.96*(600-13.2/2)^2/(4*600)

= 351.1 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.96*(200-30) = 406.84 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.192*600 / 8 = 15.984 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.064*200 / 2 = 7.1 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 367.1 ton.cm

Mmax2 = Mh2 + Mt2 = 413.9 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) 0.25 m

PITCH내 풍하중 = F x L x H x q x 1.6 =1.11x6x0.25x19.9x1.6 = 53 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.3 =1.11x2x0.25x19.9x1.3 = 14 kg

$$M_{FGG} = \frac{0.053 \times 600}{8} - \frac{0.014 \times 200}{2} = 2.575 \text{ ton.cm}$$

$$M_{FG1} = \frac{0.014 \times 200}{2} = 1.4 \text{ ton.cm}$$

(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 600 / 4 = 2550 kg.cm = 2.55 ton.cm

*켄틀레버 풍하중

$M_{FH1=}$ 17 x 200 = 3400 kg.cm = 3.4 ton.cm

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7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG}$ = 2.575+2.55= 5.125 ton.cm

*켄틀레버

$M_{HC1}$= $M_{FG1}$ + $M_{FH1}$ = 1.4+3.4= 4.800 ton.cm

## 8. BENDING STRESS

### A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 367.1 / 481 = 0.763 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 413.9 / 481 = 0.860 ton/㎠

### B. 수평 최대 응력

1. PITCH 내

σv3= $M_{HCG}$/Zy= 5.125 / 67.7 = 0.076 ton/㎠

2. 켄틀레버

σv4= $M_{HC1}$/Zy= 4.8 / 67.7 = 0.071 ton/㎠

## 9. 합성 응력

Σσ1 = σv1+ σv3= 0.839

0.839 < 1.279 ton/$cm^2$ ☞ O.K

Σσ2 = σv2+σv4= 0.931

0.931 < 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 =1.11x6x0.25x158x1.6 = 421 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.3 =1.11x2x0.25x158x1.3 = 114 kg

$$MM_{G1} = \frac{0.421 \times 600}{8} - \frac{0.114 \times 200}{2} = 20.175 \text{ ton.cm}$$

$$MM_{1} = \frac{0.114 \times 200}{2} = 11.4 \text{ ton.cm}$$

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

*PITCH내 $MM_{H0}$= 137 x 600 / 4= 82200 KG.CM = 20.55 ton.cm

*켄틀레버 $MM_{H1}$= 137 x 200 = 27400 KG.CM = 27.4 ton.cm



### * COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 20.175 + 20.55 = 40.725 ton.cm

$MM_4 = MM_1 + MM_{H1} =$ 11.4 + 27.4 = 38.80 ton.cm

* BENDING STRESS

$\Sigma\sigma 3 = MM_2 / Zy =$ 40.725 / 67.7 = 0.602 $ton/cm^2$ < 1.447 ton/cm^2--O.K

$\Sigma\sigma 4 = MM_4 / Zy =$ 38.8 / 67.7 = 0.573 $ton/cm^2$ < 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

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\ Ix} = 0.5825\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\ L^3}{384 \times E \times Ix} = 0.0357\ cm$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 0.618 cm

RATIO : D3/L = 1/ 971 < 800 ------ O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\ Ix} = 0.2120\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\ L1^3}{8 \times E \times Ix} = 0.0042\ cm$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 0.2162 cm

RATIO : D3/L = 1/ 925 < 500 ------ O.K

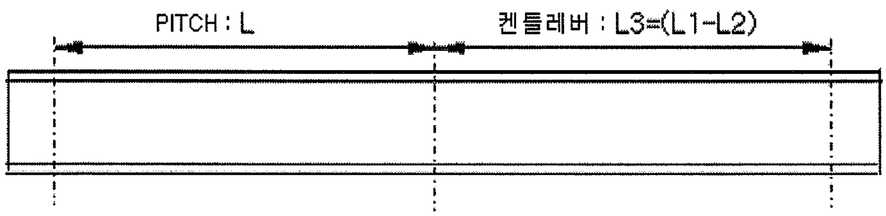
# 7. H-BEAM 최대허용 가능 SPAN 계산

## 1. SPECIFICATION

| | | | | |
|---|---|---|---|---|
| .정격하중 | ------------------------------ | Q = | 1.8 | ton |
| .SPAN (PITCH) | ------------------------------ | L= | 800 | cm |
| .켄틸리버 | -------------------- | L1= | 300 | cm |
| .TROLLEY WHEEL BASE | -------------------- | B= | 13.2 | cm |
| .WEIGHT OF HOIST | -------------------- | Wh= | 0.16 | ton |
| .PITCH내의 GIRDER 무게 | -------------------- | Wg= | 0.395 | ton |
| .켄틸리버의 GIRDER 무게 | -------------------- | Wg1= | 0.148 | 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 = 1.8 + 0.16 = 1.96 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*1.96*(800-13.2/2)^2/(4*800)

= 470.8 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.96*(300−30) = 646.15 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.395*800 / 8 = 43.845 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.148*300 / 2 = 24.64 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 514.6 ton.cm

Mmax2 = Mh2 + Mt2 = 670.8 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) 0.25 m

PITCH내 풍하중 = F x L x H x q x 1.6 =1.11x8x0.25x19.9x1.6 = 71 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.3 =1.11x3x0.25x19.9x1.3 = 22 kg

$$M_{FGG} = \frac{0.071 \times 800}{8} - \frac{0.022 \times 300}{2} = 3.8 \text{ ton.cm}$$

$$M_{FG1} = \frac{0.022 \times 300}{2} = 3.3 \text{ ton.cm}$$

(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 800 / 4 = 3400 kg.cm = 3.4 ton.cm

*켄틀레버 풍하중

$M_{FH1}=$ 17 x 300 = 5100 kg.cm = 5.1 ton.cm



7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 3.8+3.4= 7.200 ton.cm

*켄틀레버

$M_{HC1}$= $M_{FG1}$ + $M_{FH1}$ = 3.3+5.1= 8.400 ton.cm

## 8. BENDING STRESS

### A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 514.6 / 771 = 0.667 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 670.8 / 771 = 0.870 ton/㎠

### B. 수평 최대 응력

1. PITCH 내

σv3= $M_{HCG}$/Zy= 7.2 / 112 = 0.064 ton/㎠

2. 켄틀레버

σv4= $M_{HC1}$/Zy= 8.4 / 112 = 0.075 ton/㎠

## 9. 합성 응력

Σσ1 = σv1+ σv3= 0.732

0.732 < 1.279 $ton/cm^2$ ☞ O.K

Σσ2 = σv2+σv4= 0.945

0.945 < 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 =1.11x8x0.25x158x1.6 = 561 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.3 =1.11x3x0.25x158x1.3 = 171 kg

$$MM_{G1} = \frac{0.561x800}{8} - \frac{0.171 \times 300}{2} =$$ 30.45 ton.cm

$$MM_1 = \frac{0.171 \times 300}{2} =$$ 25.65 ton.cm

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

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

*켄틀레버 $MM_{H1}$= 137 x 300 = 41100 KG.CM = 41.1 ton.cm



* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 30.45 + 27.4 = 57.85 ton.cm

$MM_4 = MM_1 + MM_{H1} =$ 25.65 + 41.1 = 66.75 ton.cm

* BENDING STRESS

| | | | | |
|---|---|---|---|---|
| $\Sigma\sigma 3 = MM_2 / Zy =$ | 57.85 / 112 = | 0.517 $ton/cm^2$ | < 1.447 | ton/cm^2--O.K |
| $\Sigma\sigma 4 = MM_4 / Zy =$ | 66.75 / 112 = | 0.596 $ton/cm^2$ | < 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

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\,Ix} = 0.7374 \text{ cm}$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\, L^3}{384 \times E \times Ix} = 0.0929 \text{ cm}$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 0.830 cm

RATIO : D3/L = 1/ 964 < 800 ------- O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\,Ix} = 0.4536 \text{ cm}$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\, L1^3}{8 \times E \times Ix} = 0.0176 \text{ cm}$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 0.4712 cm

RATIO : D3/L = 1/ 637 < 500 ------- O.K

# 8. H-BEAM 최대허용 가능 SPAN 계산

## 1. SPECIFICATION

| | | | | |
|---|---|---|---|---|
| .정격하중 | Q = | 1.8 | ton |
| .SPAN (PITCH) | L= | 1000 | cm |
| .켄틸리버 | L1= | 380 | cm |
| .TROLLEY WHEEL BASE | B= | 13.2 | cm |
| .WEIGHT OF HOIST | Wh= | 0.16 | ton |
| .PITCH내의 GIRDER 무게 | Wg= | 0.654 | ton |
| .켄틸리버의 GIRDER 무게 | Wg1= | 0.249 | 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 = 1.8 + 0.16 = 1.96 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*1.96*(1000-13.2/2)^2/(4*1000)

= 590.4 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.96*(380-30) = 837.61 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.654*1000 / 8 = 90.743 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.249*380 / 2 = 52.51 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 681.2 ton.cm

Mmax2 = Mh2 + Mt2 = 890.1 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 1.6 =1.11x10x0.25x19.9x1.6 = 88 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.3 =1.11x3.8x0.25x19.9x1.3 = 27 kg

$$M_{FGG} = \frac{0.088 \times 1000}{8} - \frac{0.027 \times 380}{2} = 5.87 \text{ ton.cm}$$

$$M_{FG1} = \frac{0.027 \times 380}{2} = 5.13 \text{ ton.cm}$$

(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 1000 / 4 = 4250 kg.cm = 4.25 ton.cm

*켄틀레버 풍하중

$M_{FH1}=$ 17 x 380 = 6460 kg.cm = 6.46 ton.cm

7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 5.87+4.25= 10.120 ton.cm

*켄틀레버

$M_{HC1}$= $M_{FG1}$ + $M_{FH1}$ = 5.13+6.46= 11.590 ton.cm

8. BENDING STRESS

A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 681.2 / 1170 = 0.582 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 890.1 / 1170 = 0.761 ton/㎠

B. 수평 최대 응력

1. PITCH 내

σv3= $M_{HCG}$/Zy= 10.12 / 174 = 0.058 ton/㎠

2. 켄틀레버

σv4= $M_{HC1}$/Zy= 11.59 / 174 = 0.067 ton/㎠

9. 합성 응력

Σσ1 = σv1+ σv3= 0.640

0.640 < 1.279 ton/cm$^2$ ☞ O.K

Σσ2 = σv2+σv4= 0.827

0.827 < 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 $^4\sqrt{h}$ = 67.5 x $^4\sqrt{30}$ = 158.0 kg/㎡

M= V² /30 = 67.5

*휴지시 풍하중에 의한 수평하중

PITCH내 풍하중 = F x L x H x q x 1.6 =1.11x10x0.25x158x1.6 = 702 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.3 =1.11x3.8x0.25x158x1.3 = 217 kg

$$MM_{G1} = \frac{0.702x1000}{8} - \frac{0.217 x 380}{2} = 46.52 \text{ ton.cm}$$

$$MM_{1} = \frac{0.217 x 380}{2} = 41.23 \text{ ton.cm}$$

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

*PITCH내 $MM_{H0=}$ 137 x 1000 / 4= 137000 KG.CM = 34.25 ton.cm

*켄틀레버 $MM_{H1=}$ 137 x 380 = 52060 KG.CM = 52.[illegible] ton.cm



* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 46.52 + 34.25 = 80.77 ton.cm

$MM_4 = MM_1 + MM_{H1} =$ 41.23 + 52.1 = 93.33 ton.cm

* BENDING STRESS

| | | | | |
|---|---|---|---|---|
| $\Sigma\sigma 3 = MM_2 / Zy =$ | 80.77 / 174 = | 0.464 $ton/cm^2$ | < 1.447 | ton/cm^2--O.K |
| $\Sigma\sigma 4 = MM_4 / Zy =$ | 93.33 / 174 = | 0.536 $ton/cm^2$ | < 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

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\ Ix} = 0.8274\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\ L^3}{384 \times E \times Ix} = 0.1726\ cm$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 1.000 cm

RATIO : D3/L = 1/ 1000 < 800 ------ O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\ Ix} = 0.5676\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\ L1^3}{8 \times E \times Ix} = 0.0346\ cm$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 0.6022 cm

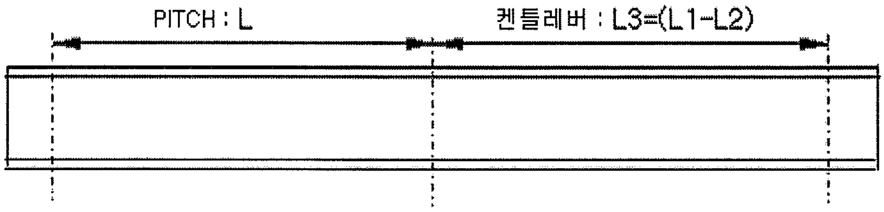
RATIO : D3/L = 1/ 631 < 500 ------ O.K

# 9. H-BEAM 최대허용 가능 SPAN 계산

## 1. SPECIFICATION

| | | | | |
|---|---|---|---|---|
| .정격하중 | ------------------------------ | Q = | 1.8 | ton |
| .SPAN (PITCH) | ------------------------------ | L= | 1100 | cm |
| .켄틸리버 | -------------------- | L1= | 420 | cm |
| .TROLLEY WHEEL BASE | -------------------- | B= | 13.2 | cm |
| .WEIGHT OF HOIST | -------------------- | Wh= | 0.16 | ton |
| .PITCH내의 GIRDER 무게 | -------------------- | Wg= | 0.824 | ton |
| .켄틸리버의 GIRDER 무게 | -------------------- | Wg1= | 0.315 | 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 = 1.8 + 0.16 = 1.96 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*1.96*(1100-13.2/2)^2/(4*1100)

= 650.3 ton.cm

2) 캔틸리버 BENDING MOMENT

Mh2 = F x M x P x L3

= 1.11*1.1*1.96*(420-30) = 933.33 ton.cm

4. 자중에 의한 BENDING MOMENT(I-BEAM)

1) PITCH 지점내 BENDING MOMENT

Mt1 = F x Wg x L / 8 =1.11*0.824*1100 / 8 = 125.763 ton.cm

2) 캔틸리버 BENDING MOMENT

Mt2 = F x Wg1 x L1 / 2 =1.11*0.315*420 / 2 = 73.43 ton.cm

5. 수직하중에 의한 최대 BENDING MOMENT

Mmax1 = Mh1 + Mt1 = 776 ton.cm

Mmax2 = Mh2 + Mt2 = 1006.8 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) 0.25 m

PITCH내 풍하중 = F x L x H x q x 1.6 =1.11x11x0.25x19.9x1.6 = 97 kg

켄틀레버 풍하중 = F x L1 x H x q x 1.3 =1.11x4.2x0.25x19.9x1.3 = 30 kg

$$M_{FGG} = \frac{0.097 \times 1100}{8} - \frac{0.03 \times 420}{2} = 7.038 \text{ ton.cm}$$

$$M_{FG1} = \frac{0.03 \times 420}{2} = 6.3 \text{ ton.cm}$$

(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 1100 / 4 = 4675 kg.cm = 4.675 ton.cm

*켄틀레버 풍하중

$M_{FH1=}$ 17 x 420 = 7140 kg.cm = 7.14 ton.cm



7. COMBINED MOMENT

*PITCH내

$M_{HCG} = M_{FGG} + M_{FHG} =$ 7.038+4.675= 11.713 ton.cm

*켄틀레버

$M_{HC1}$= $M_{FG1}$ + $M_{FH1}$ = 6.3+7.14= 13.440 ton.cm

## 8. BENDING STRESS

### A. VERTICAL BENDING STRESS

1. PITCH 내

σv1= Mmax1/Zx= 776 / 1460 = 0.532 ton/㎠

2. 켄틀레버

σv2= Mmax2/Zx= 1006.8 / 1460 = 0.690 ton/㎠

### B. 수평 최대 응력

1. PITCH 내

σv3= $M_{HCG}$/Zy= 11.713 / 187 = 0.063 ton/㎠

2. 켄틀레버

σv4= $M_{HC1}$/Zy= 13.44 / 187 = 0.072 ton/㎠

## 9. 합성 응력

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Σσ1 = | σv1+ σv3= | 0.594 | | | | | |
| | | 0.594 | < | 1.279 | $ton/cm^2$ | ☞ | O.K |
| Σσ2 = | σv2+σv4= | 0.761 | | | | | |
| | | 0.761 | < | 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 1.6 =1.11x11x0.25x158x1.6 = 772 kg

켄틀레버에대한 풍하중 = FxL1xHxqx1.3 =1.11x4.2x0.25x158x1.3 = 239 kg

$$MM_{G1} = \frac{0.772 \times 1100}{8} - \frac{0.239 \times 420}{2} = 55.96 \text{ ton.cm}$$

$$MM_{1} = \frac{0.239 \times 420}{2} = 50.19 \text{ ton.cm}$$

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

*PITCH내 $MM_{H0=}$ 137 x 1100 / 4= 150700 KG.CM = [illegible] ton.cm

*켄틀레버 $MM_{H1=}$ 137 x 420 = 57540 KG.CM = [illegible] ton.cm

* COMBINED MOMENT

$MM_2 = MM_{G1} + MM_{H0} =$ 55.96 + 37.675 = 93.635 ton.cm

$MM_4 = MM_1 + MM_{H1} =$ 50.19 + 57.5 = 107.69 ton.cm

* BENDING STRESS

| | | | | |
|---|---|---|---|---|
| $\Sigma\sigma 3 = MM_2 / Zy =$ | 93.635 / 187 = | 0.501 $ton/cm^2$ | < 1.447 | ton/cm^2--O.K |
| $\Sigma\sigma 4 = MM_4 / Zy =$ | 107.69 / 187 = | 0.576 $ton/cm^2$ | < 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

$$.D1 = \frac{(Q+Q2)x(L)^3}{48xEx\ Ix} = 0.7866\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{5 \times Wgx\ L^3}{384 \times E \times Ix} = 0.2067\ cm$$

3) TOTAL DEFLECTION

$.\delta 1 = D1 + D2 =$ 0.993 cm

RATIO : D3/L = 1/ 1107 < 800 ------- O.K

* 켄틀레버

1) DUE TO RATED & TROLLEY LOAD

$$.D1 = \frac{(Q+Q2)x(L1-L2)^3}{3xEx\ Ix} = 0.5609\ cm$$

2) DUE TO DEAD LOAD

$$.D2 = \frac{Wg1x\ L1^3}{8 \times E \times Ix} = 0.0422\ cm$$

3) TOTAL DEFLECTION

$.\delta 2 = D1 + D2 =$ 0.6031 cm

RATIO : D3/L = 1/ 696 < 500 ------ O.K

# SUSPENSION MONORAIL 볼트 및 용접강도계산

## 1.볼트로 고정시의 강도계산

* 허용 최대 SPAN 및 하중은 최악의 조건으로 계산한다.
(허용 최대 스판 11 M, 400x150x12.5/25t, HOIST자중 : 160 KG)

| | |
|---|---|
| .Q = RATED LOAD= | 1800 KG |
| .Q1=HOIST SELF WEIGHT= | 160 KG |
| .Q2=I-BEAM WEIGHT = | 1054 KG |

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

| | | |
|---|---|---|
| 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 |
| M20 일때 do= | 1.7294 CM | n= 5.1 |

. n = 유효산수(산수*80? 너트1종너트사용

P = 1.14*(Q+Q1) + 1.1* Q2/2
= 1.14*(1800+160) + 1.1* 1054/2
= 2814 KG

$(\sigma a = 2100\ KG/CM^2)$

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

M16 일때 $Z = \dfrac{4 \times P}{\pi \times do^2 \times \sigma} = \dfrac{4x2814}{835\text{^}2 \times 2100} =$ 0.89 개

M18 일때 $Z = \dfrac{4 \times P}{\pi \times do^2 \times \sigma} = \dfrac{4x2814}{294\text{^}2 \times 2100} =$ 0.73 개

M20 일때 $Z = \dfrac{4 \times P}{\pi \times do^2 \times \sigma} = \dfrac{4x2814}{294\text{^}2 \times 2100} =$ 0.57 개

2)접촉 면압 강도 $(\sigma a = 400\ KG/CM^2)$

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

M14 일때 $Z = \dfrac{4x2814}{\pi \times (1.4\text{^}2 - 1.1835\text{^}2) x400x\ 4.4} =$ 3.64 개

M16 일때 $Z = \dfrac{4x2814}{\pi \times (1.6\text{^}2 - 1.3835\text{^}2) x400x\ 5.2} =$ 2.67 개

M18 일때 $Z = \dfrac{4x2814}{\pi \times (1.8\text{^}2 - 1.5294\text{^}2) x400x\ 4.8} =$ 2.07 개

M20 일때 $Z = \dfrac{4x2814}{\pi \times (2\text{^}2 - 1.7294\text{^}2) x400x\ 5.1} =$ 1.74 개

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

서면심사필 2014.03.31 한국승강기안전기술원

3)따라서 다음과 같이 적용한다

H.T.B M14,M16,M18, M20일때 : 브라켓트당 4개 이상 사용한다.

## 2. I-빔을 용접시공으로 고정시의 강도계산

* 허용 최대 SPAN 및 하중은 최악의 조건으로 계산한다.
(허용 최대 스판 11 M, 400x150x12.5/25t, HOIST자중 : 160 KG)

| | | |
|---|---|---|
| .Q = RATED LOAD= | 1800 KG | (h : 용접두께 |
| .Q1=HOIST SELF WEIGHT= | 160 KG | L : 용접길이 ) |
| .Q2=I-BEAM WEIGHT = | 1054 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

$$L = \frac{1.414x2814}{0.5 \ x\ 1200} = \quad 6.63\ CM = \quad 66.3\ mm$$

(2) h 가 6일때

$$L = \frac{1.414x2814}{0.6 \ x\ 1200} = \quad 5.53\ CM = \quad 55.3\ mm$$

(3) h 가 7일때

$$L = \frac{1.414x2814}{0.7 \ x\ 1200} = \quad 4.74\ CM = \quad 47.4\ mm$$

2) 적용

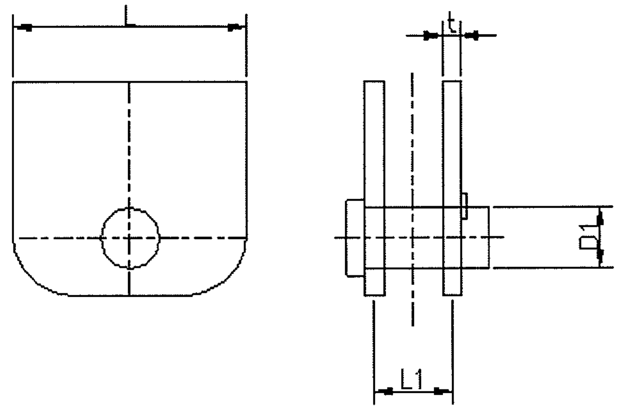
h = 5일때, 한 브라켓트당 용접길이 L = 80mm 이상 용접한다.

h = 6일때, 한 브라켓트당 용접길이 L = 70mm 이상 용접한다.

h = 7일때, 한 브라켓트당 용접길이 L = 50mm 이상 용접한다.

## * 상후크 지지대 SHAFT & BRACKET

### 1. DESIGN DATA




1) DIMENSION

| | | | | | | |
|---|---|---|---|---|---|---|
| PIN직경 | D1 | 4.0 | 판 두께 | t2 | 1.2 | |
| 중심거리 | L1 | 6.6 | 핀수량 | | 1 | EA |
| | L | 15.0 | | | | |

2) 허용 응력

| | | | | |
|---|---|---|---|---|
| SS41-PLATE<br>S45C-SHAFT | 허용압축응력 | $\sigma p$ = | 1400 | KG/CM² |
| | 허용전단응력 | $\sigma t$ = | 800 | KG/CM² |
| | 허용굽힘응력 | $\sigma b$ = | 1400 | KG/CM² |

3) RATED LOAD

Q= 1800 KG

4) CHAIN HOIST WEIGHT

G1= 160 KG

### 2. PIN의 전단응력, σt

$\sigma t = P / A,$

P= (Q+G1)/2 = 980 KG

전단면 2곳

$$= \frac{P}{\pi D^2/4} = \frac{P * 4}{\pi D^2}$$

$$\sigma t = \frac{4 \times 980}{\pi \times 4^2} = 78 \quad KG/CM^2 < 800 \quad KG/CM^2 \text{ ------ O.K}$$

### 3. PIN의 굽힘응력, σb

P1 = Q+G1= 1960 KG

$$\sigma b = M / Z = \frac{P \times L1 / 4}{\pi D^3/32} = \frac{32 * P * L1}{4 * \pi * D^3}$$

$$\sigma b = \frac{32 \times 1960 \times 6.6}{4 \times \pi \times 4^3} = 515 \quad KG/CM^2 < 1400 \quad KG/CM^2 \text{ ------ O.K}$$

### 4. BRACKET의 지지압, σp

$$\sigma p = P1 / A = \frac{P1}{(L-D) \times t \times E} \times f$$

*E(PLATE 수량) : 2 EA

* f(형상계수) : 2.5

$$\sigma p1 = \frac{P \times f}{(L3-D1) \times t1 \times 2} = \frac{1960 \times 2.5}{(15-4) * 1.2 \times 2} = 186 \quad KG/CM^2 < 1400 \quad KG/CM^2 \text{ ----- O.K}$$

## 6. FOR REFERENCE

1) LOAD CHAIN 시험성적서

2) MOTOR DATA SHEET

3) HOIST 사용설명서( operation manual )

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".

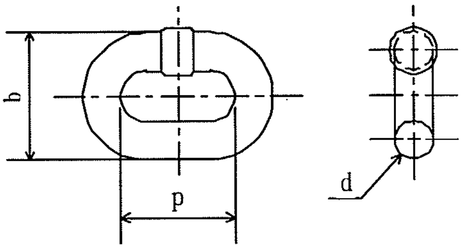
Technical Control Group

Certificate No.: FK070214
Date of Issue: 2008.03.21

# Test Certificate

Messrs.

Commodity: NC Load Chain
Code: KER102
Lot No. : —
Quantity: — line(s)




1. Material: Manganese Alloy Steel

2. Dimensions

| | d | p | b |
|---|---|---|---|
| Specified | 10.2mm ±0.4 | 28.4mm +0.56 / 0 | Max. 35.7mm |
| Result | Good | Good | Good |

3. Breaking test

| | Breaking load | Total ultimate elongation |
|---|---|---|
| Specified | Min. 131 (kN) | Min. 10 (%) |
| Result | Good | Good |

4. Manufacturing Proof force test (Test load: 81.7 kN)

| | Permanent elongation |
|---|---|
| Specified | 0.25 (%) |
| Result | Good |

**General judgment: Satisfactory**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Quality Assurance Depertment
Development & Technology Division
K. Kishimoto (Manager)

Certificate No.: MM080011e

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 | 1.8kW | 4P | 60%ED | 220V | 60Hz |

Full load characteristics

| Voltage Frequency | | 220V 60Hz |
|---|---|---|
| Load | % | 100 |
| Current | A | 8.4 |
| Speed | rpm | 1620 |

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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Quality Assurance Department
Development & Technology Division

M. Ogihara (Manager)

Certificate No.: MM080011f

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 | 1.8kW | 4P | 40/20%ED | 220V | Speed Control by Inverter |

Full load characteristics

| Voltage Frequency | 220V Speed Control by Inverter |
|---|---|
| Load % | 100 |
| Current A | 11.2 |
| 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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Quality Assurance Department
Development & Technology Division

M. Ogihara (Manager)

Certificate No.: MM070011e
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 | 1.8kW | 4P | 60%ED | 380 - 440V | 60Hz |

Full load characteristics

| | |
|---|---|
| Voltage Frequency | 380 - 440V 60Hz |
| Load % | 100 |
| Current A | 4.6 |
| Speed rpm | 1610 |

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 | 1.8kW | 4P | 60%ED | 380 - 440V | Speed Control by Inverter |

Full load characteristics

| Voltage Frequency | 380 - 440V Speed Control by Inverter |
|---|---|
| Load % | 100 |
| Current A | 5.1 |
| 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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(Manager)

K. Kishimoto

Certificate No.: MM080012a

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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Certificate No.: MM080012b
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 | 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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Quality Assurance Department
Development & Technology Division
M. Ogihara (Manager)

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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Certificate No.: MM070013b
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 | 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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