

出國報告（出國類別：其他）

桃園國際機場第一航廈
空橋汰換工程
廠驗報告

服務機關：桃園國際機場股份有限公司

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派赴國家：新加坡

出國期間：107年9月30日至107年10月5日

報告日期：107年10月30日

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一、緣起

桃園國際機場股份有限公司為考量第一航廈現有驅動式空橋已使用多年，辦理「桃園國際機場第一航廈空橋汰換工程」，主要內容為汰換現有驅動式空橋設備等，以維護營運安全及提升作業效率。

本案由台灣世曦工程顧問股份有限公司負責規劃設計及監造作業，採最有利標之評選方式決標於新加坡(亞洲)有限公司(ShinMaywa (Asia) Pte. Ltd)，廠商所選用之「驅動式登機空橋」為自行設計之產品，前端蓬罩、伸縮走道及旋轉圓廳等部分則在台灣生產製造，然驅動軸柱及驅動輪則在新加坡製造廠生產。本報告則詳細敘述本工程案派員至新加坡製造工廠進行「驅動軸柱」及「驅動輪」廠驗之過程與結果。

二、目的

本次廠驗之主要目的係執行履約督導之工作，確認廠商工廠生產機組之規格與品質是否符合契約規範及其所委託之第三公正單位會同測試紀錄結果，並藉由設備抽驗之方式實施細部規格與功能之現場測試，惟並不對設備製造或製造商之工廠製造(程)進行查證(驗)與保證。同時參訪樟宜民用航空機場之相關驅動式空橋設施使用情形，作為桃園國際機場後續規畫案之參考。

三、行程

日期	時間	行程
第一天 107年9月30日	星期日	桃園國際機場飛往新加坡樟宜國際機場
第二天 107年10月1日	星期一	參訪新加坡樟宜國際機場(空橋及行李輸送機使用狀況)
第三天 107年10月2日	星期二	歡迎至新明和辦公室 廠驗及會驗簡報
第四天 107年10月3日	星期三	設備檢驗:驅動軸柱總成(驅動軸柱)
第五天 107年10月4日	星期四	設備檢驗:驅動軸柱總成(驅動輪)
第六天 107年10月5日	星期五	自新加坡樟宜國際機場搭機返抵桃園國際機場

四、廠驗

(一)公司簡介

1. 空橋技術廠商 - 新明和工業股份有限公司

新明和日本擁有建造飛機經驗，其最具代表作之作品為替日本當地獨立設計並建造因應防衛用途的兩棲用飛機；並將此技術的專業擴展應用至其他的產品上。現今，新明和日本提供廣泛的產品與技術服務，從使用於狹路之垃圾車設計擴大至全世界使用的自動傾倒式垃圾車。除上述技術以外，亦為電纜線的繫帶、污水處理廠之水泵產品與 Airbus 及 Boeing 的產品(部分)供應商。其他的工程實績還包含有 B777 的機翼及 A380 的整流板及全世界廣泛使用的空橋建造工程。

2. 專案服務廠商 - 新明和亞洲股份有限公司

新明和亞洲股份有限公司(ShinMaywa (Asia) Pte. Ltd) 以下簡稱新明和亞洲)成立於 1980 年，附屬於日本新明和工業股份有限公司，主要領域之一為市場上的空橋地區性的銷售及承包工程作業，當時成立的動機在於支援日本新明和於新加坡樟宜國際機場第一航廈的 34 座空橋案，自 1990 年起，新明和亞洲持續承作樟宜國際機場 28 座空橋工程，且持續從第一航廈擴展至第二航廈並且涵蓋 62 座空橋工程。

西元 2002 年，曾經承包更換樟宜國際機場航廈中之 27 座空橋專案工程，且於西元 2007 年成功地提供樟宜機場第三航廈，共計 56 座空橋工程，並簽署 15 年的維修服務契約，西元 2013 年度，取得第二航廈 26 座空橋更換工程，西元 2014 年，於第一航廈取得 45 座空橋更換工程以及額外於新航廈(第 4 航廈)25 座空橋汰換合約；這兩項專案分別同時簽署 7 年的維修契約。

目前，新明和亞洲於新加坡樟宜國際機場的第一、二、三航廈正在進行 196 座空橋工程，此工程派有 52 名具有專業能力的員工(2 名維修經理、3 名技術專員、3 名監督員、44 名技術員)，以確保於複雜的工程執行中保有完整的技術能力。迄今，曾經於日本與新加坡的乘客登機橋 (Passenger Boarding Bridge)服務工程實績總計為 136 座，截至目前為

止，無論專案合約規模，新明和亞洲皆督促承包商完成工作，從未延誤過工期，且所有專案皆安全地完成工作。



廠商公司大門合影



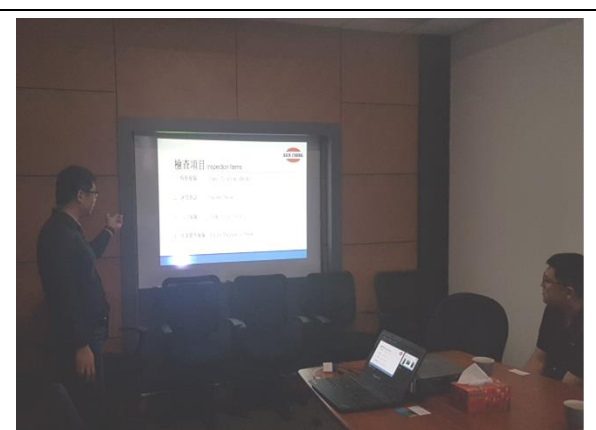
與監造及廠商進行相關業主討論

(二)廠測前說明會議

本次會議由新明和亞洲有限公司品管經理 Raymond 主持，介紹本案驅動軸柱及驅動輪製造流程、設備零件於各組裝工作站之組裝情形、各階段之檢驗與設備校正、成品之塗裝，最終的運轉及功能測試、檢測之依據標準及檢測流程，以及使用檢測儀器設備與軟體等予以詳細說明，以作為本次檢測之依據，並檢視檢測儀器校正報告。另針對驅動軸柱及驅動輪設備測試紀錄表之內容進行確認，以確認所採購之設備符合契約之規定。



廠驗檢測流程說明



廠驗檢測項目說明

KI-2118M-Rev.A

Drive column inspection record 驅動軸柱檢查紀錄

1. Motor specification inspection 馬達規格檢查

Motor 馬達	Serial No. 編號	Maker 製造商	(kw)	(V)	(A)	Ratio 比率	Judgment 檢測結果
Vertical motor 垂直馬達	L 左 R 右	Sumitomo heavy industries, Ltd. 住友重工業有限公司	3.7	400	7.15	51	

2. Dimension check 尺寸檢查

No. 項次	Check point 檢查點	Standard 標準	Measurement 測量	Judgment 檢測結果
1	Retract length(L) 縮回長度(左)	88 ± 5mm	mm	
2	Extend length(R) 伸出長度(右)	2975 ± 5mm	mm	
3	Origin point(L) 高度重置原點(左)	1975 ± 2mm	mm	
4	Origin point(R) 高度重置原點(右)	1975 ± 2mm	mm	
5	Left upper plate position 左上板位置	1031 ± 3mm	mm	
6	Right upper plate position 右上板位置	1031 ± 3mm	mm	
7	Left upper and lower plate distance 左上和下部位置距離	3166 ± 5mm	mm	
8	Right upper and lower plate distance 右上和下部位置距離	3166 ± 5mm	mm	

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3. Vertical motor drive test record (Test condition : No load, AC415V, 50Hz)
垂直馬達驅動測試紀錄 [測試條件(空載, 交流電壓 415V, 50Hz 赫茲)]

No. 項次	Item 項目	Standard 標準	Measurement 測量	Judgment 檢測結果
1	Current check 電流檢查	L 左 Up 上	Less than 4.4A 少於 4.4A *note 1 *注解 1	A
		Down 下		A
		R 右 Up 上		A
		Down 下		A
2	Extend speed 伸長速度	L 左	0.010m/sec±10% *note 2 *注解 2	m/sec
		R 右		m/sec

Note 1: Standard current value has referred from 25% load current value of motor.
注解 1: 標準電流值是指電機的 25% 負載電流值。
Note 2: Speed has been calculated by motor speed (1500rpm), ratio (51) and ball screw read (20mm).
注解 2: 通過馬達轉速(1500rpm), 比率(51)和滾珠絲桿讀數(20mm)計算轉速。

4. Insulation resistance measurement (Equipment DC500V megger tester)
絕緣電阻測量 (設備直流電阻 500V 兆歐表測試儀)

No. 項次	Item 項目	Point 檢查點	Standard 標準	Measurement 測量	Judgment 檢測結果
1	Vertical motor (L) 垂直馬達(左)	U4L-Earth U4L-接地	More than 10MΩ 多過 10MΩ	More than 多過	MΩ
2	Vertical motor (R) 垂直馬達(右)	U4R-Earth U4R-接地	More than 10MΩ 多過 10MΩ	More than 多過	MΩ

驅動軸柱檢查紀錄表(一)

驅動軸柱檢查紀錄表(二)

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5. Paint thickness inspection 油漆膜厚檢查

Note) * A measuring point measures five arbitrary different places. Unit : μm
注解) * 一點測量點測量五個任意不同的地方。單位: μm

No. 項次	Item 項目	Standard 標準	Check point 檢查點					Judgment 檢測結果	
			1	2	3	4	5		
1	Top tube 外層方形管	More than 多過 200	L 左	Front 前面					
			Back 後面						
			Inside 內側						
			Outside 外側						
			Front 前面						
2	Bottom tube 內層方形管	More than 多過 200	L 左	Front 前面					
			Back 後面						
			Inside 內側						
			Outside 外側						
			Front 前面						

6. Colour Check 顏色檢查

No. 項次	Item 項目	Colour Code 顏色代碼	Measurement 測量	Judgment 檢測結果
1	Drive Column 驅動軸柱	Gray Semi-gloss 灰色(半光澤)		

驅動軸柱檢查紀錄表(三)

KI-2118M-Rev.A

Wheel carriage inspection record 驅動輪檢查紀錄

1. Motor specification inspection 馬達規格檢查

Motor 馬達	Serial No. 編號	Maker 製造商	(kw)	(V)	(A)	Ratio 比率	Judgment 檢測結果
Horizontal motor 驅動馬達	L 左 R 右	Sumitomo heavy industries, Ltd. 住友重工業有限公司	3.7	400	7.15	87	

2. Dimension check 尺寸檢查

No. 項次	Check point 檢查點	Standard 標準	Measurement 測量	Judgment 檢測結果
1	Width of cross beam 橫樑的寬度	3054 ± 5mm	mm	
2	Drive column connect plate distance 驅動軸連接板的距離	2504 ± 5mm	mm	

驅動輪檢查紀錄表(一)

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3. Horizontal motor drive test record (Test condition : No load, AC400V, 52Hz varied by inverter)
 駆動軸高速試験記録 (試験条件 : 空載、AC400V・52Hz 由變換器改變)

No. 項次	Item 項目	Standard 標準	Measurement 測量	Judgment 檢測結果
1	Current check 電流檢查	Less than 4.4 A 少於 4.4 A *note 1	Forward 前面	A
			Back 後面	A
			Forward 前面	A
			Back 後面	A
2	Revolution speed 旋轉速度	4.48 rpm ± 10%	L 左	rpm
			R 右	rpm

Note1: Standard current value has referred from 25% load current value of motor.
 注解1: 標準電流值是指電機的25%負載電流值。

4. Insulation resistance measurement (Equipment DC500V megger tester)
 絕緣電阻測量 (設備 DC500V 兆歐表測試儀)

No. 項次	Item 項目	Point 檢查點	Standard 標準	Measurement 測量	Judgment 檢測結果
1	Horizontal Motor (L) 驅動輪馬達(左)	U5-EarthU U5-接地	More than 10MΩ 多過 10MΩ	More than MΩ 多過	MΩ
2	Horizontal Motor (R) 驅動輪馬達(右)	U6-EarthU U6-接地	More than 10MΩ 多過 10MΩ	More than MΩ 多過	MΩ

驅動輪檢查紀錄表(二)

KI-2118M-Rev.A

5. Paint thickness inspection
 油漆膜厚檢查

Note) ・ A measuring point measures five arbitrary different places. Unit : μm
 注解) ・ 一個測量點測量五個任意不同的地方。單位 : μm

No. 項次	Item 項目	Standard 標準	Check point 檢查點					Judgment 檢測結果
			1	2	3	4	5	
1	Cross beam 橫樑	More Than 200	Front 前面					
			Rear 後面					
			Upper 頂端					
2	Wheel carriage 輪架	More Than 200	Front 前面					
			Rear 後面					
			Upper 頂端					

6. Colour Check
 顏色檢查

No. 項次	Item 項目	Colour Code 顏色代碼	Measurement 測量	Judgment 檢測結果
1	Wheel carriage 輪架	Gray Semigloss 灰色(半光澤)		
2	Safety hoop 安全蓋	Gray Semigloss 灰色(半光澤)		

驅動輪檢查紀錄表(三)

Certificate No. N18F092
 March 20, 2018

計測器檢査成績書
 ACCURACY CERTIFICATE OF MEASURING INSTRUMENT

使用事業所 Branch : シンガポール事務所 Singapore Office
 種類 Item : 鋼製卷尺 Steel Tape Measure
 全長 Length : 30 meter Grade : JIS first class
 張力 Standard tension : 20 N 器物番号 Serial No.1

上記計測器を檢査した成績は次の通り
 The above instrument was tested with the following results.

1. 器差 Instrumental Error

表示長さ Indication (m)	器差 Instrumental Error (mm)	JIS一級許容差 JIS First Class Tolerance (mm)
0~5	+ 0.05	±0.7
0~10	+ 0.10	±1.2
0~15	+ 0.20	±1.7
0~20	+ 0.25	±2.2
0~25	+ 0.35	±2.7
0~30	+ 0.40	±3.2

* 真実の長さは表示長さから器差を減じて求める。
 2. 檢査の方法 Method of test
 檢査は、常用参照標準で校正された檢査用ワーキングスタンダードを用いた。
 The steel tape measure was compared with the working standard scale calibrated-by the Laboratory Reference Standard

3. 常用参照標準 Laboratory Reference Standard calibrated by Secondary Standards
 全長 Length : 1m
 器物番号 Instrument No. : 0245
 証明番号 Calibration Certificate No. : 160-61051

4. ワーキングスタンダード Working Standard Scale
 全長 Length : 5m
 器物番号 Instrument No. : SD-02
 証明番号 Calibration Certificate No. : N17F999

5. 檢査時の条件 Condition at time of test
 室温 Room temperature : 20°C ± 1.5°C 湿度 Humidity : 50% ± 10%

6. 檢査者 Measurer
 計量士 NO. 5983 中村博明
 The Certified Measurer's No. : 5983 Name: Hiroaki Nakamura

7. 檢査年月日 Date of test
 平成30年3月20日 March 20, 2018

8. 備考 Remark
 上記の成績は、JIS1級の許容差の範囲内です。
 The above-mentioned test results were within the acceptance tolerance specified by the Japanese Industrial Standard (first class).
 一般社団法人 日本海審檢定協会
 計量管理室
 NIPPON KAIJI KENTEI KYOKAI
 CALIBRATION CENTER

30m 捲尺量測儀器校正報告

SETSICO

Calibration Report No. : CM-22202/2017
 (This Report is issued subject to the terms & conditions set out below)

Your Ref. : Our Ref: CM-850002202/JVM201

**CALIBRATION REPORT
 ON
 COATING THICKNESS GAUGE CW THICKNESS FOILS**

Issued To : NIPPON KAIJI KENTEI KYOKAI
 Bk 511 Kampong Bahru Road
 #05-04 Kopeki Climpark
 Singapore 099447
 Attn: Jefferson Liow

Description : Coating Thickness Gauge c/w
 Thickness Foils Range : 0 - 1.350 μm
 Resolution : 0.1 μm, 1 μm & 0.01 mm
 Manufacturer : CEM Date Calibrated : 24 September 2018
 Serial No. : 18030547B Recommended Due : 24 September 2021
 Model No. : DT-156H

This instrument has been calibrated at Setsico Services Pte Ltd, Calibration Laboratory (Dimension) under the ambient temperature of 20°C ± 1°C and relative humidity of 50% ± 10% r.h.

Calibration Method
 The method of calibration is generally as stated in SETSCO procedure MTD/CAL-124 : 2004, as a guide.

Reference Equipment Used

- Universal Length Machine of Serial No. 1018, traceable to NPL via Setso Certificate No. SK-35263/1A dated on 25.04.2018 due on 25.04.2019.
- Gauge Block Set of Serial No. P9351, traceable to NPL via Setso Certificate No. SK-34953/7 dated on 23.02.2018 due on 23.02.2019.
- Calibrated Foil of Serial No. DL-014, traceable to NPL via Setso Certificate No. SK-33862/6 dated on 03.10.2017 due on 03.10.2018.

Calibration Results
 See Tables attached.

CM-850002202/JVM201/CM Word/Mohan

Notes & Conditions

- The Report is prepared by the opinion of the Client and is based upon the data submitted. The process responsibility of the Client and the conditions under which the Services are performed by SETSCO. The Report is not intended to be a replacement of the Client's own inspection or control or a replacement for the Client's own quality control system.
- SETSCO does not accept responsibility for the accuracy of the Client's own inspection or control or a replacement for the Client's own quality control system.
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- SETSCO does not accept responsibility for the accuracy of the Client's own inspection or control or a replacement for the Client's own quality control system.

The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council.
 LA 1984-0089 A, LA 1985-0091 A, LA 1986-0092 A, LA 1987-0093 A, LA 1988-0094 A, LA 1989-0095 A, LA 1990-0096 A, LA 1991-0097 A, LA 1992-0098 A, LA 1993-0099 A, LA 1994-0100 A, LA 1995-0101 A, LA 1996-0102 A, LA 1997-0103 A, LA 1998-0104 A, LA 1999-0105 A, LA 2000-0106 A, LA 2001-0107 A, LA 2002-0108 A, LA 2003-0109 A, LA 2004-0110 A, LA 2005-0111 A, LA 2006-0112 A, LA 2007-0113 A, LA 2008-0114 A, LA 2009-0115 A, LA 2010-0116 A, LA 2011-0117 A, LA 2012-0118 A, LA 2013-0119 A, LA 2014-0120 A, LA 2015-0121 A, LA 2016-0122 A, LA 2017-0123 A, LA 2018-0124 A, LA 2019-0125 A, LA 2020-0126 A, LA 2021-0127 A, LA 2022-0128 A, LA 2023-0129 A, LA 2024-0130 A, LA 2025-0131 A, LA 2026-0132 A, LA 2027-0133 A, LA 2028-0134 A, LA 2029-0135 A, LA 2030-0136 A, LA 2031-0137 A, LA 2032-0138 A, LA 2033-0139 A, LA 2034-0140 A, LA 2035-0141 A, LA 2036-0142 A, LA 2037-0143 A, LA 2038-0144 A, LA 2039-0145 A, LA 2040-0146 A, LA 2041-0147 A, LA 2042-0148 A, LA 2043-0149 A, LA 2044-0150 A, LA 2045-0151 A, LA 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CM-850022202/JVM/201

Calibration Report No.: CM-22202/201

Description : Coating Thickness Gauge c/w
Thickness Foils
Serial No. : 180305478
Date Calibrated : 24 September 2018
Recommended Due : 24 September 2021

Results: As Found

Nominal Thickness (µm)	Mean Measured Value (µm)
49	49.8
252	248.5 (mean) 249.2 (max) 247.8 (min)
1020	1008.0 (mean) 1010.7 (max) 1007.9 (min)

The calibration was performed at measuring force 1.5 N.

Gauge Repeatability Check (Ferrous)

Foil Thickness Used : 49.7 µm

Measured Value (µm)					Repeatability (µm)
R ₁	R ₂	R ₃	R ₄	R ₅	
51.2	51.4	51.4	51.4	51.5	0.3

Gauge Linearity Check (Ferrous)

Nominal Thickness Value (µm)	Mean Measured Value (µm)
49.7	51.2
119.0	120
251.9	257
465.3	473
Nominal Thickness Value (mm)	Mean Measured Value (mm)
0.984	1.01

J.V.M. ——— JTC

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SETSCO
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CM-850022202/JVM/201

Calibration Report No.: CM-22202/201

Description : Coating Thickness Gauge c/w
Thickness Foils
Serial No. : 180305478
Date Calibrated : 24 September 2018
Recommended Due : 24 September 2021

Gauge Repeatability Check (Non-Ferrous)

Foil Thickness Used : 49.7 µm

Measured Value (µm)					Repeatability (µm)
R ₁	R ₂	R ₃	R ₄	R ₅	
46.5	46.5	46.4	46.5	46.4	0.1

Gauge Linearity Check (Non-Ferrous)

Nominal Thickness Value (µm)	Mean Measured Value (µm)
49.7	46.6
119.0	115
251.8	252
465.3	464
983.8	980

Expanded Uncertainty of Measurement:
Foil Measurement : 0.4 µm with coverage factor k = 2.52.
Linearity Measurement (Ferrous)
(up to 99.9 µm) : 1.1 µm with coverage factor k = 2.00.
(100 to 999 µm) : 3 µm with coverage factor k = 3.31.
(Above 1 mm) : 0.02 mm with coverage factor k = 2.52.
Linearity Measurement (Non-Ferrous)
(up to 99.9 µm) : 1.1 µm with coverage factor k = 2.00.
(100 to 999 µm) : 2 µm with coverage factor k = 2.37.
(Above 1 mm) : 10 µm with coverage factor k = 2.00.

The expanded uncertainty of measurement is at a confidence level of approximately 95%.
The user should determine the suitability of this gauge for its intended use.

J.V.M. ——— NEO TIEN SING
J.V.MOHANRAJ Senior Technical Officer (Calibration & Measurement)
Calibration Officer Mechanical Technology Division

模厚計校正報告(3/3)

BESTLABS SINGAPORE
Company Registration No: 201728718W

calibration Certificate PAGE NO.: 1 OF 2

SUBMITTED TO: Ben Ching Engineering Pte Ltd
30, Tuas Basin Link
Singapore 638772

CERTIFICATE NO.: BLE1813019-1
REFERENCE NO.: BSO-18-013018
CALIBRATED DATE: 24-Sep-2018

Bestlabs organisation and practices have been duly accredited, are in compliance to the requirements of ISO 9001:2015, the quality standard. The reference measurement standards used are traceable to National Metrology Centre (NMC, SINGAPORE) and/or other National Standards.

INSTRUMENT	DIGITAL CLAMP METER
MANUFACTURER	KYORITSU
MODEL NO.	2017
SERIAL NO.	W0008011
RANGE	(MULTIRANGE)
TAG NO.	-
PART NO.	-
LOCATION	-
CALIBRATION AT	BLS Laboratory

REFERENCE STANDARDS	TRACEABILITY	SERIAL NO.	TAG NO.	CAL. DATE	DUE DATE
MULTIFUNCTION CALIBRATOR	NMC SINGAPORE	9760013	85 1304	10-May-2018	10-May-2019
MULTIFUNCTION CALIBRATOR	NMC SINGAPORE	10724705	85 1320	30-Nov-2016	30-Nov-2018

METHOD OF CALIBRATION: FSE DL, FSE OS & FSE OB

NOTES:
• The results of the calibration are given on the attached following pages.
• The expanded uncertainty of measurement associated with the calibration is estimated at a confidence level of approximately 95%.
• No adjustment was done unless otherwise stated.
• The user should determine the suitability of the instrument for its intended use.
• The reports shall not be reproduced except in full, without written approval by management representative of BESTLABS SINGAPORE PTE LTD.

R RAMESH | ASST. TECHNICAL MANAGER
APPROVING OFFICER

Tel: +65 6914 7777 / Fax: +65 6914 7788 www.calibration.sg / sales@calibration.sg
10 Admiralty Street, #02-90 Northlink Building, Singapore 757695.

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BESTLABS SINGAPORE
Company Registration No: 201728718W

calibration Certificate PAGE: 2 OF 2

CERTIFICATE NUMBER: BLE1813019-1



TEST RESULTS:

ACTUAL VALUE	LOW LIMIT	MEASURED VALUE	HIGH LIMIT	UNCERTAINTY	COVERAGE (K) FACTOR
AC VOLTAGE TEST @ 50Hz					
20 V	19.6	19.7	20.4	0.1 V	2.0
100 V	98.8	99.7	101.2	0.1 V	2.0
180 V	178.0	179.4	182.0	0.2 V	2.0
300 V	295	299	305	1 V	2.0
540 V	533	539	547	1 V	2.0
AC CURRENT TEST @ 50 Hz					
20 A	19.3	19.6	20.7	0.3 A	2.0
100 A	98.1	99.4	101.9	0.7 A	2.0
180 A	176.9	178.5	183.1	1.1 A	2.0
300 A	294	301	306	2 A	2.0
540 A	532	541	548	3 A	2.0
RESISTANCE TEST					
20 ohm	19.6	20.1	20.4	0.1 ohm	2.0
100 ohm	98.6	99.8	101.4	0.1 ohm	2.0
180 ohm	177.6	180.4	181.4	0.1 ohm	2.0

***** End Of Test Results *****

Tel: +65 6914 7777 / Fax: +65 6914 7788 www.calibration.sg / sales@calibration.sg
10 Admiralty Street, #02-90 Northlink Building, Singapore 757695.

三用電表校正報告(2/2)

 <p>BESTLABS SINGAPORE PTE. LTD. Company Registration No: 201728718W</p> <p>calibration Certificate PAGE NO. 1 OF 2</p> <p>SUBMITTED TO: Ben Ching Engineering Pte Ltd 25, Tuas Road Link Singapore 638772</p> <p>CERTIFICATE NO. : BLE1813018-2 REFERENCE NO. : BSO-18-013018 CALIBRATED DATE : 24-Sep-2018</p>  <p>BestLabs organisation and practices have been duly accredited are in compliance to the requirements of ISO 9001:2015 the quality standard. The reference measurement standards used are traceable to National Metrology Centre, (NMC, SINGAPORE) and/or other National Standards.</p> <table border="1"> <thead> <tr> <th>INSTRUMENT</th> <th>INSULATION TESTER</th> <th>AMB. TEMPERATURE</th> <th>RELATIVE HUMIDITY</th> </tr> </thead> <tbody> <tr> <td>MANUFACTURER</td> <td>:- KYORITSU</td> <td>:- (21 ± 2) °C</td> <td>:- (55 ± 10) % relative humidity</td> </tr> <tr> <td>MODEL NO.</td> <td>:- 3165</td> <td>RECEIVED DATE</td> <td>:- 20-Sep-2018</td> </tr> <tr> <td>SERIAL NO.</td> <td>:- W815401</td> <td>DUE DATE</td> <td>:- 24-Sep-2019</td> </tr> <tr> <td>RANGE</td> <td>:- (MULTIRANGE)</td> <td></td> <td></td> </tr> <tr> <td>TAG NO.</td> <td>:-</td> <td></td> <td></td> </tr> <tr> <td>PART NO.</td> <td>:-</td> <td></td> <td></td> </tr> <tr> <td>LOCATION</td> <td>:-</td> <td></td> <td></td> </tr> <tr> <td>CALIBRATION AT</td> <td>:- BLS Laboratory</td> <td></td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>REFERENCE STANDARDS</th> <th>TRACEABILITY</th> <th>SERIAL NO.</th> <th>TAG NO.</th> <th>CAL. 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S. Subhakar</i> N. SUBHAKAR SENIOR ENGINEER CALIBRATION OFFICER</p> <p><i>R. Ramesh</i> R. RAMESH ASST. TECHNICAL MANAGER APPROVING OFFICER</p> <p>Tel: +65 6914 7777 / Fax: +65 6914 7788 www.calibration.sg / sales@calibration.sg 10 Admiralty Street, #02-90 Northlink Building, Singapore 737695.</p>	INSTRUMENT	INSULATION TESTER	AMB. TEMPERATURE	RELATIVE HUMIDITY	MANUFACTURER	:- KYORITSU	:- (21 ± 2) °C	:- (55 ± 10) % relative humidity	MODEL NO.	:- 3165	RECEIVED DATE	:- 20-Sep-2018	SERIAL NO.	:- W815401	DUE DATE	:- 24-Sep-2019	RANGE	:- (MULTIRANGE)			TAG NO.	:-			PART NO.	:-			LOCATION	:-			CALIBRATION AT	:- BLS Laboratory			REFERENCE STANDARDS	TRACEABILITY	SERIAL NO.	TAG NO.	CAL. DATE	DUE DATE	MULTIFUNCTION CALIBRATOR	NMC SINGAPORE	10724705	BS 1320	30-Nov-2018	30-Nov-2018	HIGH VOLTAGE/CURRENT RESISTANCE BOX	NMC SINGAPORE	1488	BS 1488	07-Feb-2018	07-Feb-2019	DECADE RESISTANCE BOX	NMC SINGAPORE	1643.13	BS 1484	13-Dec-2017	13-Dec-2018	 <p>BESTLABS SINGAPORE PTE. LTD. Company Registration No: 201728718W</p> <p>calibration Certificate PAGE: 2 OF 2</p> <p>CERTIFICATE NUMBER : BLE1813018-2</p> <table border="1"> <thead> <tr> <th>ACTUAL VALUE</th> <th>LOW LIMIT</th> <th>MEASURED VALUE</th> <th>HIGH LIMIT</th> <th>UNCERTAINTY</th> <th>COVERAGE FACTOR, K</th> </tr> </thead> <tbody> <tr> <td colspan="6">INSULATION TEST :</td> </tr> <tr> <td colspan="6">RANGE 500 V @ 1000 MO</td> </tr> <tr> <td>1 MO</td> <td>0.95</td> <td>1.04</td> <td>1.05</td> <td>0.04 MO</td> <td>2.0</td> </tr> <tr> <td>5 MO</td> <td>4.75</td> <td>5.08</td> <td>5.25</td> <td>0.04 MO</td> <td>2.0</td> </tr> <tr> <td>20 MO</td> <td>19.00</td> <td>20.05</td> <td>21.00</td> <td>3.5 MO</td> <td>2.0</td> </tr> <tr> <td>50 MO</td> <td>47.50</td> <td>50.02</td> <td>52.50</td> <td>3.5 MO</td> <td>2.0</td> </tr> <tr> <td>100 MO</td> <td>95.0</td> <td>100.1</td> <td>105.0</td> <td>3.5 MO</td> <td>2.0</td> </tr> <tr> <td>200 MO</td> <td>190.0</td> <td>200.2</td> <td>210.0</td> <td>3.5 MO</td> <td>2.0</td> </tr> <tr> <td>1000 MO</td> <td>950.0</td> <td>1001.0</td> <td>1050.0</td> <td>130 MO</td> <td>2.0</td> </tr> <tr> <td colspan="6">AC VOLTAGE TEST @ 50Hz</td> </tr> <tr> <td>100 V</td> <td>82.0</td> <td>100.3</td> <td>118.0</td> <td>0.1 V</td> <td>2.0</td> </tr> <tr> <td>200 V</td> <td>182.0</td> <td>200.3</td> <td>218.0</td> <td>0.1 V</td> <td>2.0</td> </tr> <tr> <td>300 V</td> <td>282.0</td> <td>300.4</td> <td>318.0</td> <td>0.1 V</td> <td>2.0</td> </tr> <tr> <td>400 V</td> <td>382.0</td> <td>400.4</td> <td>418.0</td> <td>0.1 V</td> <td>2.0</td> </tr> <tr> <td>500 V</td> <td>482.0</td> <td>500.5</td> <td>518.0</td> <td>0.1 V</td> <td>2.0</td> </tr> </tbody> </table> <p>***** End Of Test Results *****</p> <p>Tel: +65 6914 7777 / Fax: +65 6914 7788 www.calibration.sg / sales@calibration.sg 10 Admiralty Street, #02-90 Northlink Building, Singapore 737695.</p>	ACTUAL VALUE	LOW LIMIT	MEASURED VALUE	HIGH LIMIT	UNCERTAINTY	COVERAGE FACTOR, K	INSULATION TEST :						RANGE 500 V @ 1000 MO						1 MO	0.95	1.04	1.05	0.04 MO	2.0	5 MO	4.75	5.08	5.25	0.04 MO	2.0	20 MO	19.00	20.05	21.00	3.5 MO	2.0	50 MO	47.50	50.02	52.50	3.5 MO	2.0	100 MO	95.0	100.1	105.0	3.5 MO	2.0	200 MO	190.0	200.2	210.0	3.5 MO	2.0	1000 MO	950.0	1001.0	1050.0	130 MO	2.0	AC VOLTAGE TEST @ 50Hz						100 V	82.0	100.3	118.0	0.1 V	2.0	200 V	182.0	200.3	218.0	0.1 V	2.0	300 V	282.0	300.4	318.0	0.1 V	2.0	400 V	382.0	400.4	418.0	0.1 V	2.0	500 V	482.0	500.5	518.0	0.1 V	2.0
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(三) 驅動軸柱測試過程

本次驅動軸柱測試項目包含：驅動馬達規格(Motor specification inspection)、驅動軸柱尺寸檢查(Dimension check)、垂直驅動性能測試(Vertical motor drive test)、絕緣電阻量測(Insulation resistance measurement)及油漆模厚檢查等項目。

使用之測試儀器包含捲尺、卡尺、多功能三用電錶、高阻計、模厚計及驅動軸柱測試機等(詳附件 1)。

依據前揭步驟逐一進行並核對測試紀錄內容，與契約規定尚符，請參閱以下所附相片及附件測試報告紀錄表(詳附件 2)。



驅動軸柱



驅動軸柱軸桿



驅動馬達規格確認(一)



驅動馬達規格確認(二)



驅動軸柱相關尺寸量測(一)



驅動軸柱相關尺寸量測(二)



垂直驅動性能測試(一)



垂直驅動性能測試(二)



絕緣電阻量測(一)



絕緣電阻量測(二)



油漆模厚檢查(一)



油漆模厚檢查(二)

(四) 驅動輪設備測試過程

本次驅動輪測試項目包含：驅動馬達規格 (Motor specification inspection)、驅動輪尺寸檢查 (Dimension check)、驅動馬達性能測試 (Vertical motor drive test)、絕緣電阻量測 (Insulation resistance measurement) 及油漆模厚檢查等項目。

使用之測試儀器包含捲尺、卡尺、多功能三用電錶、高阻計、模厚計及驅動軸柱測試機等。

依據前揭步驟逐一進行並核對測試紀錄內容，與契約規定尚符，請參閱以下所附相片及附件測試報告紀錄表(詳附件 2)。



驅動輪



驅動輪馬達、輪軸及齒輪組



驅動輪輪軸



驅動輪實心輪胎



驅動輪馬達規格確認(一)



驅動輪馬達規格確認(二)



驅動輪相關尺寸量測(一)



驅動輪相關尺寸量測(二)



驅動輪性能測試(一)



驅動輪性能測試(二)



絕緣電阻量測(一)



絕緣電阻量測(二)



油漆模厚檢查(一)



油漆模厚檢查(二)

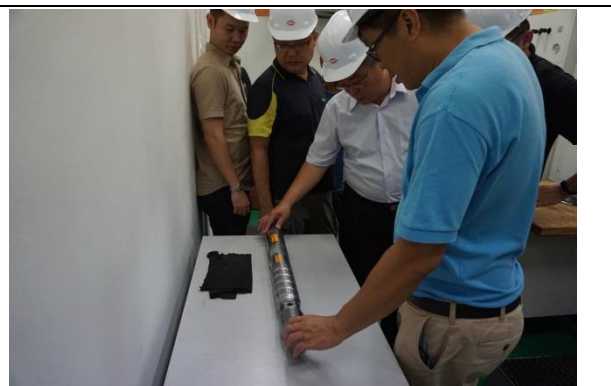
(五) 設備製造工廠參訪

由 ShinMaywa 介紹空橋設備工廠製程，對於空橋從材料進場、銲接、組立、噴砂、塗裝、內裝、配電控制、舉升柱、驅動輪組等一系列製造、組裝流程與檢測等一貫化作業、均有完整之分工及嚴謹之查核程序以確保產品品質。

對於工廠整體之管理、物料管理、瑕疵或故障零組件存放、人流物流分流及人員安全防護等，均有完善的作業程序，相關之參訪相片如下：



相關零配件製造生產



軸承製造生產



(六) 樟宜機場設備使用現況

本次參訪由 ShinMaywa(Asia) Pte. Ltd. 帶領前往樟宜國際機場第四航廈參觀機坪與航廈設施使用情形，參訪情形記載如下：

1. 橋氣、橋電設備採移動式方式處理，不附掛於空橋下方之方式。
2. 維修梯已全面取消設置於空橋側，改採用維修升降機進行維修之方式。
3. 行李輸送系統已全面採用自動輸送方式處理，以節省人力及減少人為分類時之疏失。
4. 報到櫃台行李輸送帶設置高度比較低，利於顧客行李提送。
5. 機坪運作車輛已漸漸改用電動車輛，以降低空氣汙染
6. 機艙空調機之風管，大部分使用手動捲管設備收納，部分則使用風管籃車裝。
7. 橋氣、橋電設備已改用托運載行式，減少空橋下方管線架電纜線佈設，同時也減少了電纜線因空橋經常伸縮導致易有短路之情形發生。



樟宜機場第四航廈使用中之空橋設備(一)



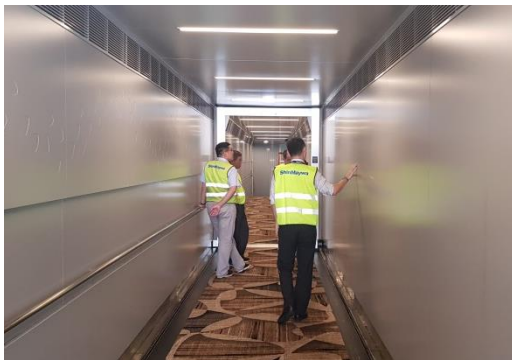
樟宜機場第四航廈使用中之空橋設備(二)



樟宜機場第四航廈使用中之空橋設備(三)



空橋伸縮走道



空橋伸縮走道



空橋控制面板



行李箱託運車輛電力充電站



行李箱託運電動車輛

	
<p>空橋電纜伸縮架</p>	<p>固定空橋內部</p>
	
<p>樟宜機場第四航廈行李報到櫃台</p>	<p>樟宜機場第四航廈行李自助報到櫃台</p>
	
<p>樟宜機場第四航廈行李輸送系統控制室</p>	<p>樟宜機場第四航廈行李自動輸送機</p>
	
<p>樟宜機場第四航廈行李自動輸送區</p>	<p>樟宜機場第四航廈大型行李自動輸送機前合影</p>

五、心得與建議事項

本次出國廠驗及相關參訪行程，茲將心得與建議事項條列如下：

1. 機場內行李輸送系統採用自動化分類及運送設備，減少人工分類及運送成本，同時可降低錯誤產生，且運送行李車輛減少，機坪內車禍肇事率將可降低。
2. 機場設計規畫時須考慮現今與未來擴充之需求，預留屆時擴充所需之空間。
3. 機場旅客報到作業已漸漸朝向自助化處理方式，以加速報到作業，減少人力。
4. 機場登機空橋採用固定及活動式方式設置，機坪內作業車輛通道寬敞及順暢，同時可減少交通事故的產生。同時可廢除空橋勤務梯的設置，增加機坪作業空間。
5. 機坪內作業車輛改為電動充電方式，可降低空氣污染量。
6. 空橋設備電纜線採用空橋下方電纜線架佈設方式，以減少電纜線因空橋經常伸縮導致易斷裂及短路之情形發生。
7. 空橋外覆建議以鋁板包覆，同時須確實定期保養，可大大降低設備腐蝕，增加使用年限。
8. 可於機坪適當區域統籌設立作業車輛充電設施，當避免作業車輛任意於機坪上充電的情形發生。

六、附件

(一)附件 1-儀器校正報告

(二)附件 2-第三公證單位會同測試紀錄表

附件 1 - 儀器校正報告

1.30m 捲尺校正報告

Certificate No. N18F092

March 20, 2018

計測器検査成績書

ACCURACY CERTIFICATE OF MEASURING INSTRUMENT

使用事業所 Branch : シンガポール事務所 Singapore Office

種類 Item : 鋼製巻尺 Steel Tape Measure

全長 Length: 30 meter Grade : JIS first class

張力 Standard tension: 20 N 器物番号 Serial No.:1

上記計測器を検査した成績は次の通り

The above instrument was tested with the following results.

1. 器差 Instrumental Error

表す長さ Indication (m)	器差 Instrumental Error (mm)	JIS一級許容差 JIS First Class Tolerance (mm)
0~5	+ 0.05	±0.7
0~10	+ 0.10	±1.2
0~15	+ 0.20	±1.7
0~20	+ 0.25	±2.2
0~25	+ 0.35	±2.7
0~30	+ 0.40	±3.2

* 真実の長さは表す長さから器差を減じて求める。

2. 検査の方法 Method of test

検査は、常用参照標準で校正された検査用ワーキングスタンダードを用いた。

The steel tape measure was compared with the working standard scale calibrated by the Laboratory Reference Standard

3. 常用参照標準 Laboratory Reference Standard calibrated by Secondary Standards

全長 Length : 1m
器物番号 Instrument No. : 0245
証明書番号 Calibration Certificate No. : 160-61051

4. ワーキングスタンダード Working Standard Scale

全長 Length : 5m
器物番号 Instrument No. : SD-02
証明書番号 Calibration Certificate No. : N17F999

5. 検査時の条件 Condition at time of test

室温 Room temperature : 20°C ± 1.5°C 湿度 Humidity: 50% ± 10%

6. 検査者 Measurer

計量士 NO. 5983 中村博明
The Certified Measurer's No.: 5983 Name: Hiroaki Nakamura

7. 検査年月日 Date of test

平成30年3月20日 March 20, 2018

8. 備考 Remark

上記の成績は、JIS1級の許容差の範囲内です。

The above-mentioned test results were within the acceptance tolerance specified by the Japanese Industrial Standard (first class).

一般社団法人 日本海事検定協会
計量管理室
NIPPON KAIJI KENTEI KYOKAI
CALIBRATION CENTER

2. 模厚計校正報告



Calibration Report No.: CM-22202/20/1

(This Report is issued subject to the terms & conditions set out below)

SetSCO Services Pte Ltd
18 Teban Gardens Crescent
Singapore 608925
Tel : (65) 6566 7777
Fax: (65) 6566 7718
www.setsco.com
Business Reg. No. 196900269D

Your Ref: -

Our Ref: CM-8500022202/JVM/20/1

Date: 24/09/2018

Page 1 of 3

CALIBRATION REPORT ON COATING THICKNESS GAUGE C/W THICKNESS FOILS

Issued To : NIPPON KAIJI KENTEI KYOKAI
Blk 511 Kampong Bahru Road
#05-04 Keppel Distripark
Singapore 099447
Attn: Jefferson Liow

Description	: Coating Thickness Gauge c/w Thickness Foils	Range	: 0 – 1 350 μm
Manufacturer	: CEM	Resolution	: 0.1 μm , 1 μm & 0.01 mm
Serial No.	: 180305478	Date Calibrated	: 24 September 2018
Model No.	: DT-156H	Recommended Due	: 24 September 2021

This instrument has been calibrated at SetSCO Services Pte Ltd, Calibration Laboratory (Dimension) under the ambient temperature of $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$ and relative humidity of $50\% \pm 10\%$ r.h.

Calibration Method

The method of calibration is generally as stated in SETSCO procedure MTD/CAL-124 : 2004, as a guide.

Reference Equipment Used

1. Universal Length Machine of Serial No. 1018, traceable to NPL via SetSCO Certificate No. SK-35263/1A dated on 25.04.2018 due on 25.04.2019.
2. Gauge Block Set of Serial No. P9351, traceable to NPL via SetSCO Certificate No. SK-34953/7 dated on 23.02.2018 due on 23.02.2019.
3. Calibrated Foil of Serial No. DL-014, traceable to NPL via SetSCO Certificate No. SK-33862/6 dated on 03.10.2017 due on 03.10.2018.

Calibration Results

See Tables attached.


CM-8500022202/JVM/20/1 (CM Word) Mohan



Terms & Conditions:

- (1) The Report is prepared for the sole use of the Client and is prepared based upon the Item submitted, the services required by the Client and the conditions under which the Services are performed by SETSCO. The Report is not intended to be representative of similar or equivalent Services on similar or equivalent Items. The Report does not constitute an endorsement by SETSCO of the Item.
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*The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council.
LA-1994-0068-A, LA-1987-0001-B, LA-1993-0067-G, LA-1998-0144-D, LA-2000-0181-F, LA-2012-0519-E, LA-1993-0051-C, LA-1987-0001-B-1





Calibration Report No.: CM-22202/20/1

Description : Coating Thickness Gauge c/w
 Thickness Foils
 Serial No. : 180305478
 Date Calibrated : 24 September 2018
 Recommended Due : 24 September 2021

Results: As Found

Nominal Thickness (µm)	Mean Measured Value (µm)
49	49.8
252	248.5 (mean) 249.2 (max) 247.5 (min)
1020	1 008.9 (mean) 1 010.7 (max) 1 007.5 (min)

The calibration was performed at measuring force 1.5 N.

Gauge Repeatability Check (Ferrous)

Foil Thickness Used : 49.7 µm					
Measured Value (µm)					Repeatability (µm)
R ₁	R ₂	R ₃	R ₄	R ₅	
51.2	51.4	51.4	51.4	51.5	0.3

Gauge Linearity Check (Ferrous)

Nominal Thickness Value (µm)	Mean Measured Value (µm)
49.7	51.2
119.0	120
251.8	257
465.3	473
Nominal Thickness Value (mm)	Mean Measured Value (mm)
0.984	1.01

JVM

[Signature]

Calibration Report No.: CM-22202/20/1

Description : Coating Thickness Gauge c/w
 Thickness Foils
 Serial No. : 180305478
 Date Calibrated : 24 September 2018
 Recommended Due : 24 September 2021

Gauge Repeatability Check (Non-Ferrous)

Foil Thickness Used : 49.7 μm					
Measured Value (μm)					Repeatability (μm)
R ₁	R ₂	R ₃	R ₄	R ₅	
46.5	46.5	46.4	46.5	46.4	0.1

Gauge Linearity Check (Non-Ferrous)

Nominal Thickness Value (μm)	Mean Measured Value (μm)
49.7	46.6
119.0	115
251.8	252
465.3	464
983.6	980

Expanded Uncertainty of Measurement:

Foil Measurement : 0.4 μm with coverage factor k = 2.52.

Linearity Measurement (Ferrous)

(up to 99.9 μm) : 1.1 μm with coverage factor k = 2.00.
 (100 to 999 μm) : 3 μm with coverage factor k = 3.31.
 (Above 1 mm) : 0.02 mm with coverage factor k = 2.52.

Linearity Measurement (Non-Ferrous)

(up to 99.9 μm) : 1.1 μm with coverage factor k = 2.00.
 (100 to 999 μm) : 2 μm with coverage factor k = 2.37.
 (Above 1 mm) : 10 μm with coverage factor k = 2.00.

The expanded uncertainty of measurement is at a confidence level of approximately 95%.

The user should determine the suitability of this gauge for its intended use.



J.V. MOHANRAJ
 Calibration Officer



NEO TIEN SING
 Senior Technical Officer (Calibration & Measurement)
 Mechanical Technology Division

3.三用電表校正報告



calibration Certificate

PAGE NO. : 1 OF 2

SUBMITTED TO:
Ben Ching Engineering Pte Ltd
39, Tuas Basin Link
Singapore 638772

CERTIFICATE NO. : BLE1813018-1
REFERENCE NO. : BSO-18-013018
CALIBRATED DATE : 24-Sep-2018



Bestlabs organisation and practices have been duly accredited are in compliant to the requirements of ISO 9001:2015 the quality standard. The reference measurement standards used are traceable to National Metrology Centre,(NMC,SINGAPORE) and/or other National Standards.

INSTRUMENT	: DIGITAL CLAMP METER				
MANUFACTURER	: KYORITSU	AMB. TEMPERATURE	: (21 ± 2) °C		
MODEL NO.	: 2017	RELATIVE HUMIDITY	: (55 ± 10) % relative humidity		
SERIAL NO.	: W0008011	RECEIVED DATE	: 20-Sep-2018		
RANGE	: (MULTIRANGE) -	DUE DATE	: 24-Sep-2019		
TAG NO.	: -		: -		
PART NO.	: -		: -		
LOCATION	: -		: -		
CALIBRATION AT	: BLS Laboratory		: -		
MEASUREMENT TRACEABILITY					
REFERENCE STANDARDS	TRACEABILITY	SERIAL NO.	TAG NO.	CAL. DATE	DUE DATE
MULTIFUNCTION CALIBRATOR	NMC SINGAPORE	9760013	BS 1394	10-May-2018	10-May-2019
MULTIFUNCTION CALIBRATOR	NMC SINGAPORE	107247G5	BS 1320	30-Nov-2016	30-Nov-2018
METHOD OF CALIBRATION: FSE 01, FSE 05 & FSE 08					

NOTES:

- The results of the calibration are given on the attached following pages.
- The expanded uncertainty of measurement associated with the calibration is estimated at a confidence level of approximately 95%.
- No adjustment was done unless otherwise stated.
- The user should determine the suitability of the instrument for its intended use.
- The reports shall not be reproduced except in full, without written approval by management representative of BESTLABS SINGAPORE PTE LTD.


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10 Admiralty Street, #02-90 Northlink Building, Singapore 757695.



calibration Certificate

CERTIFICATE NUMBER : BLE1813018-1

PAGE: 2 OF 2

TEST RESULTS:

ACTUAL VALUE	LOW LIMIT	MEASURED VALUE	HIGH LIMIT	UNCERTAINTY	COVERAGE (K) FACTOR
AC VOLTAGE TEST @ 50Hz					
20 V	19.6	19.7	20.4	0.1 V	2.0
100 V	98.8	99.7	101.2	0.1 V	2.0
180 V	178.0	179.4	182.0	0.2 V	2.0
300 V	295	299	305	1 V	2.0
540 V	533	539	547	1 V	2.0
AC CURRENT TEST @ 50 Hz					
20 A	19.3	19.6	20.7	0.3 A	2.0
100 A	98.1	99.4	101.9	0.7 A	2.0
180 A	176.9	179.5	183.1	1.1 A	2.0
300 A	294	301	306	2 A	2.0
540 A	532	541	548	3 A	2.0
RESISTANCE TEST					
20 ohm	19.6	20.1	20.4	0.1 ohm	2.0
100 ohm	98.6	99.8	101.4	0.1 ohm	2.0
180 ohm	177.6	180.4	182.4	0.1 ohm	2.0

***** End Of Test Results *****

4.高阻計校正報告



PAGE NO. : 1 OF 2

SUBMITTED TO:
Ben Ching Engineering Pte Ltd
39, Tuas Basin Link
Singapore 638772

CERTIFICATE NO. : BLE1813018-2
REFERENCE NO. : BSO-18-013018
CALIBRATED DATE : 24-Sep-2018



Bestlabs organisation and practices have been duly accredited are in compliant to the requirements of ISO 9001:2015 the quality standard. The reference measurement standards used are traceable to National Metrology Centre,(NMC,SINGAPORE) and/or other National Standards.

INSTRUMENT		INSULATION TESTER			
MANUFACTURER	: KYORITSU	AMB. TEMPERATURE	: (21 ± 2) °C		
MODEL NO.	: 3165	RELATIVE HUMIDITY	: (55 ± 10) % relative humidity		
SERIAL NO.	: W8154101	RECEIVED DATE	: 20-Sep-2018		
RANGE	: (MULTIRANGE) .	DUE DATE	: 24-Sep-2019		
TAG NO.	: -	-	: -		
PART NO.	: -	-	: -		
LOCATION	: -	-	: -		
CALIBRATION AT	: BLS Laboratory	-	: -		
MEASUREMENT TRACEABILITY					
REFERENCE STANDARDS	TRACEABILITY	SERIAL NO.	TAG NO.	CAL. DATE	DUE DATE
MULTIFUNCTION CALIBRATOR	NMC SINGAPORE	107247G5	BS 1320	30-Nov-2016	30-Nov-2018
HIGH VOLTAGE/CURRENT RESISTANCE BOX	NMC SINGAPORE	1488	BS 1488	07-Feb-2018	07-Feb-2019
DECADE RESISTANCE BOX	NMC SINGAPORE	1643L13	BS 1484	13-Dec-2017	13-Dec-2018
METHOD OF CALIBRATION: FSE 03 & FSE 05					

NOTES:

- The results of the calibration are given on the attached following pages.
- The expanded uncertainty of measurement associated with the calibration is estimated at a confidence level of approximately 95%.
- No adjustment was done unless otherwise stated.
- The user should determine the suitability of the instrument for its intended use.
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calibration Certificate

CERTIFICATE NUMBER : BLE18123018-2

PAGE: 2 OF 2

ACTUAL VALUE	LOW LIMIT	MEASURED VALUE	HIGH LIMIT	UNCERTAINTY	COVERAGE FACTOR, K
--------------	-----------	----------------	------------	-------------	--------------------

INSULATION TEST :

RANGE 500 V @ 1000 MΩ

1 MΩ	0.95	1.04	1.05	0.04 MΩ	2.0
5 MΩ	4.75	5.08	5.25	0.04 MΩ	2.0
20 MΩ	19.00	20.05	21.00	3.5 MΩ	2.0
50 MΩ	47.50	50.02	52.50	3.5 MΩ	2.0
100 MΩ	95.0	100.1	105.0	3.5 MΩ	2.0
200 MΩ	190.0	200.2	210.0	3.5 MΩ	2.0
1000 MΩ	950.0	1001.0	1050.0	130 MΩ	2.0

AC VOLTAGE TEST @ 50Hz

100 V	82.0	100.3	118.0	0.1 V	2.0
200 V	182.0	200.3	218.0	0.1 V	2.0
300 V	282.0	300.4	318.0	0.1 V	2.0
400 V	382.0	400.4	418.0	0.1 V	2.0
500 V	482.0	500.5	518.0	0.1 V	2.0

***** End Of Test Results *****

附件 2-第三公證單位會同測試紀錄表

KI-2118M-Rev.A



Tao Yuan International Airport Terminal 1 Project
桃園國際機場第一航廈空橋汰換工程

Factory Acceptance Test 廠驗	
Inspection Items 檢驗項目:	Drive column and Wheel carriage 驅動軸柱總成
Model 型號:	ATSC2-303RB, ASTC2-328RB
Gate No. 機坪編號:	TY04/B3

Inspection place: 檢驗地點:	BEN CHINA ENGINEERING PTE LTD
Inspection date: 檢驗日期:	10月4日 2018年

Witnessed by 見證者			
Signature/Name 簽名/姓名 <i>Stephen Chan</i> NKKK	Signature/Name 簽名/姓名 <i>TAN TEIK YI</i> SAP Shinmaywa	Signature/Name 簽名/姓名 <i>CECI</i> <i>王正光</i>	Signature/Name 簽名/姓名 <i>邱奕明</i>
Date 日期: 04/10/18	Date 日期: 4/10/18	Date 日期: 10.10.18	Date 日期: 10.10.18

Conducted by 執行者			
Signature/Name 簽名/姓名 <i>蘇文彬</i> BP SW BCE QC	Signature/Name 簽名/姓名	Signature/Name 簽名/姓名	Signature/Name 簽名/姓名
Date 日期: 04/10/2018	Date 日期:	Date 日期:	Date 日期:

Revision 校訂	Date 日期	Description 描述	Author (s) 作者	Reviewer (s) 審查者
A	8/May/2018	Newly released	W. Shimomori	H. Takeda

ShinMaywa Industries, Ltd.
Parking systems division Airport equipment department

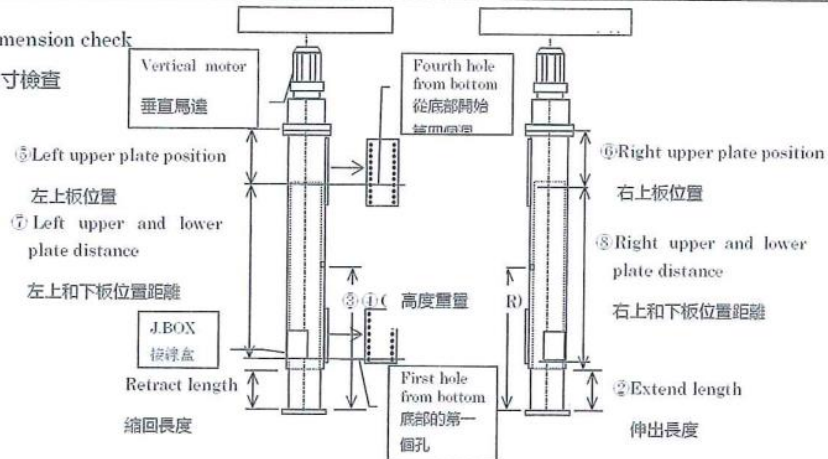
Drive column inspection record 驅動軸柱檢查記錄

1. Motor specification inspection 馬達規格檢查

Motor 馬達		Serial No. 編號	Maker 製造商	(kw)	(V)	(A)	Ratio 比率	Judgment 檢測結果
Vertical motor 垂直馬達	L 左	Motor 馬達 HN1269873	Sumitomo heavy industries, Ltd. 住友重工業 有限公司	3.7	400	7.15	51	OK
		Gear 齒輪 SG0133930						
	R 右	Motor 馬達 HN1269881						
		Gear 齒輪 SG0133926						

2. Dimension check

尺寸檢查



No. 項次	Check point 檢查點	Standard 標準	Measurement 測量	Judgment 檢測結果
1	Retract length(L) 縮回長度(左)	88±5mm	89 mm	OK
2	Extend length(R) 伸出長度(右)	2975±5mm	2975 mm	OK
3	Origin point(L) 高度量原點(左)	1975±2mm	1976 mm	OK
4	Origin point(R) 高度量原點(右)		1976 mm	OK
5	Left upper plate position 左上板位置	1031±3mm	1031 mm	OK
6	Right upper plate position 右上板位置		1030 mm	OK
7	Left upper and lower plate distance 左上和下板位置距離	3166±5mm	3165 mm	OK
8	Right upper and lower plate distance 右上和下板位置距離		3165 mm	OK

3. Vertical motor drive test record (Test condition : No load, AC415V, 50Hz)

垂直馬達驅動測試記錄 (測試條件(空載, 交流電壓 415V, 50Hz 赫茲))

No. 項次	Item 項目		Standard 標準	Measurement 測量	Judgment 檢測結果
1	Current check 電流檢查	L 左	Up 上	3.8 A	OK
			Down 下	3.8 A	OK
		R 右	Up 上	3.9 A	OK
			Down 下	3.8 A	OK
2	Extend speed 伸長速度	L 左	0.010m/sec±10% *note 2	0.010 m/sec	OK
		R 右	*注解 2	0.010 m/sec	OK

Note 1: Standard current value has referred from 25% load current value of motor.

注解 1: 標準電流值是指電機的 25% 負載電流值。

Note 2: Speed has been calculated by motor speed (1500rpm), ratio (51) and ball screw read (20mm).

注解 2: 通過馬達轉速(1500rpm), 比率(51)和滾珠絲桿讀數(20mm)計算轉速。

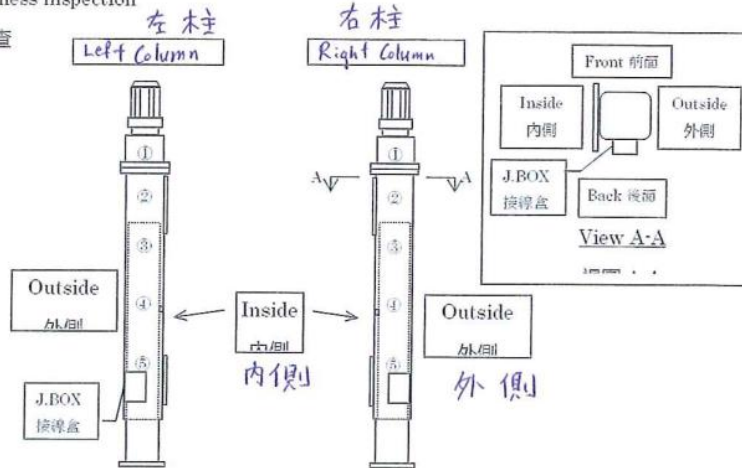
4. Insulation resistance measurement (Equipment DC500V megger tester)

絕緣電阻測量 (設備直流電流 500V 兆歐表測試儀)

No. 項次	Item 項目	Point 檢查點	Standard 標準	Measurement 測量	Judgment 檢測結果
1	Vertical motor (L) 垂直馬達(左)	U4L-Earth U4L-接地	More than 10MΩ 多過 10MΩ	More than MΩ 多過 300MΩ	OK
2	Vertical motor (R) 垂直馬達(右)	U4R-Earth U4R-接地	More than 10MΩ 多過 10MΩ	More than MΩ 多過 200MΩ	OK

5. Paint thickness inspection

油漆膜厚檢查



Note) · A measuring point measures five arbitrary different places. Unit : μm

注解) · 一個測量點測量五個任意不同的地方。單位 : μm

No. 項次	Item 項目		Standard 標準	Check point 檢查點					Judgment 檢測結果	
				1	2	3	4	5		
1	Top tube 外層方形管	L 左	Front 前面	More than 多過 200	391	313	332	350	358	OK
			Back 後面		327	451	285	372	449	OK
			Inside 內側		379	469	325	308	435	OK
			Outside 外側		344	413	323	447	382	OK
		R 右	Front 前面		339	223	322	413	297	OK
			Back 後面		265	399	526	400	461	OK
			Inside 內側		354	384	323	358	418	OK
			Outside 外側		290	292	359	417	365	OK
2	Bottom tube 內層方形管	L 左	Front 前面	More than 多過 200	/	522	388	533	473	OK
			Back 後面			345	470	511	445	OK
			Inside 內側			531	426	454	424	OK
			Outside 外側			399	451	542	282	OK
		R 右	Front 前面			347	385	412	431	OK
			Back 後面			385	324	359	515	OK
			Inside 內側			559	551	536	639	OK
			Outside 外側			432	527	522	599	OK

6. Colour Check

顏色檢查

No. 項次	Item 項目	Colour Code 顏色代碼	Measurement 測量	Judgment 檢測結果
1	Drive Column 驅動軸柱	Gray Semi-gloss 灰色 (半光澤)	No. 5400F #38 Grey semi Gloss	OK

Wheel carriage inspection record

驅動輪檢驗記錄

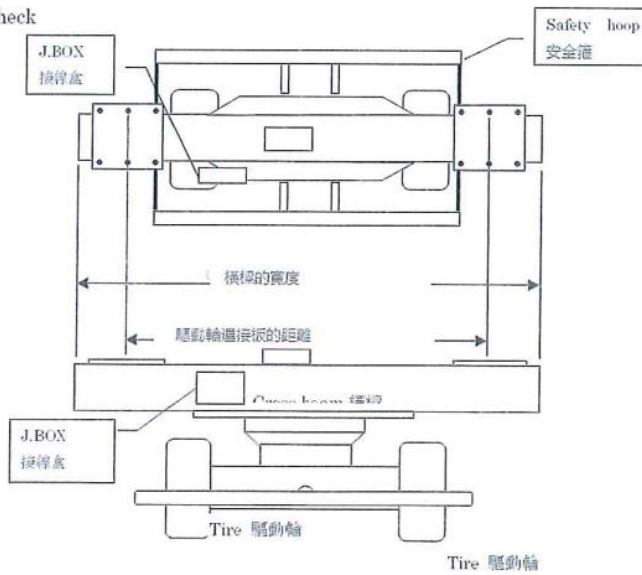
1. Motor specification inspection

馬達規格檢查

Motor 馬達		Serial No. 編號	Maker 製造商	(kw)	(V)	(A)	Ratio 比率	Judgment 檢測結果
Horizontal motor 驅動輪馬達	L 左	Motor 馬達 HN1283305	Sumitomo heavy industries, Ltd. 住友重工業有限公司	3.7	400	7.15	87	OK
		Gear 齒輪 S6013392						
	R 右	Motor 馬達 HN1283310						
		Gear 齒輪 S6013393						

2. Dimension check

尺寸檢查



No. 項次	Check point 檢查點	Standard 標準	Measurement 測量	Judgment 檢測結果
1	Width of cross beam 橫樑的寬度	3054 ± 5mm	3052 mm	OK
2	Drive column connect plate distance 驅動輪連接板的距離	2504 ± 5mm	2502 mm	OK

3. Horizontal motor drive test record (Test condition : No load, AC400V, 52Hz varied by inverter)

驅動輪馬達測試記錄 (測試條件: 空載, AC400V, 52Hz 由變頻器改變)

No. 項次	Item 項目		Standard 標準	Measurement 測量	Judgment 檢測結果
1	Current check 電流檢查	L 左	Forward 前面	2.84 ^A	OK
			Back 後面	2.84 ^A	OK
		R 右	Forward 前面	2.86 ^A	OK
			Back 後面	2.87 ^A	OK
2	Revolution speed 旋轉速度	L 左	4.48 rpm ± 10% *note 1 *注解 1	4.5 ^{rpm}	OK
		R 右		4.5 ^{rpm}	OK

Note1: Standard current value has referred from 25% load current value of motor.

注解 1: 標準電流值是指電機的 25% 負載電流值。

4. Insulation resistance measurement (Equipment DC500V megger tester)

絕緣電阻測量 (設備 DC500V 兆歐表測試儀)

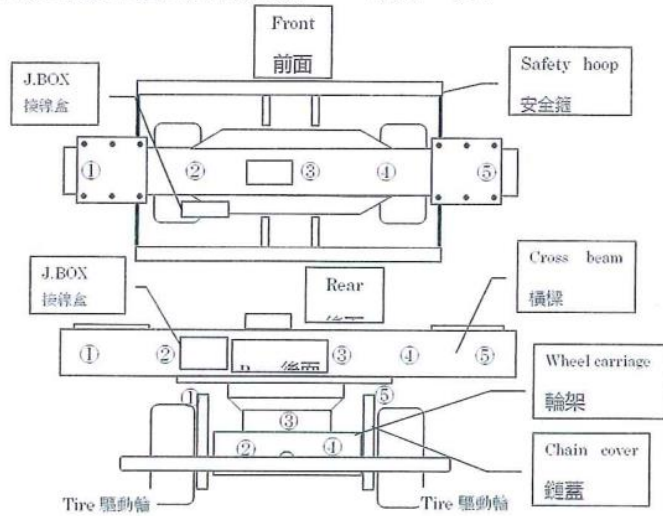
No. 項次	Item 項目	Point 檢查點	Standard 標準	Measurement 測量	Judgment 檢測結果
1	Horizontal Motor (L) 驅動輪馬達(左)	U5-EarthU U5-接地	More than 10MΩ 多過 10MΩ	More than MΩ 多過 200MΩ	OK
2	Horizontal Motor (R) 驅動輪馬達(右)	U6-EarthU U6-接地	More than 10MΩ 多過 10MΩ	More than MΩ 多過 250MΩ	OK

5. Paint thickness inspection

油漆膜厚檢查

Note) · A measuring point measures five arbitrary different places. Unit : μm

注解) · 一個測量點測量五個任意不同的地方。單位 : μm



No. 項次	Item 項目	Standard 標準	Check point 檢查點					Judgment 檢測結果
			1	2	3	4	5	
1	Cross beam 橫樑	Front 前面	589	562	794	696	519	OK
		Rear 後面	525	613	756	482	486	OK
		Upper 頂端	531	556	688	684	420	OK
		Lower 底部	380	335	441	443	431	OK
2	Wheel carriage 輪架	Front 前面	379	508	539	403	344	OK
		Rear 後面	445	498	419	387	323	OK
		Upper 頂端	331	320	598	465	347	OK
		Lower 底部	346	384	288	432	303	OK

6. Colour Check

顏色檢查

No. 項次	Item 項目	Colour Code 顏色代碼	Measurement 測量	Judgment 檢測結果
1	Wheel carriage 輪架	Gray Semi-gloss 灰色 (半光澤)	No. 5400F #38 Semi-gloss	OK
2	Safety hoop 安全箍	Gray Semi-gloss 灰色 (半光澤)	No. 5400F #38 Semi-gloss	OK