

工業用電動起重車、堆高車及搬運車安規驗證市場分析報告	頁次
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工業用電動起重車、堆高車及搬運車驗證市場分析報告

一、重要元件

- 1) 電池/充電器
- 2) 馬達/馬達控制器/剎車
- 3) 電路控制與其零件(開關/燈/線材)

二、美洲 UL 電動車市場驗證分析

- 1) 驗證要求 UL583 內容要求, 參照 3.)
- 2) 個別零件要執行 UL 相關標準驗證
 - a.) 鋰電池必須符合 Electric Vehicles, UL 2580 或 Light Electric Vehicle (LEV) UL 2271.
 - b.) 馬達/馬達控制器須符合 Rotating Electrical Machines - General Requirements, UL 1004-1.
 - c.) 個別零件若未申請 UL, 必須得由最終產品 Lift Truck 驗證者吸收
- 3.) 工廠現場執行目擊整機測試:
 - a.) 安全重要零件、外殼與材料, 須適合使用.
 - b.) 報價未含差旅與食宿費
 - c.) 報價未含相關其他國家安規證書.
 - d.) 不得使用替代品(No alternate components are employed)
 - e.) Each line item above is a separate phase of the Service(s) and is optional and independent of the completion of the previous phase(s). Your written acceptance will be required to proceed to the next phase(s) of the Service(s) and each phase will be governed by this Quotation and the referenced terms and conditions. Final certification, if applicable, is contingent on the successful completion of all phases and compliance with UL Requirements.
 - f.) This Quote anticipates that all requested information and/or samples necessary to proceed with the evaluation will be available within 60 days from the time they have been requested.
 - g.) This Quote includes the cost of a predetermined set of testing. In the event of testing nonconformance, a summary of the testing results and cost for the additional evaluation will be provided. A separate project may be issued to cover the retesting.
 - h.) Additional cost will be required for any change of scope and/or rework, once the project is established.
 - i.) During the course of the evaluation, if requested information and/or samples are unavailable for more than 60 days,

preventing work from continuing, we will close the project and bill for the charges incurred. A new project will be established when all necessary items are available.

- j.) This quotation includes representative testing in order to provide a lower project cost limit and reduce sample requirements. Upon completion of the Phase 1 - Construction Review/Pre-Testing, if it is determined additional testing is required, additional costs may be necessary.
- k.) Where testing is conducted at Lab outside UL, the client is required to cover the charges for Lab either on their own or as an additional charge above the cost limit.
- l.) This quote excludes costs or fees associated with services of outside contractors or test facilities and certain special equipment charges. Completion time assumes that the outside contractor and test facilities, when necessary, will be available within the timeframe allotted.
- m.) In accordance with UL's Data Acceptance Program (DAP), UL retains the right to request that a test or test program be repeated at UL or under UL witness after review of submitted data. Additional charges may apply.

All test equipment utilized during a factory visit that is provided by the client must have the proper calibration certificates submitted for review and verified for compliance prior to the arrival of the project handler.

Devices or materials utilized for testing and/or certification must be UL Certified and bear the appropriate UL Mark, while meeting the requirements outlined in the product standard being used for this evaluation. Any device or material that does not conform to these requirements may be subject to additional evaluation, prior to being utilized for testing in this project.

- n.) Assumes the client can provide a sample(s) of each (Model AC F2-T Series & AC F2-D Series) unit for evaluation purposes.

Assumes the client can provide electrical schematics, voltage

maps, and printed wiring board layout drawings (in English).

Assumes the client can provide adequate samples to complete all testing required at client's site.

Assumes the client can provided the necessary connections to allow us to function the controller as it is intended in the end use application.

o.) Assumes the client can provide a sample(s) of each (Model AC

Assumes the following tests to be conducted:

- 1.) Input Test - Components (Conduct both at DC and AC application)
- 2.) Temperature Test - Components (Conduct both at DC and AC application)
- 3.) Dielectric Withstand Test - Components
- 4.) Solid State Circuitry Test
- 5.) Low-voltage Limited Energy Circuit Measurements
- 6.) Ball Impact Tests
- 7.) Mold Stress Relief Test

Assumes we will test a model from the AC F2-T Series and a model from the AC F2-D Series to represent all models.

Assumes Model AC F2-T 48-240-240 will be tested and used to represent the AC F2-T (Pump) Series.

Assumes Model AC F2-D 48-240 will be tested and used to represent the AC F2-D (Traction) Series.

Assumes no unlisted component evaluations.

三、歐洲電動車市場驗證分析

1) 引用最終產品 Lift Truck 或 Forklift 機械指令 2006/42/EC 危險機械類 Annex IV 執行驗證, 使用規範, 可能包括:

A. 歐盟安規

a.) EN 12100 : 2010

Safety of machinery - General principles for design - Risk assessment and risk reduction

b.) ISO 13849-1 :2015

Safety of machinery — Safety- related parts of control systems
Part 1: General principles for design

IEC Guide 115 2007

Application of uncertainty of measurement to conformity assessment activities in the electrotechnical sector

c.) IEC 61508-1:2010

Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 1: General requirements

d.) IEC 61508-2:2010

Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems.

e.) IEC 61508-3:2010

Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 3: Software requirements

f.) IEC 61508-4:2010

Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 4: Definitions and abbreviations.

g.) IEC 62061:2015:

Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems

h.) EN 61800-5-1:2007+A1:2017

Adjustable speed electrical power drive systems —Part 5-1: Safety requirements —Electrical, thermal and energy

i.) EN 61800-5-2:2017

Adjustable speed electrical power drive systems. Safety requirements. Functional

j.) EN1175-1:1998+A1:2010

Safety of industrial trucks-Electrical requirements-Part 1: General requirements for battery powered trucks

k.) EN280:2013

Mobile elevating work platforms-Design calculations- Stability criteria - Construction - Safety- Examinations and tests.

l.) IEC 60204-1:2016

Safety of machinery - Electrical equipment of machines - Part 1: General requirements

B. 歐盟 EMC 電磁相容

a.) EN 61800-3:2018

Adjustable speed electrical power drive systems. EMC requirements and specific test methods

b.) EN12895:2015

Industrial Trucks- Electromagnetic compatibility

c. EN61000-6-2:2016

Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments

d. EN61000-6-4:2018

Industrial Trucks- Electromagnetic compatibility

2.) 個別零件要執行 CE 電動車相關標準驗證

a.) 鋰電池 48V ac 必須符合: RoHS 及 Reach

b.) 馬達 31V ac 必須符合 : RoHS 及 Reach

c.) 48V ac 馬達控制器, 須引用最終產品 Lift Truck 及

Forklift 危險機械類 2006/42/EC 機械指令, Annex IV 執行驗證, 可能引用標準, 如上述 1.) 所述

3.) 工廠現場執行目擊整機測試

必須根據 2006/42/EC 危險機械類 Annex IV 執行驗證測試

四、實務驗證

- A. Lift truck 或 Forklift 等成品驗證必須個別獨立執行測試驗證
- B. 必須備妥所有相關元件安規證書或執行個別元件驗證
- C. 須備妥所有測試設備進行目擊現場測試

五、結論

根據四、實務驗證

申請安規, 包括整機或元件均須個別於獨立整機上執行測試驗證, 此項工程浩大, 牽涉包括: 時間、金錢及相關供應鏈產業. 單打獨鬥將使台灣工業用電動車產業鏈失去競爭力

台灣相關供應鏈產業, 相對落後於中國、日本、義大利、加拿大及韓國, 必須利用最終成品驗證機會, 同時加入相關供應鏈產品, 方可有機會節省驗證成本並在最短的時間內, 集結產業鏈, 趕上工業用電動產業的熱潮

建議:

- A. 以 Lift truck 或 Forklift 最終成品製造廠商、Motor Controller 或馬達廠為中心, 聯繫相關供應鏈業者, 成立一專業實驗室執行驗證測試
- B. 邀集所有可能應用 Lift truck 或 Forklift 相關元件廠商, 包括:
 - 1) 電池/充電器
 - 2) 馬達/馬達控制器/剎車
 - 3) 電路控制與其零件(開關/燈/線材)於驗證 Lift truck 或 Forklift 等成品時, 即加入備用替代品驗證

附件一

UL 驗證美洲市場分析

一、Category code: YCFT2 (Motor Controller)

YCFT2 Industrial Truck Accessories, Battery Powered – Component 市場概況

USA	Italy	Japan	Mexico	Netherland	Korea	Sweden	China
59	12	4	3	2	6	2	5
Germany	Canada	Czech	Finland	France	India	Taiwan	
6	3	1	1	1	1	2	

Japan: Toyota/Mitubishi: Motor controller

Mexico: Motor

Korea: DC Converter/AC motor/Steering Controller

Sweeden: Vehicle master controller

二、最終產品

1. XWJV :Trucks, Electric-battery-powered) Trucks, Industrial, Type E: 22 家

USA	Italy	Canada	Korea	China
15	1	2	3	1

2. XWXT :Trucks, Electric-battery-powered) Trucks, Industrial, Type EE 24 家

USA	Italy	Canada	Korea	China	Japan
16	1	2	3	1	1

3. XVVX: This category covers electric-battery-powered industrial trucks classed as Types E, CGH, E or CGH, EE or ES. 0 家

Types of industrial trucks have been certified only as to fire and electric shock hazards for use in locations defined in ANSI/NFPA 505, "Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations."

Unless marked to indicate otherwise, industrial trucks are tested on a course having a ramp with a 5% minimum grade.

附件二

歐洲 TUV 萊茵驗證市場分析

3 Advanced Search Results

PRODUCTS
 APPLICATIONS
 FS/CS MANAGEMENT PROCESSES

Keywords:
 Filter by Certificate: EC Type-Examination Certificate (Machinery Directive)

Product Categories:

Grid Automation

Inspections

Logic Units

Nuclear Components of Safety I&C and Reactor I

Safety Components for Lift Applications

Safety Instrumented Systems / SRECS / Safety F

Sensors, Transmitters, Guards

Software

Compact Controllers

Relay Safety Modules

Safety PLCs

Power Drive Systems (safety-related)

Monitoring Devices

Muting Modules

Solid State Controllers

Controllers

Input / Output Modules

Bus Modules

Certificate/Reg.-No.	Certificate Holder	Product Category	Product Tested	Type Designation	Details	PDF
01/205/0676.02/20	OMRON Corporation	Logic Units → Safety PLCs	Pressure Sensitive Protective Devices to detect the presence of persons consisting of Safety Mat Controller in conjunction with pressure sensitive safety mats	Mat Controller: MC3	<input type="button" value="🔍"/>	<input type="button" value="📄"/>
01/205/5462.01/21	Rockwell Automation Asia Pacific Business Center Pte. Ltd.	Logic Units → Safety PLCs	Safety-Related Programmable Logic Controller	Compact GuardLogix 5370 (L3yS) SIL 3 Controller Family as listed in	<input type="button" value="🔍"/>	<input type="button" value="📄"/>
01/205/5462.00/16 ✖ expired	Rockwell Automation Asia Pacific Business Center Pte. Ltd.	Logic Units → Safety PLCs	Safety-Related Programmable Logic Controller Compact	Compact GuardLogix L3yS Family as listed in the actual "Compact	<input type="button" value="🔍"/>	<input type="button" value="📄"/>

281 Advanced Search Results

PRODUCTS
 APPLICATIONS
 FS/CS MANAGEMENT PROCESSES

Keywords:
 Filter by Certificate:

Product Categories:

- Field Buses
- Grid Automation
- Inspections
- Logic Units
- Nuclear Components of Safety I&C and Reactor I
- Safety Components for Lift Applications
- Safety Instrumented Systems / SRECS / Safety F
- Sensors, Transmitters, Guards
- Compact Controllers
- Relay Safety Modules
- Safety PLCs
- Power Drive Systems (safety-related)
- Monitoring Devices
- Muting Modules
- Solid State Controllers

Certificate/Reg.-No.	Certificate Holder	Product Category	Product Tested	Type Designation	Details	PDF
01/205/5215.01/17	Vacon S.R.L.	Logic Units → Power Drive Systems	Safety function "Safe Torque Off (STO)" within Adjustable	Vacon 20 AC Drive VACON0020-3L-a-b-c +d +e		
01/205/5812.00/20	Vahle Automation GmbH	Logic Units → Power Drive Systems	Integrierte Antriebssicherheitsfunktionen	VCS-SMG-SAFE, 1-xxxx		
01/205/5579.01/19 X expired	WAT MOTOR SANAYI VE TICARET A.Ş.	Logic Units → Power Drive Systems	Integrated Safety Function STO within the ARF-WD74 series	ARF-WD74-012SC-EC, ARF-WD74-022SC-EC, ARF-WD74-		
01/205/5580.01/19	WAT MOTOR SANAYI VE TICARET A.Ş.	Logic Units → Power Drive Systems	Safety function "Safe Torque Off" (STO) within the Inverter	ARF-WF84-00023-2-60, ARF-WF84-00038-2-60, ARF-WF84-		
01/205/5493.00/16 X expired	WEG DRIVES & CONTROLS - AUTOMAÇÃO LTDA	Logic Units → Power Drive Systems	Safety Function "Safe Torque Off" (STO)	Safety Module SSC 1.00 within the SCA06 Servo Drive series,		
01/205/5723.00/19	WEG DRIVES & CONTROLS - AUTOMAÇÃO LTDA	Logic Units → Power Drive Systems	Safety Functions "Safe Torque Off (STO)" and "Safe Stop 1"	Safety Module CFW500-SFY2 for the CFW5XX inverter series.		
01/205/5723.01/20	WEG DRIVES & CONTROLS - AUTOMAÇÃO LTDA	Logic Units → Power Drive Systems	Safety Functions "Safe Torque Off (STO)" and "Safe Stop 1"	Safety Module CFW500-SFY2 for the CFW5XX inverter series.		
01/205/5135.01/17	WEG Equipamentos Elétricos S.A. - Automação	Logic Units → Power Drive Systems	Safety Function "Safe Torque Off (STO)" within Frequency	Frequency Inverter Types: CFW11, CFW70x, CFW11M Series		
01/205/5288.01/15 X expired	ZIEHL-ABEGG SE	Logic Units → Power Drive Systems	Safety Function STO, Safe Stop (Stop Category 0)	ZETADYN 4C / ZAdyn 4C Drive Family (for details see revision		
01/205/5288.02/17	ZIEHL-ABEGG SE	Logic Units → Power Drive Systems	Safety Function STO, Safe Stop (Stop Category 0)	ZETADYN 4C / ZAdyn4C / ZAdynpro Drive Family (für		

Remark: In case of missing entries this is due to restrictions by the certificate holder Top of Page ^

8 Advanced Search Results

PRODUCTS
 APPLICATIONS
 FS/CS MANAGEMENT PROCESSES

Keywords:
 Filter by Certificate:

Product Categories:

- Field Buses
- Grid Automation
- Inspections
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- Nuclear Components of Safety I&C and Reactor I
- Safety Components for Lift Applications
- Safety Instrumented Systems / SRECS / Safety F
- Sensors, Transmitters, Guards
- Compact Controllers
- Relay Safety Modules
- Safety PLCs
- Power Drive Systems (safety-related)
- Monitoring Devices
- Muting Modules
- Solid State Controllers

Certificate/Reg.-No.	Certificate Holder	Product Category	Product Tested	Type Designation	Details	PDF
01/205/5578.01/19	Delta Electronics, Inc.	Logic Units → Power Drive Systems	Safety Function "Safe Torque Off"	MH300 series: VFDXXXMHXXXXSXA		
01/205/5578.02/20	Delta Electronics, Inc.	Logic Units → Power Drive Systems	Safety Function "Safe Torque Off"	MH300 series: VFDXXXMHXXXXSXA		
01/205/5578.00/17	Delta Electronics, Inc.	Logic Units → Power Drive Systems	Safety Function "Safe Torque Off"	MH300 series: VFDXXXMHXXXXSXA		
01/205/5738.00/19	Delta Electronics, Inc.	Logic Units → Power Drive Systems	Safety Function "Safe Torque Off" (STO)	VFD-ED-S series drive Details see actual "Revision List"		
01/205/5664.01/19	Delta Electronics, Inc.	Logic Units → Power Drive Systems	Safety Function "Safe Torque Off" (STO)	Within the ASD-A2 series and ASD-A3 series drive		
01/205/5429.04/19	Delta Electronics, Inc.	Logic Units → Power Drive Systems	Safety Function "Safe Torque Off" (STO)	Within the C2000, C2000 Plus, C2000-HS, CT2000, CH2000,		
01/205/5664.00/18	Delta Electronics, Inc.	Logic Units → Power Drive Systems	Safety Function "Safe Torque Off" (STO)	within the drive series ASD-A2 Details see Annex (Version		
01/205/5429.03/19	Delta Electronics, Inc.	Logic Units → Power Drive Systems	Safety Function "Safe Torque Off" (STO)	Within the drive series VFD-CP, DPD-K and VFD-CFP		

3類產品證書未註明： 2006/42/EC指令

TUV 證書查詢結論:

1. 應用於機械指令 2006/42/EC 的證書, 僅限於零件 Relay, Converter, safety related module, 而且僅限用於 EN81, 並無 lift truck 或 forklift 等應用的 EN1175-1 及 EN280 最終產品驗證, Lift 最終成品為非機械指令產品
2. Logic Units 查詢結果
 - a. Safety PLC(只有 3 家): 無 48V ac 相關產品應用於 lift truck 產品上
 - b. Power Drive System(281 家): 大部分應用於高壓(我無法查出 48V ac 相關產品應用)
3. 猜測報價高昂原因:
 - a. TUV 萊茵尚未有機械指令 2006/42/EC 的 lift truck 或 forklift 最終產品驗證經驗
 - b. 指令或安全標準要求未明確, 導致執行機械指令 2006/42/EC 的 ISO 13849-1 真的需參照許多規範, 或
 - c. 貿易障礙