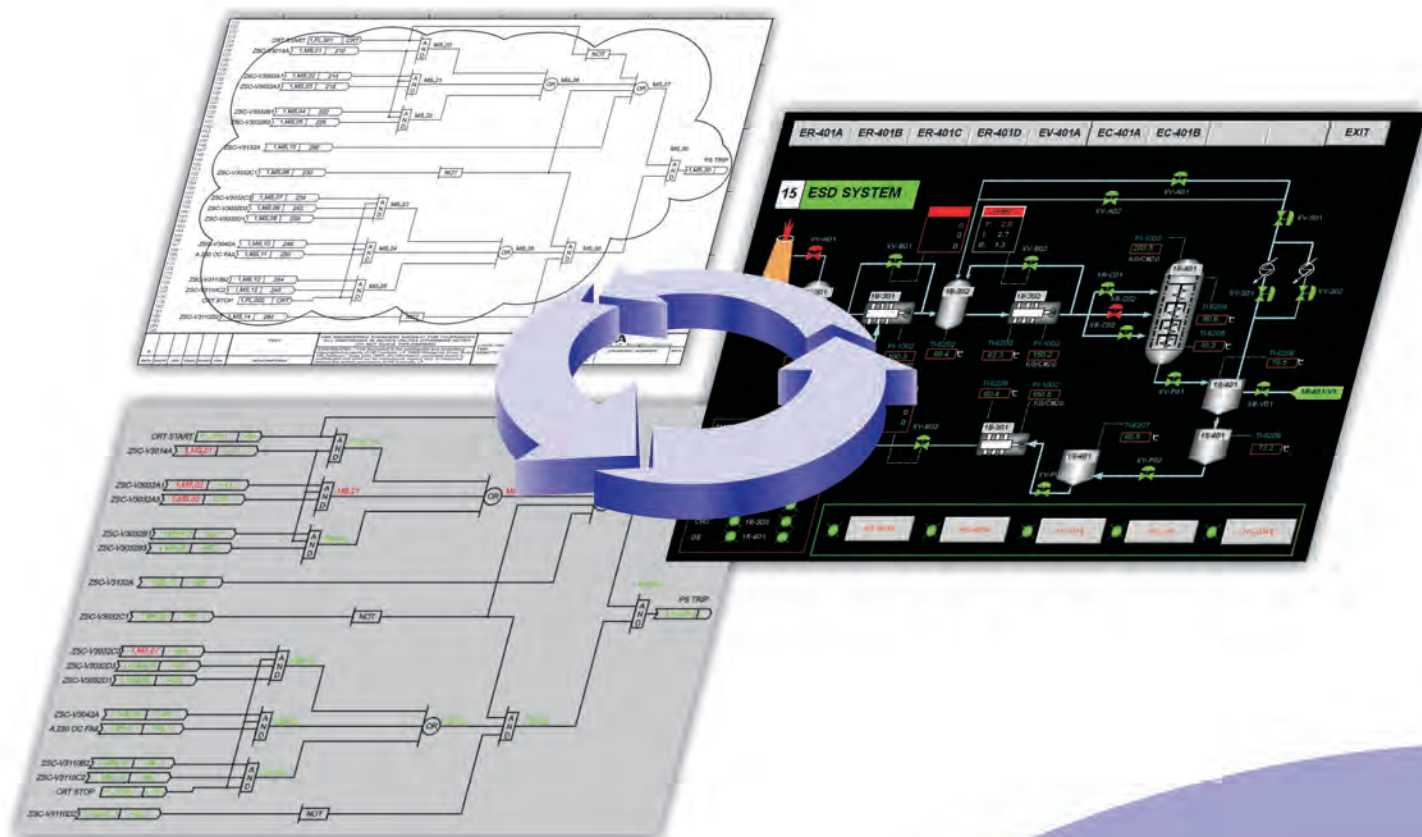




安全控制系統 SAFETY CONTROL SYSTEM

SCS-2000



台灣塑膠工業股份有限公司
FORMOSA PLASTICS CORPORATION

電子專案組
ELECTRONICS GROUP

架構圖

Architecture

具使用實績的安全系統

Proven-In-Use technology

核電廠廣泛使用

Widely used in nuclear industry

通過化學製程及鍋爐之安全認證

Safety certification for chemical process (IEC-61508 Rev 2 & IEC-61511) and boiler (NFPA 85)

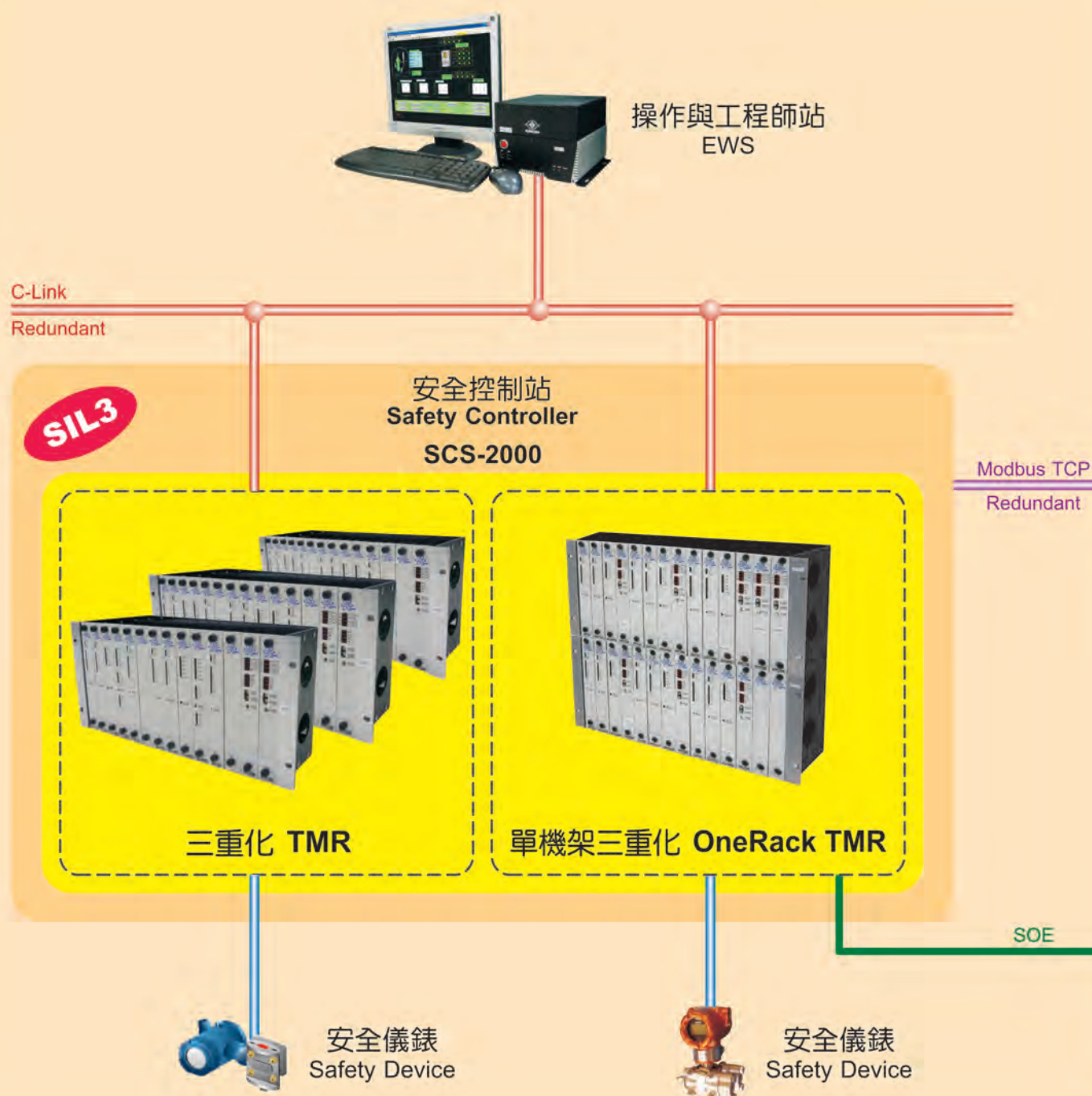
三重化冗餘架構

Triple Module Redundancy (TMR)

硬體容錯能力較二重化高

Higher hardware fault tolerance than DMR

安全系統 SAFETY SYSTEM



易於檢查及驗證

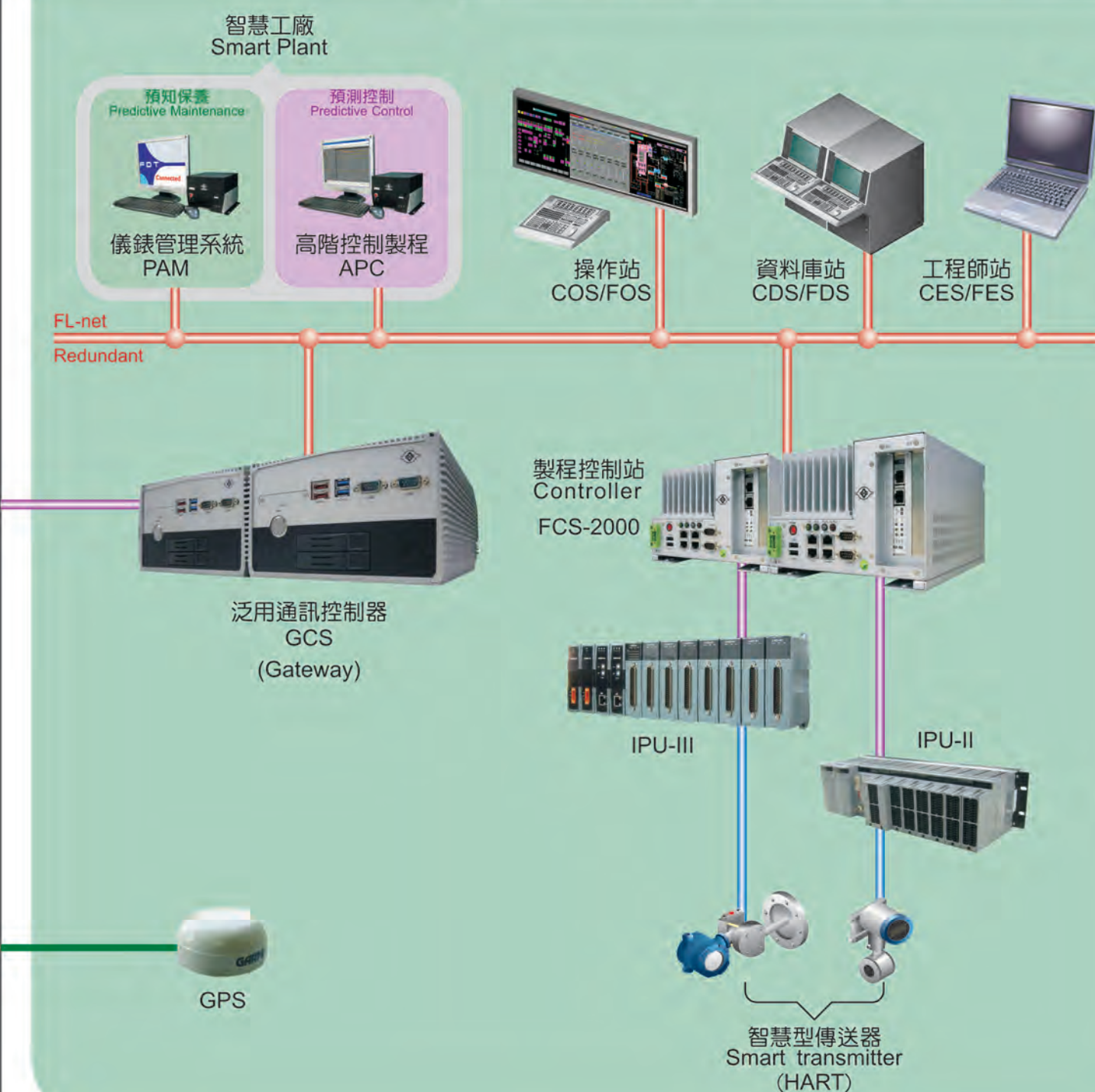
Verification and Validation

實際控制邏輯可於人機顯示
Logic diagram = Control process

FCS: FORMOSA Control Station
COS/FOS: CX/FX Operator Station
CDS/FDS: CX/FX Database Station
CES/FES: CX/FX Engineering Station
GCS: Generic Communication Station

PAM: Plant Asset Management
APC: Advanced Process Control
EWS: Engineering Workstation
DMR: Dual Module Redundancy
TMR: Triple Module Redundancy
SOE: Sequence of Event

控制系統 CONTROL SYSTEM

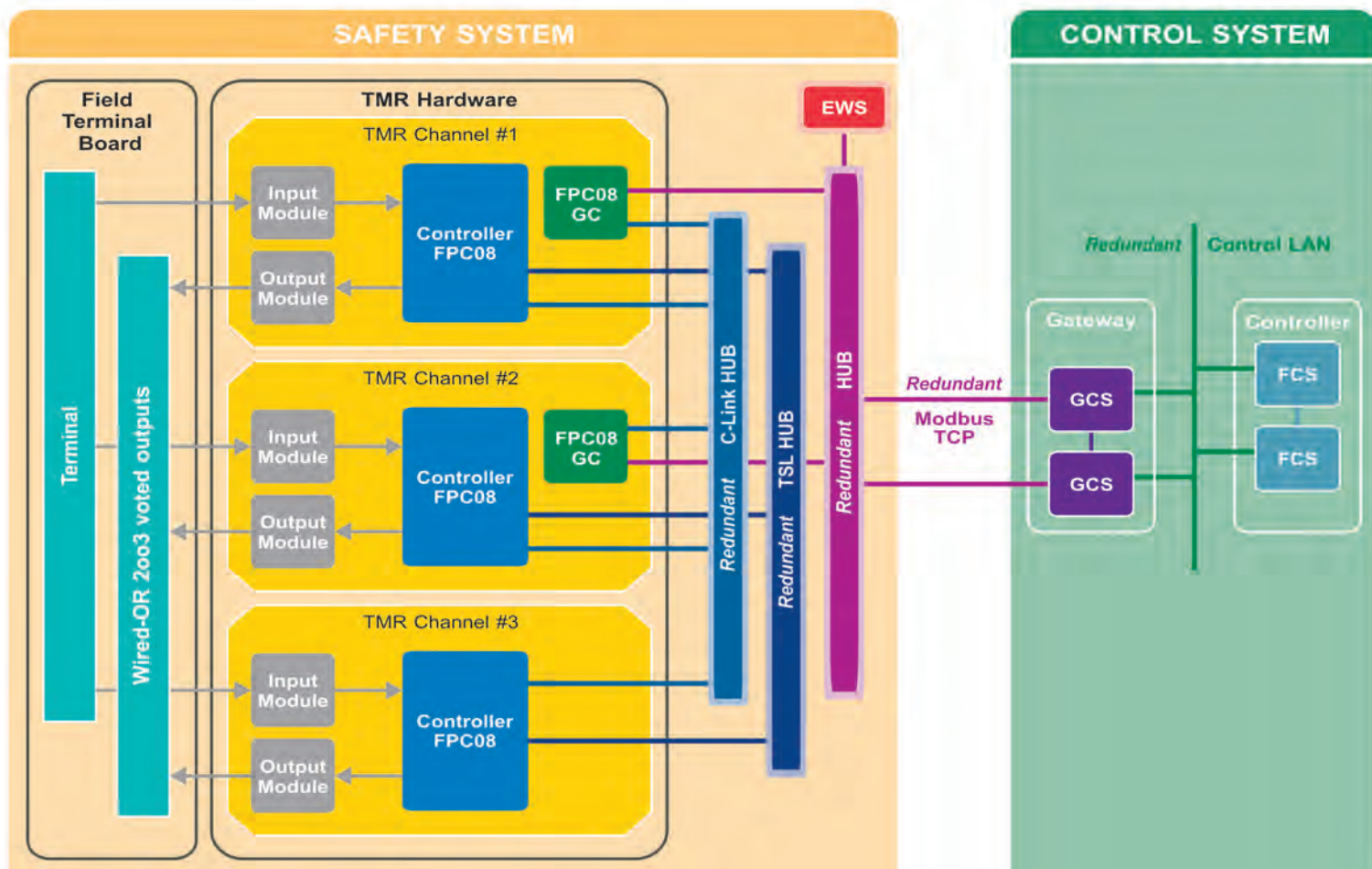


三重化

Triple Module Redundancy

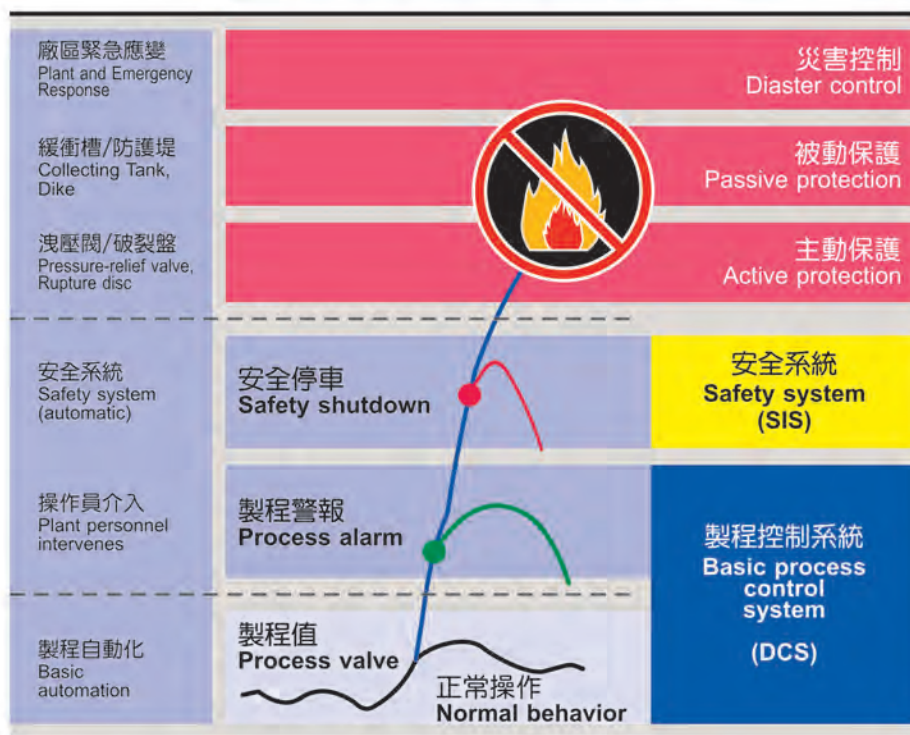
三重化採三選二投票表決，硬體容錯能力高於二重化系統

The TMR of SCS-2000 votes 2oo3 (2 out of 3) and the hardware fault tolerance is higher than DMR



三重化系統可達SIL3等級，降低1千至1萬倍之風險

The TMR of SCS-2000 supports up to SIL3 reducing risk by 1000-10000 times



當製程偏離正常DCS操作範圍時，安全儀錶系統SIS立刻執行緊急遮斷，避免災害發生。

If process out of control, the SIS (Safety Instrumented Systems) bring process back to safe state.

安全需求規範 Safety Requirement Specification (SRS)		
安全完整性等級 Safety Integrity Level	低需求模式操作失效率 Probability of failure on demand (PFD) per year	風險降低因子 Risk Reduction Factor = 1/PFD
SIL4	$\geq 10^{-5}$ to $< 10^{-4}$	10 000 to 100 000
SIL3	$\geq 10^{-4}$ to $< 10^{-3}$	1 000 to 10 000
SIL2	$\geq 10^{-3}$ to $< 10^{-2}$	100 to 1 000
SIL1	$\geq 10^{-2}$ to $< 10^{-1}$	10 to 100

簡化IEC61511安全生命週期
Simplify the Safety Lifecycle in IEC 61511

危害風險及評估
Harzard and Risk
Assessment

分配
安全功能
至各保護層

擬定安全儀錶安全需求規範
Safety Requirements Specification (SRS)
for the Safety Instrumented System (SIS)

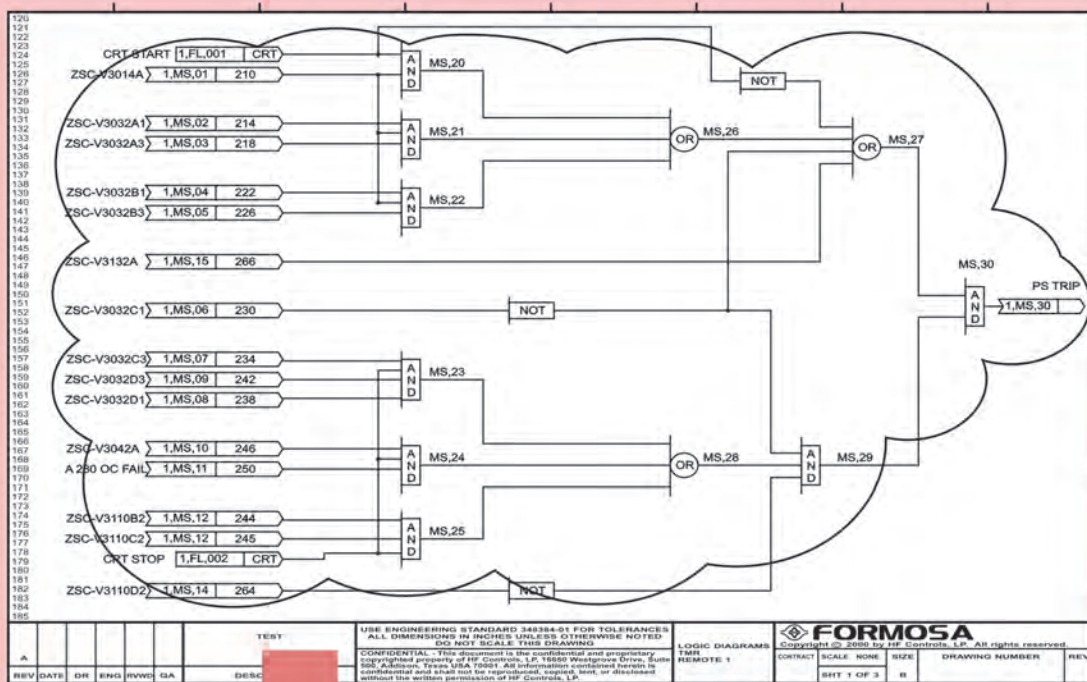
Allocation of Safety Functions to
Protection Layers

安全儀錶系統之設計及工
Design and Engineering of
Safety Instrumented System

其他風險降低方法之設計
Design and Development of
means of risk reduction

分析 ANALYSIS

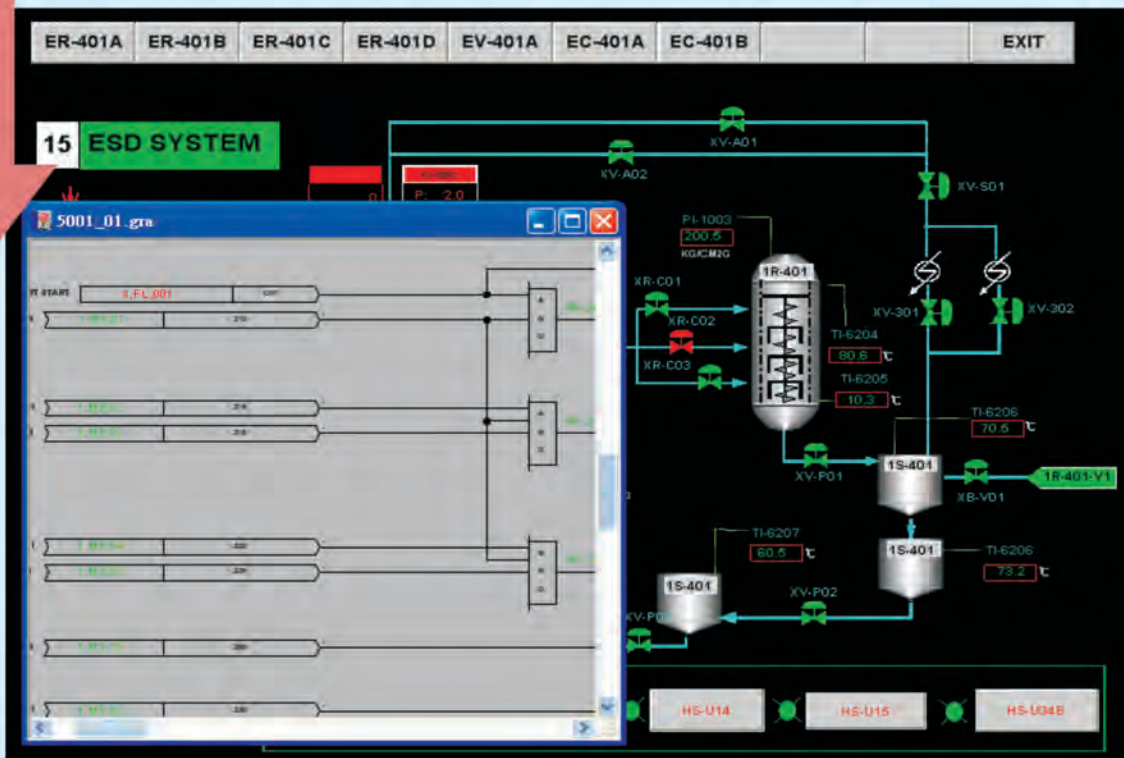
實現



邏輯設計於AutoCAD
上完成
Logic are designed on
AutoCAD

自動轉成控制邏輯與邏輯圖

Automatically converted to control code and logic diagram



邏輯圖可顯示觸發
原因於操作畫面
Logic diagram with
diagnostic & dynamic
display on the operation
screen

操作圖面可顯示邏輯圖，且100%等於實際製程邏輯，不會因設計變更產生不一致，便於第三方檢證
The Logic diagram 100% the same as control process of controller and compliant even after modification

程

(SIS)
及開發
other

安裝，試車及確認
Installation, Commissioning
and Validation

操作維護
Operation and
Maintenance

系統修改
Modification

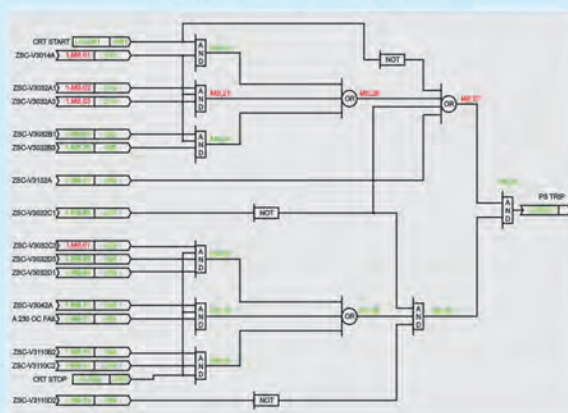
系統除役
Decommissioning

REALIZATION

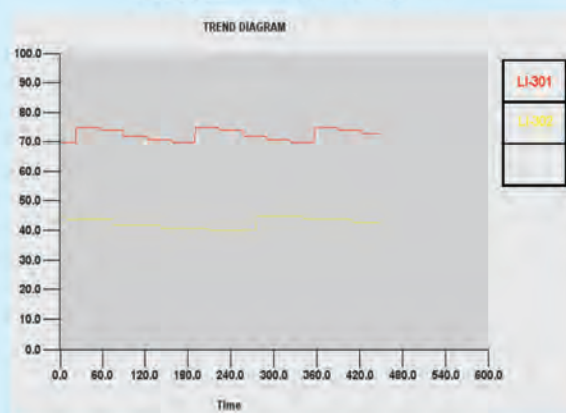
操作 OPERATION

操作維護畫面 OPERATOR SCREEN

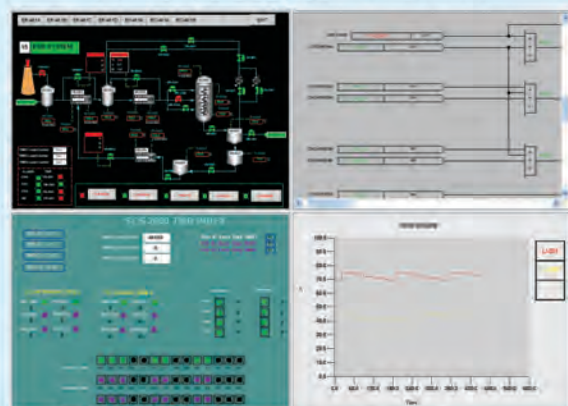
邏輯圖 Logic diagram



趨勢圖 Trend diagram



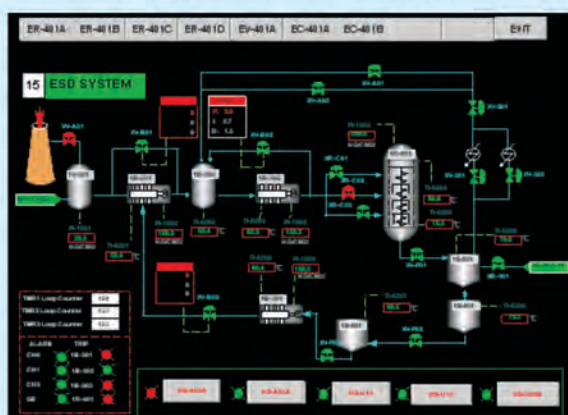
同一螢幕四分割 Multi screen



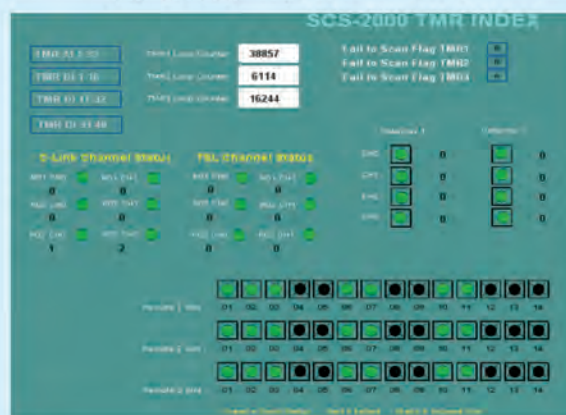
警報履歷 Historical alarm

Alarm No.	Alarm Date	Alarm Name	Description	Value	State
223	14/11/11 00:00:01	1.1.1.1	space	0	OFF
224	14/11/11 00:00:01	1.1.1.2	space	0	OFF
225	14/11/11 00:00:01	1.1.1.3	REMOTE 2 ON C LINK	1	ON
226	14/11/11 00:00:01	1.1.1.4	REMOTE 2 ON C LINK	1	ON
227	14/11/11 00:00:01	1.1.1.5	REMOTE 2 ON C LINK	1	ON
228	14/11/11 00:00:01	1.1.1.6	REMOTE 2 ON C LINK	1	ON
229	14/11/11 00:00:01	1.1.1.7	REMOTE 2 ON C LINK	1	ON
230	14/11/11 00:00:01	1.1.1.8	REMOTE 2 ON C LINK	1	ON
231	14/11/11 00:00:01	1.1.1.9	REMOTE 2 ON C LINK	1	ON
232	14/11/11 00:00:01	1.1.1.10	REMOTE 2 ON C LINK	1	ON
233	14/11/11 00:00:01	1.1.1.11	REMOTE 2 ON C LINK	1	ON
234	14/11/11 00:00:01	1.1.1.12	REMOTE 2 ON C LINK	1	ON
235	14/11/11 00:00:01	1.1.1.13	REMOTE 2 ON C LINK	1	ON
236	14/11/11 00:00:01	1.1.1.14	REMOTE 2 ON C LINK	1	ON
237	14/11/11 00:00:01	1.1.1.15	REMOTE 2 ON C LINK	1	ON
238	14/11/11 00:00:01	1.1.1.16	REMOTE 2 ON C LINK	1	ON
239	14/11/11 00:00:01	1.1.1.17	REMOTE 2 ON C LINK	1	ON
240	14/11/11 00:00:01	1.1.1.18	REMOTE 2 ON C LINK	1	ON
241	14/11/11 00:00:01	1.1.1.19	REMOTE 2 ON C LINK	1	ON
242	14/11/11 00:00:01	1.1.1.20	REMOTE 2 ON C LINK	1	ON
243	14/11/11 00:00:01	1.1.1.21	REMOTE 2 ON C LINK	1	ON
244	14/11/11 00:00:01	1.1.1.22	REMOTE 2 ON C LINK	1	ON
245	14/11/11 00:00:01	1.1.1.23	REMOTE 2 ON C LINK	1	ON
246	14/11/11 00:00:01	1.1.1.24	REMOTE 2 ON C LINK	1	ON
247	14/11/11 00:00:01	1.1.1.25	REMOTE 2 ON C LINK	1	ON
248	14/11/11 00:00:01	1.1.1.26	REMOTE 2 ON C LINK	1	ON
249	14/11/11 00:00:01	1.1.1.27	REMOTE 2 ON C LINK	1	ON
250	14/11/11 00:00:01	1.1.1.28	REMOTE 2 ON C LINK	1	ON
251	14/11/11 00:00:01	1.1.1.29	REMOTE 2 ON C LINK	1	ON
252	14/11/11 00:00:01	1.1.1.30	REMOTE 2 ON C LINK	1	ON
253	14/11/11 00:00:01	1.1.1.31	REMOTE 2 ON C LINK	1	ON
254	14/11/11 00:00:01	1.1.1.32	REMOTE 2 ON C LINK	1	ON
255	14/11/11 00:00:01	1.1.1.33	REMOTE 2 ON C LINK	1	ON
256	14/11/11 00:00:01	1.1.1.34	REMOTE 2 ON C LINK	1	ON
257	14/11/11 00:00:01	1.1.1.35	REMOTE 2 ON C LINK	1	ON
258	14/11/11 00:00:01	1.1.1.36	REMOTE 2 ON C LINK	1	ON
259	14/11/11 00:00:01	1.1.1.37	REMOTE 2 ON C LINK	1	ON

製程圖 Process diagram



系統狀態 System condition



通過美國核能級與歐州功能安全標準雙認證
Certified with both USNRC and IEC61508 Functional safety standards

IEC61508 2010年第二版證書
IEC61508 2010 Rev2 Certificate License

USNRC EPRI 核能級儀控系統證書
USNRC EPRI 107330 Certificate



**ZERTIFIKAT
CERTIFICATE**

No.: 968/EZ 578.00/13

Product tested	SCS-2000 Safety Controller System (TMR)	Certificate holder	Institute of Nuclear Energy Research No. 1000, Werhwa Rd 32546 Jiaan Village, Longtan Township, Taoyuan County, Taiwan, R.O.C.
Type designation	SCS-2000 with FPC08 Controller	Manufacturer	Doosan/HF Controls Corporation 1624 West Crosby, Suite#124 Carrollton, TX 75006 USA
Codes and standards forming the basis of testing	IEC 61508 Parts 1-7:2010 IEC 61131-2:2007 IEC 61326-3-1:2008		IEC 61511 Parts 1-3:2004 EN 50158-1:2004 NFPA 65:2011
Intended application	The SCS-2000 Safety Control System (TMR) complies with the requirements of the relevant standards (SIL 3 acc. to IEC 61508) and can be used in applications up to SIL 3. The SCS-2000 TMR can also be an element or sub-system within a safety instrumented system for the process industry sector.		
Specific requirements	For the use of the SCS-2000 Safety Control System (TMR) the installation instruction (released by INER), including recommendations for risk assessment and requirements for maintenance shall be considered.		
This certificate is valid until 2018-06-28			

The issue of this certificate is based upon an examination, whose results are documented in report no. 968/EZ 578.00/13 dated 2013-06-28.
This certificate is valid only for products which are identical with the product tested. It becomes invalid at any change of the codes and standards forming the basis of testing for the intended application.

TÜV Rheinland Industrie Service GmbH
Bereich Automation
Funktionsale Sicherheit
Am Grauen Stein, 51105 Köln

Köln, 2013-06-28

Certification Body for FS-Products

H. Gall
Dipl.-Ing. Heinz Gall



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 27, 2011

Mr. Allen Hsu
HF Controls Corporation
1624 West Crosby Road
Suite 124
Carrollton, TX 75006

SUBJECT: FINAL SAFETY EVALUATION FOR DOOSAN HF CONTROLS CORPORATION
HFC-6000 SAFETY SYSTEM TOPICAL REPORT (TAC NO. MD8462)

Dear Mr. Hsu:

By letter dated March 5, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML080780168), Doosan HF Controls Corporation (HFC) submitted the HFC-6000 Safety System Topical Report (TR) to the U.S. Nuclear Regulatory Commission (NRC) staff for review. By letter dated February 15, 2011, an NRC draft safety evaluation (SE) regarding our approval of the HFC-6000 Safety System TR was provided for your review and comments. By letter dated March 11, 2011 (ADAMS Accession No. ML110760426), HFC commented on the draft SE. The NRC staff's disposition of HFC's comments on the draft SE are discussed in the attachment to the final SE enclosed with this letter.

The NRC staff has found that HFC-6000 Safety System TR is acceptable for referencing in licensing applications for nuclear power plants to the extent specified and under the limitations delineated in the TR and in the enclosed final SE. The final SE defines the basis for our acceptance of the TR.

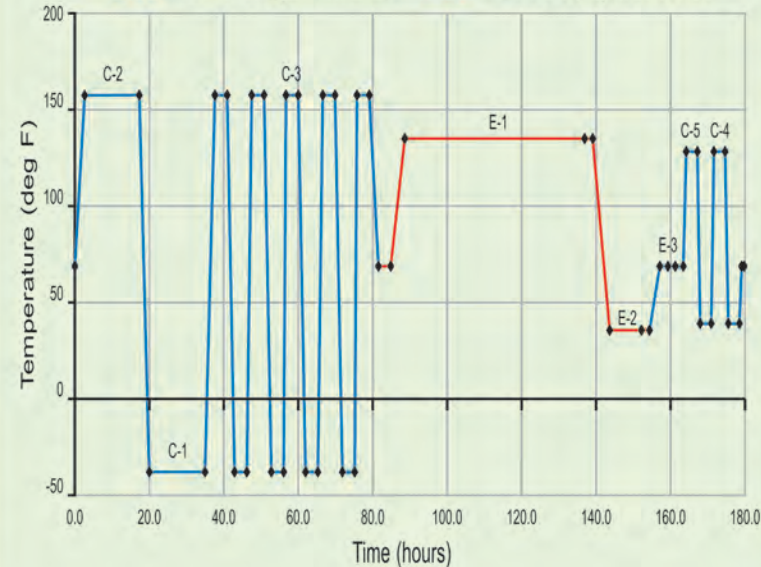
Our acceptance applies only to material provided in the subject TR. We do not intend to repeat our review of the acceptable material described in the TR. When the TR appears as a reference in license applications, our review will ensure that the material presented applies to the specific plant involved. License amendment requests that deviate from this TR will be subject to a plant-specific review in accordance with applicable review standards.

In accordance with the guidance provided on the NRC website, we request that HFC publish accepted proprietary and non-proprietary versions of this TR within three months of receipt of this letter. The accepted versions shall incorporate this letter and the enclosed final SE after the title page. Also, they must contain historical review information, including NRC requests for additional information and your responses. The accepted versions shall include an "A" (designating accepted) following the TR identification symbol.

核級與歐洲雙標準環境耐受測試

TÜV and EPRI Environmental Stress Test

Blue = TÜV Requirements Red = EPRI Requirements



核級與歐洲雙標準EMC電磁耐受測試

TÜV and EPRI EMC Tests

EMC Test Name	Title	IEC Standard	Compatible MIL-STD-461E
ESD1	Electrostatic Discharge Immunity	IEC 61000-4-2	—
REF1	Immunity to radiated, RF, EM fields amplitude modulated	IEC 61000-4-3	RS103
CRI1	Immunity to conducted disturbances induced by RF	IEC 61000-4-6	CS114
BURST1	Electrical fast transient immunity	IEC 61000-4-4	CS115
SURGE1	Ring Wave Immunity	IEC 61000-4-5	CS116
EI1/ EI2	Emitted Interference	IEC 61000-6-4	CE101, CE102 RE101, RE102
MAG1	Power frequency magnetic field immunity	IEC 61000-4-8	RS101
VV1/ VV2	Voltage Variation	IEC 61326-3-1	—
MV1	Conducted Common Mode Voltage	IEC 61000-4-16	CS101

CONTACT US

台北辦公室 Taipei Office

105 台北市敦化北路201號(台塑大樓 後棟6樓)

Rear Building-6F, No.201, Tung Hwa North Rd., Taipei 105, Taiwan

TEL : 886-2-2712-2211 Ext.7152

FAX : 886-2-8712-2938

高雄辦公室 Kaohsiung Office

814 高雄市仁武區水管路100號

No.100, Shuiguan Rd., Renwu Dist., Kaohsiung City 814, Taiwan

TEL : 886-7-371-1411 Ext.5163

FAX : 886-7-372-7026

台塑電子(寧波)有限公司 Ningbo Office

寧波市北侖區霞浦鎮 台塑關係企業 寧波工業園區

FPG Ningbo Industrial Park, Beilun, Ningbo, China

TEL : (0574) 86902999 Ext.3654/3682

FAX : (0574) 86902939

Website : <http://www2.fpc.com.tw/epd/index.html>

E-mail : amy-chen@fpc.com.tw



台灣塑膠工業股份有限公司
FORMOSA PLASTICS CORPORATION

電子專案組
ELECTRONICS GROUP