倍福中国

BECKHOFF

BECKHOFF

倍福TwinSAFE功能安全系统

陈利雄
产品经理

倍福TwinSAFE功能安全系统

BECKHOFF

功能安全

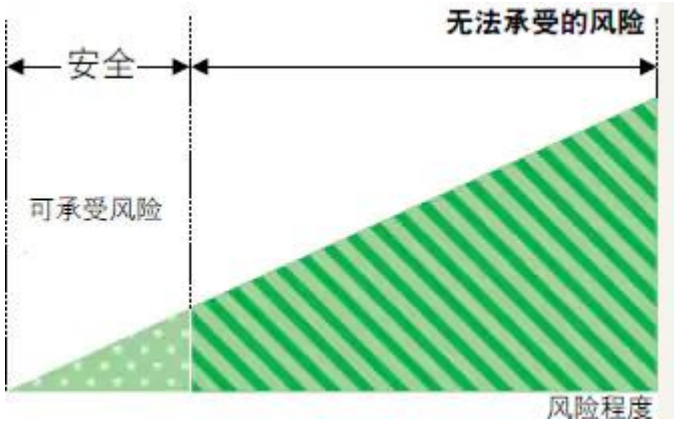
TwinSAFE

产品介绍

安全架构

风险 = 危害的严重性 x 危害发生的概率（IEC/ISO 指南51）

安全：免于难以承受的风险（IEC/ISO 指南51）
即将风险降低到能够忍受的水平实现安全



- 功能安全是什么?

与EUC和EUC控制系统有关的整体安全的组成部分，它取决于E/E/PE安全相关系统，其它技术安全相关系统和外部风险降低设施功能的正确行使。

——IEC 61508

用于安全控制的安全元件必须取得国际标准的认证！

为了符合国际安全标准要求，安全PLC需具备（但不限于）以下特点：

- 采用冗余CPU的工作方式，内部数据并行处理和相互检测
- 失效是在可预测的范围内，一旦失效，系统将进入安全停止模式。
- 数据传输报文采用CRC码校验，保证数据正确
- 硬件内部的自我诊断功能
- 采用专用的安全软件进行编程、下载和监控
- 强调系统安全（输入+控制器+软件+输出+外围设备）

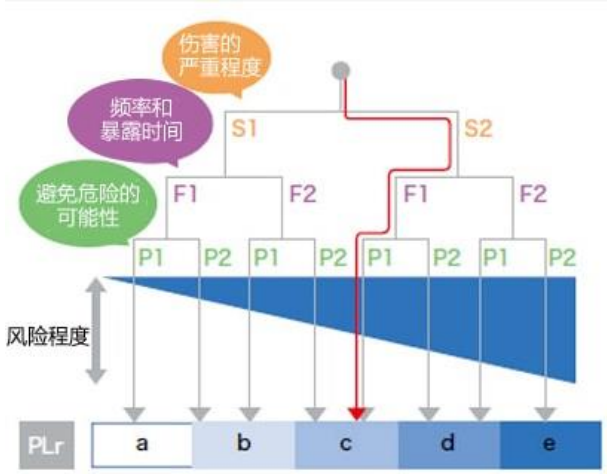
……

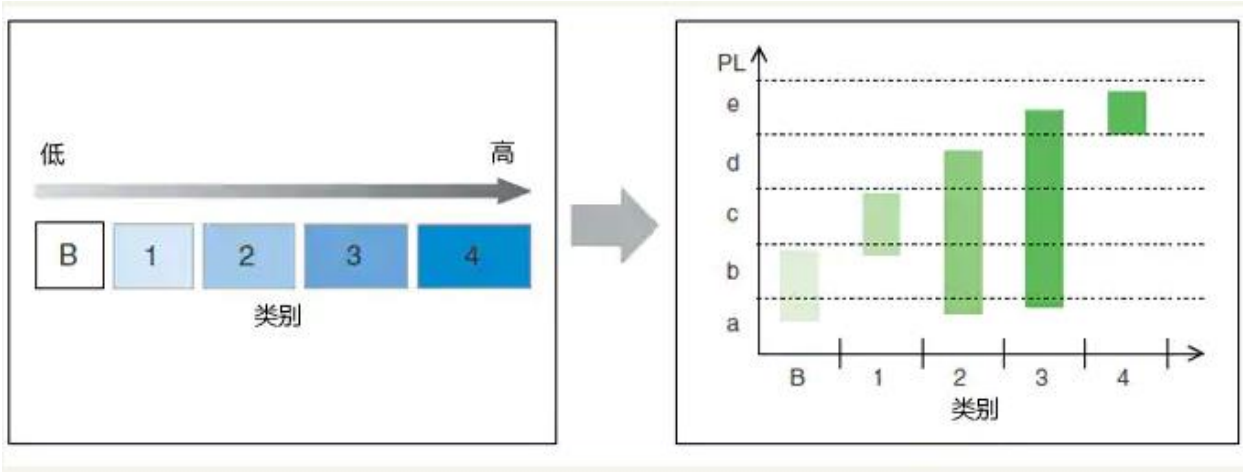
安全I/O模块的特点：

- 实时硬件内部的自我诊断功能
- 对外接设备的诊断功能
- 采用专用协议报文形式传输信号，不可人为强制信号

……

CAT(EN954-1)/PL(ISO 13849)





S 伤害的严重程度：

S1：轻微

S2：严重（如不可逆转的伤害和死亡）

F 频率和/或暴露于危险的时间

F1：很少至不经常和/或暴露时间角短

F2：频繁至连续和/或暴露时间较长

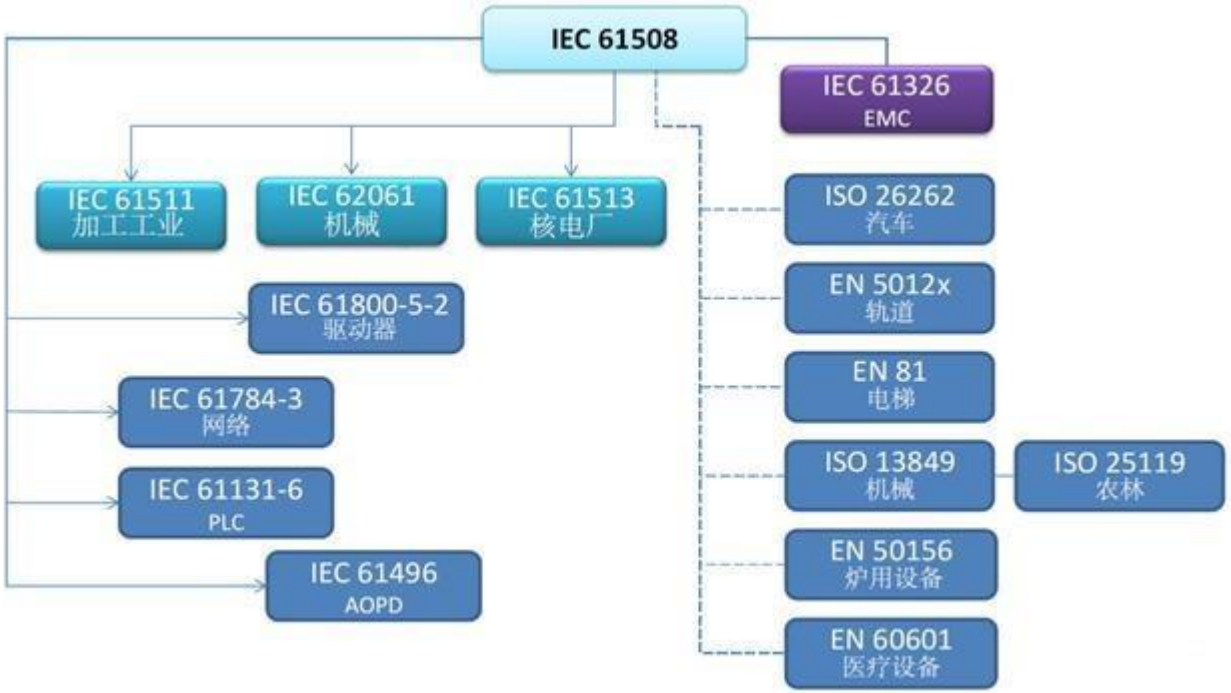
P 避免危险或限制伤害的可能性

P1：在特定条件下有可能

P2：几乎不可能

BECKHOFF

安全完整性等级(SIL)——IEC61508



PL与SIL的关系（ISO 13849-1:2006）

每小时危险失效概	PL	SIL IEC 61508-1 （高要求或连续操作模式）	每小时危险失效概率 （高要求或连续操作模式）
≥ 10^{-5} 且 < 10^{-4}	a	无对应关系	
≥ 3×10^{-6} 且 < 10^{-5}	b	1	≥ 10^{-6} 且 < 10^{-5}
≥ 10^{-6} 且 < 3×10^{-6}	c	1	≥ 10^{-6} 且 < 10^{-5}
≥ 10^{-7} 且 < 10^{-6}	d	2	≥ 10^{-7} 且 < 10^{-6}
≥ 10^{-8} 且 < 10^{-7}	e	3	≥ 10^{-8} 且 < 10^{-7}

BECKHOFF

功能安全系统的等级

$MTTF_D$	
Designation for each channel	**Range for each channel**
low	3 years ≤ $MTTF_D$ < 10 years
medium	10 years ≤ $MTTF_D$ < 30 years
high	**30 years ≤ $MTTF_D$ ≤ 100 years**

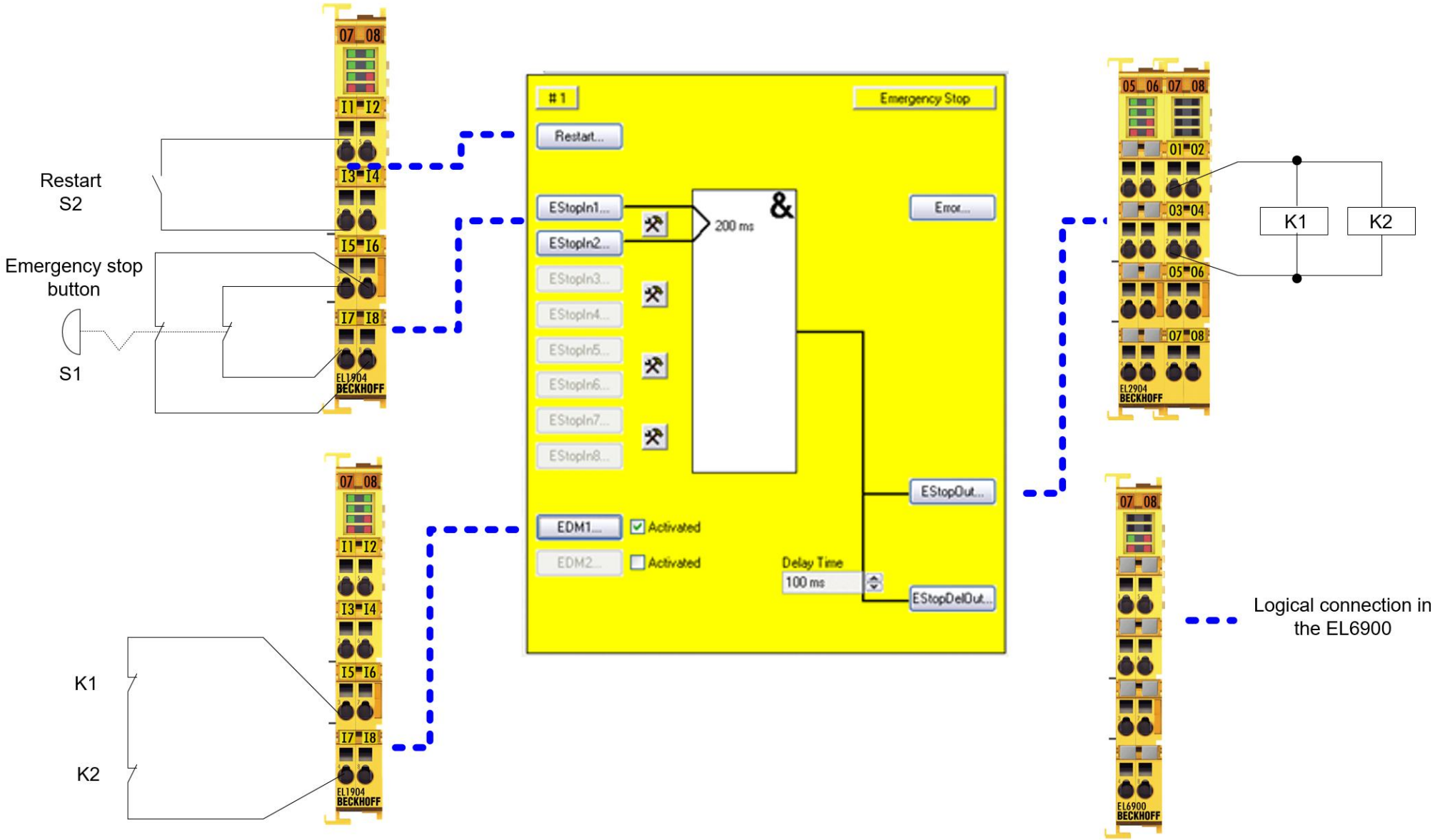
DC	
Name	**Range**
none	DC < 60 %
low	60 % ≤ DC < 90 %
medium	90 % ≤ DC < 99 %
high	**99 % ≤ DC**

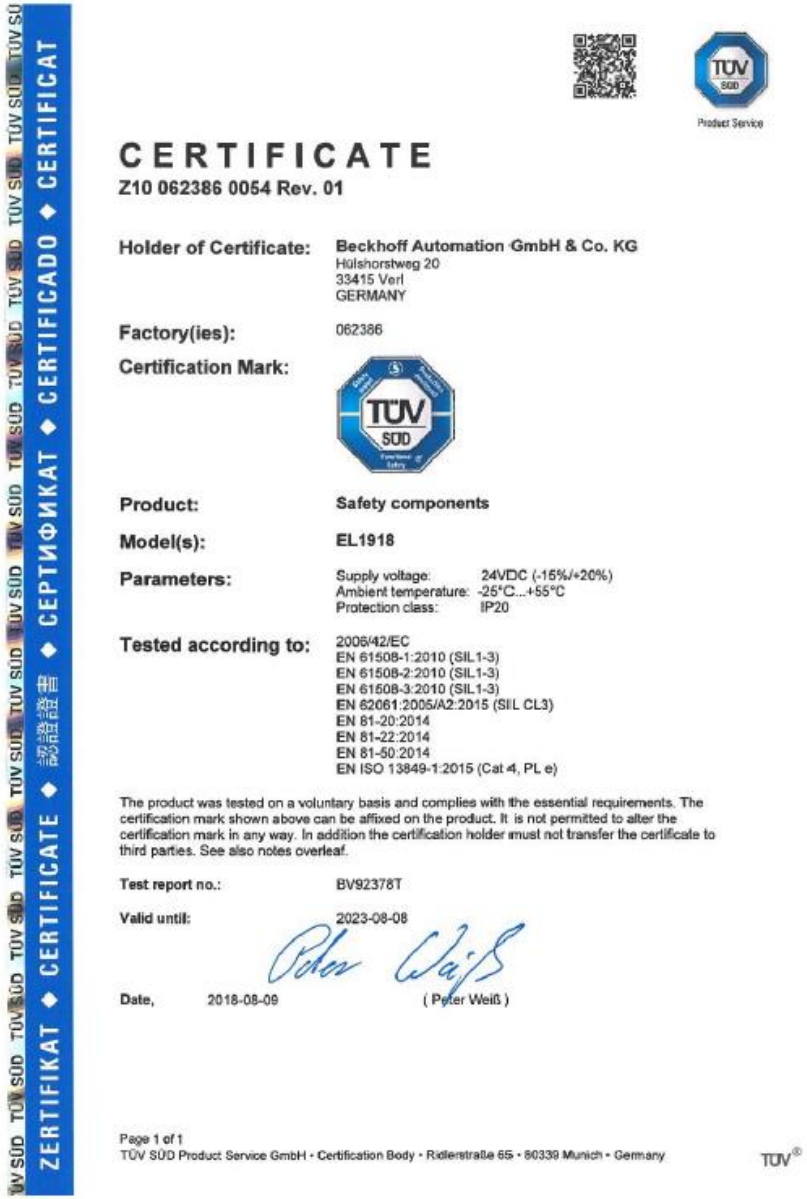
Category	**B**	**1**	**2**	**2**	**3**	**3**	**4**
DC / **$MTTF_D$**	**none**	**none**	**low**	**medium**	**low**	**medium**	**high**
low	a	-	a	b	b	c	-
medium	b	-	b	c	c	d	-
high	-	c	c	d	d	d	e

https://www.beckhoff.com/media/downloads/downloads/applicationguidetwinsafede.pdf

安全等级

BECKHOFF





ZERTIFIKAT ◆ CERTIFICATE ◆ 認證證書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

TÜV SÜD Product Service

CERTIFICATE

Z10 062386 0054 Rev. 01

Holder of Certificate: Beckhoff Automation GmbH & Co. KG
Hülshorstweg 20
33415 Verl
GERMANY

Factory(ies): 062386

Certification Mark:

Product: Safety components

Model(s): EL1918

Parameters:
Supply voltage: 24VDC (-15%/+20%)
Ambient temperature: -25°C...+55°C
Protection class: IP20

Tested according to:
2006/42/EC
EN 61508-1:2010 (SIL1-3)
EN 61508-2:2010 (SIL1-3)
EN 61508-3:2010 (SIL1-3)
EN 62061:2005/A2:2015 (SIL CL3)
EN 81-20:2014
EN 81-22:2014
EN 81-50:2014
EN ISO 13849-1:2015 (Cat 4, PL e)

The product was tested on a voluntary basis and complies with the essential requirements. The certification mark shown above can be affixed on the product. It is not permitted to alter the certification mark in any way. In addition the certification holder must not transfer the certificate to third parties. See also notes overleaf.

Test report no.: BV92378T

Valid until: 2023-08-08

Date, 2018-08-09 (Peter Weiß)

Page 1 of 1
TÜV SÜD Product Service GmbH · Certification Body · Ridlerstraße 65 · 80339 Munich · Germany

TÜV®

Product: Safety components

Model(s): EL1918

Parameters:
Supply voltage: 24VDC (-15%/+20%)
Ambient temperature: -25°C...+55°C
Protection class: IP20

Tested according to:
2006/42/EC
EN 61508-1:2010 (SIL1-3)
EN 61508-2:2010 (SIL1-3)
EN 61508-3:2010 (SIL1-3)
EN 62061:2005/A2:2015 (SIL CL3)
EN 81-20:2014
EN 81-22:2014
EN 81-50:2014
EN ISO 13849-1:2015 (Cat 4, PL e)

Marks	Description
TÜV SÜD Z10	A Z10 certificate is issued for the use of the product in the European Union and contains the relevant DIN, EN or IEC standards for the product (e.g. EN ISO 13849-1:2015). The corresponding standards are listed in the table.
Declaration of conformity	A TÜV SÜD conformity declaration typically has no expiration date and confirms a specific property of a product at the time of testing.
TÜV SÜD U8	A U8 certificate is issued for NRTL, NFPA, CSA certification and includes standards relevant to the North American market. The table lists the relevant standards.
M6A	An M6A certificate is the EC-Type Examination Certificate for the corresponding TwinSAFE product.
EC	Beckhoff Automation GmbH & Co. KG issues the EC Declaration of Conformity on the basis of the corresponding M6A certificate.
cULus	The entry cULus refers to a certification according to UL 508 / UL 61010-1 / UL 61010-2-201 / UL 508C / UL 61800-5-1.
RoHS	The EC declaration of conformity listed the EN 50581:2012. Thus the RoHS marking *RoHS 2011/65/EU* may be attached to the product. This mark is not listed separately in the table.
CE	On the basis of the EC declaration of conformity, a CE mark may be affixed to the product. This mark is not listed separately in the table.
EAC	For the Russian market or the countries Russia, Belarus, Armenia, Kazakhstan and Kyrgyzstan, the EAC logo must be affixed to the product. For manufacturers outside Russia or the EAWU (Eurasian Economic Union), an authorized representative in the EAWU is required, who is responsible for the marking.
CCC	*China Compulsory Certification* is a certification for the Chinese market.
KC	KC (Korea Certification) is a certification for the South Korean market.
RCM	*Regulatory Compliance Mark* is used for the Australian market and is focused on electrical safety and electromagnetic compatibility. *(Australian Standard AS/NZS 4417 - Regulatory compliance mark for electrical and electronic equipment* supplemented by Amendment 2 of January 2016*)*

EN ISO 13849-1:2015 or EN 61508:2010.

UL 1998 and CAN/CSA-C22.2.

https://www.beckhoff.com/media/downloads/downloads/twinsafe_certificates-2.pdf

倍福TwinSAFE功能安全系统

BECKHOFF

功能安全

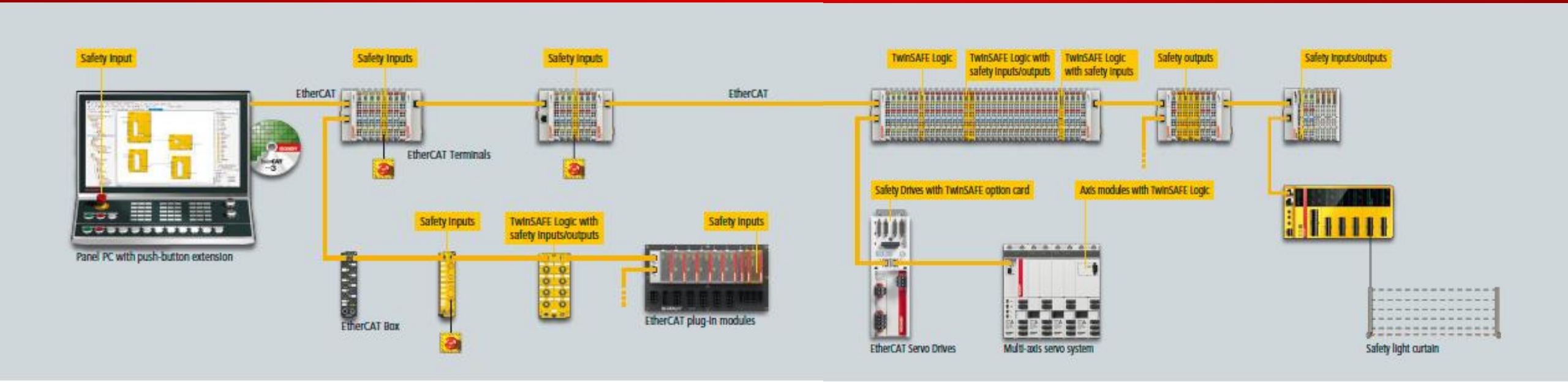
TwinSAFE

产品介绍

安全架构

TwinSAFE：开放、可扩展的安全技术

BECKHOFF



- TwinSAFE集成安全解决方案是倍福基于PC控制开放控制理念的延续
- TwinSAFE组件可以与通用控制系统无缝融合

安全功能无缝集成

- 全面、可扩展和模块化的自动化产品组合
- 统一的软件和硬件平台
- 结束“安全”与“非安全”的严格分离
- 适用于各种架构
  - —独立控制器到紧凑型控制器
  - —“传统”解决方案到分布式控制和基于软件的控制

TwinSAFE：开放、可扩展的安全技术

BECKHOFF

为所有应用领域提供最合适的解决方案

Engineering

图形化编程，快速实现安全解决方案，提供多种附加工具

Control

高性能的安全逻辑模块支持各种类型的安全应用

I/Os

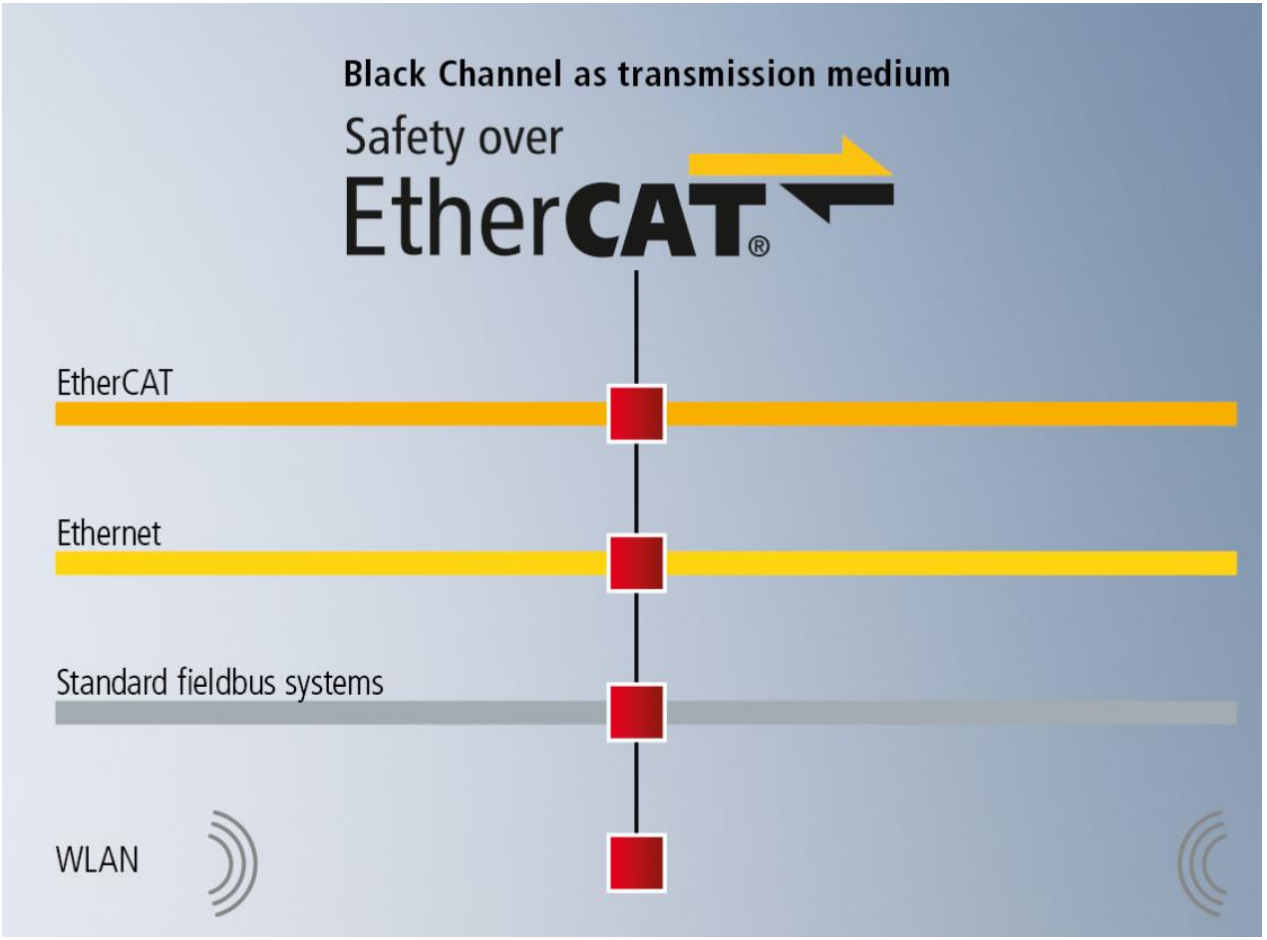
提供安全输入、输出以及混合组件选择，满足客户个性化需求

Motion

标准和紧凑型驱动产品均集成安全功能

基于EtherCAT的安全通讯（FSoE，Fail Safe Over EtherCAT）

- 定义了开放、安全的数据传输标准
- 满足SIL3安全等级
- 基于“黑色通道”原理，安全报文可以通过任意介质进行传输
- FSoE是EtherCAT技术的理想补充，统一的通讯系统保证了高性能的控制和安全信息传输
- 支持不同供应商提供的安全组件



TwinSAFE：开放、可扩展的安全技术

BECKHOFF

所有安全组件均集成逻辑功能

- 拓宽应用场景
- 减少安全程序的复杂性
- 简化安全程序的确认和验证工作

应用场景

- 通过输入组件直接对信号进行预处理
- 通过本地安全应用进行快速响应控制

倍福TwinSAFE功能安全系统

BECKHOFF

功能安全

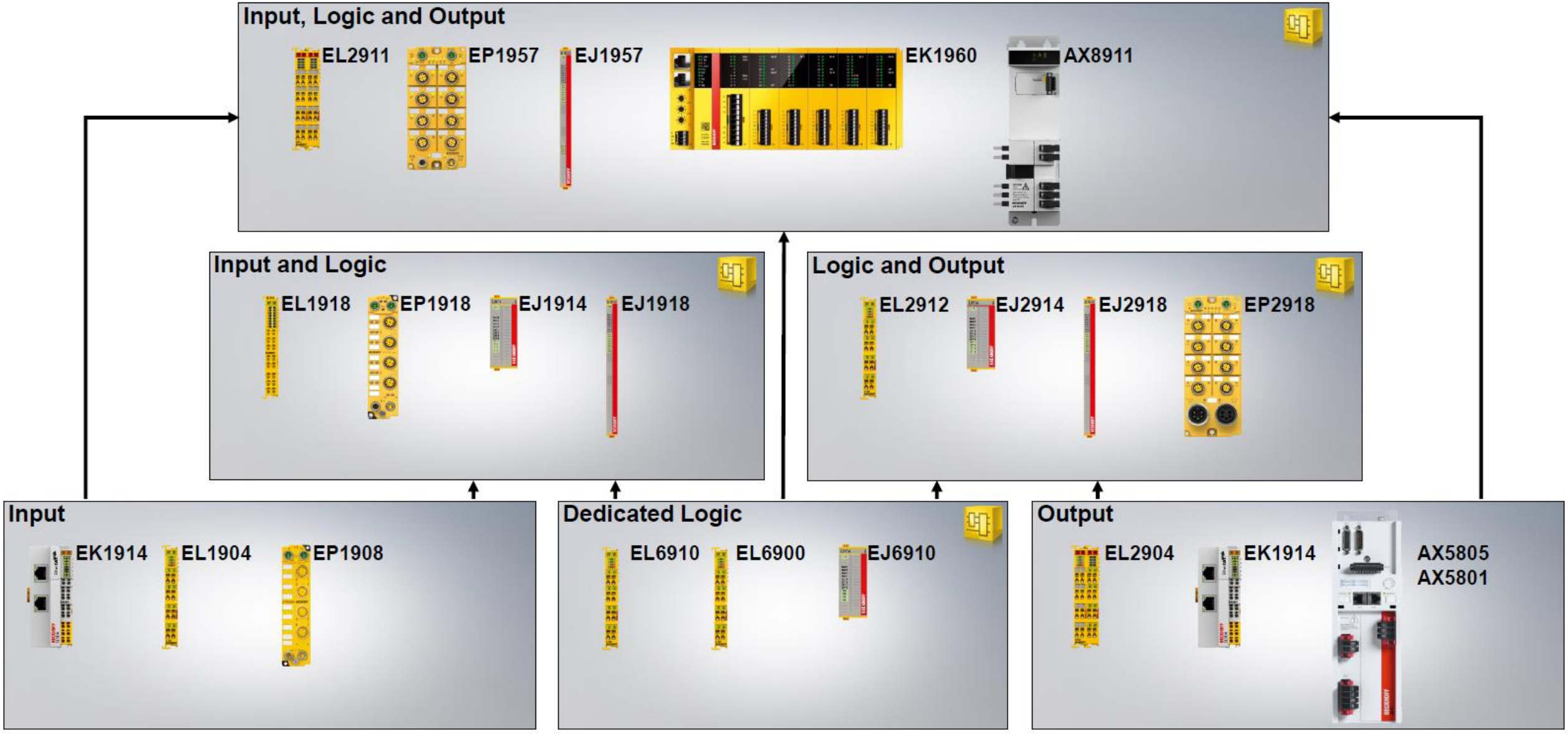
TwinSAFE

产品介绍

安全架构

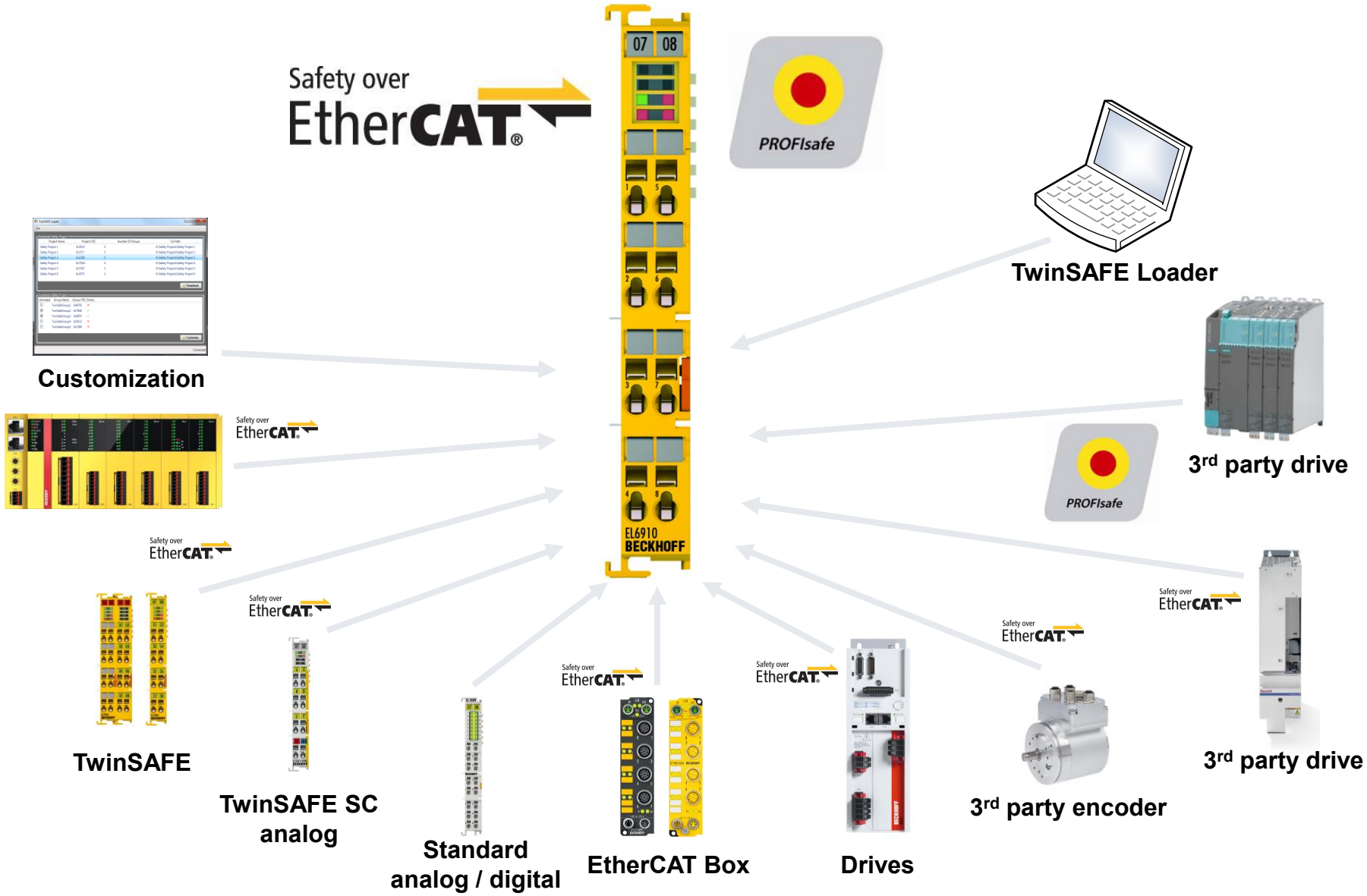
产品概览

BECKHOFF



新一代的EL6910模块

BECKHOFF

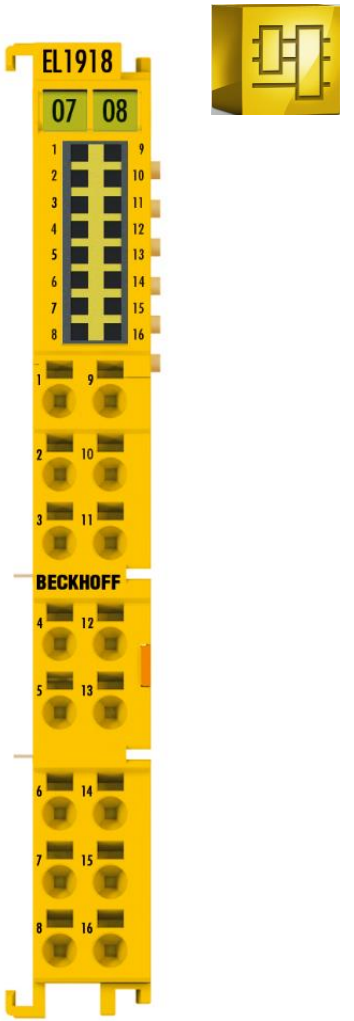


EL1918:集成安全输入以及安全逻辑功能

BECKHOFF

- 8通道安全输入
- 安全逻辑功能
- SIL3（IEC61508:2010）
- PL e，Cat 4（ISO13849-1:2015）

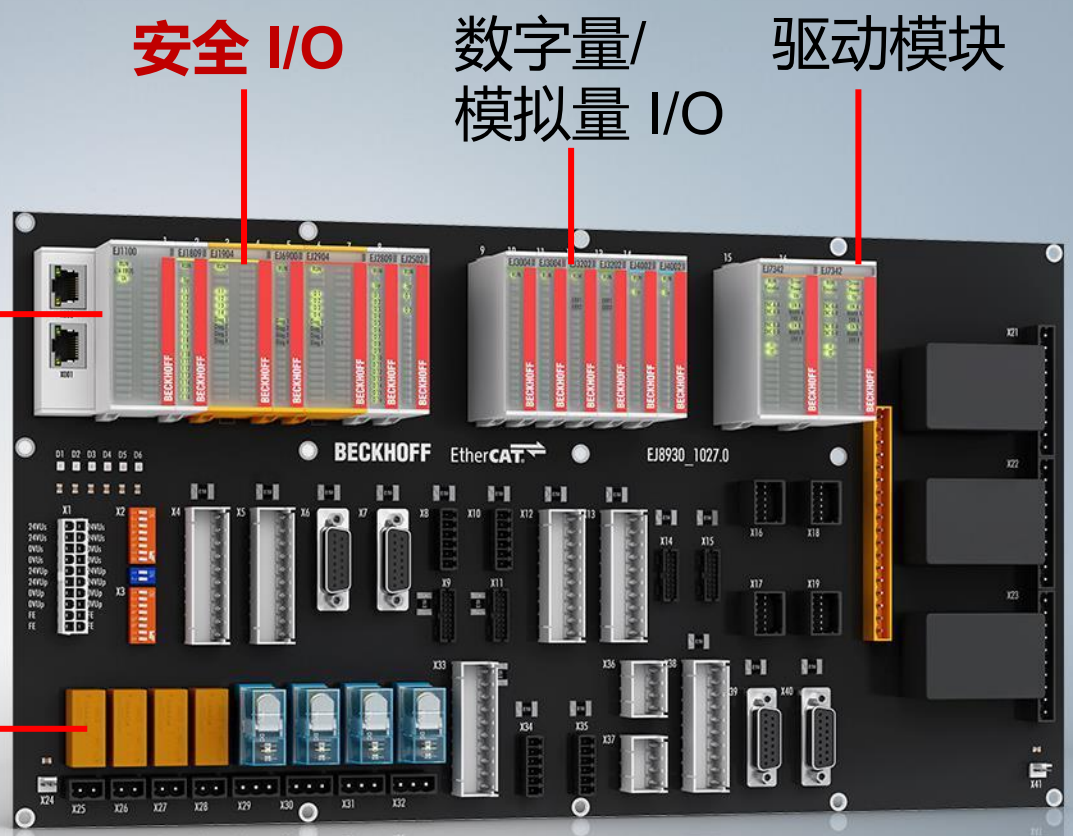
搭配安全输出模块实现安全回路



TwinSAFE EJ 模块

BECKHOFF

EJ6910	Logic
EJ1914	4 Safe In, Logic
EJ1918	8 Safe In, Logic
EJ2914	4 Safe Out, Logic
EJ2918	8 Safe Out, Logic
EJ1957	8 Safe In 4 Safe Out Logic



TwinSAFE Motion

BECKHOFF

STO/SS1

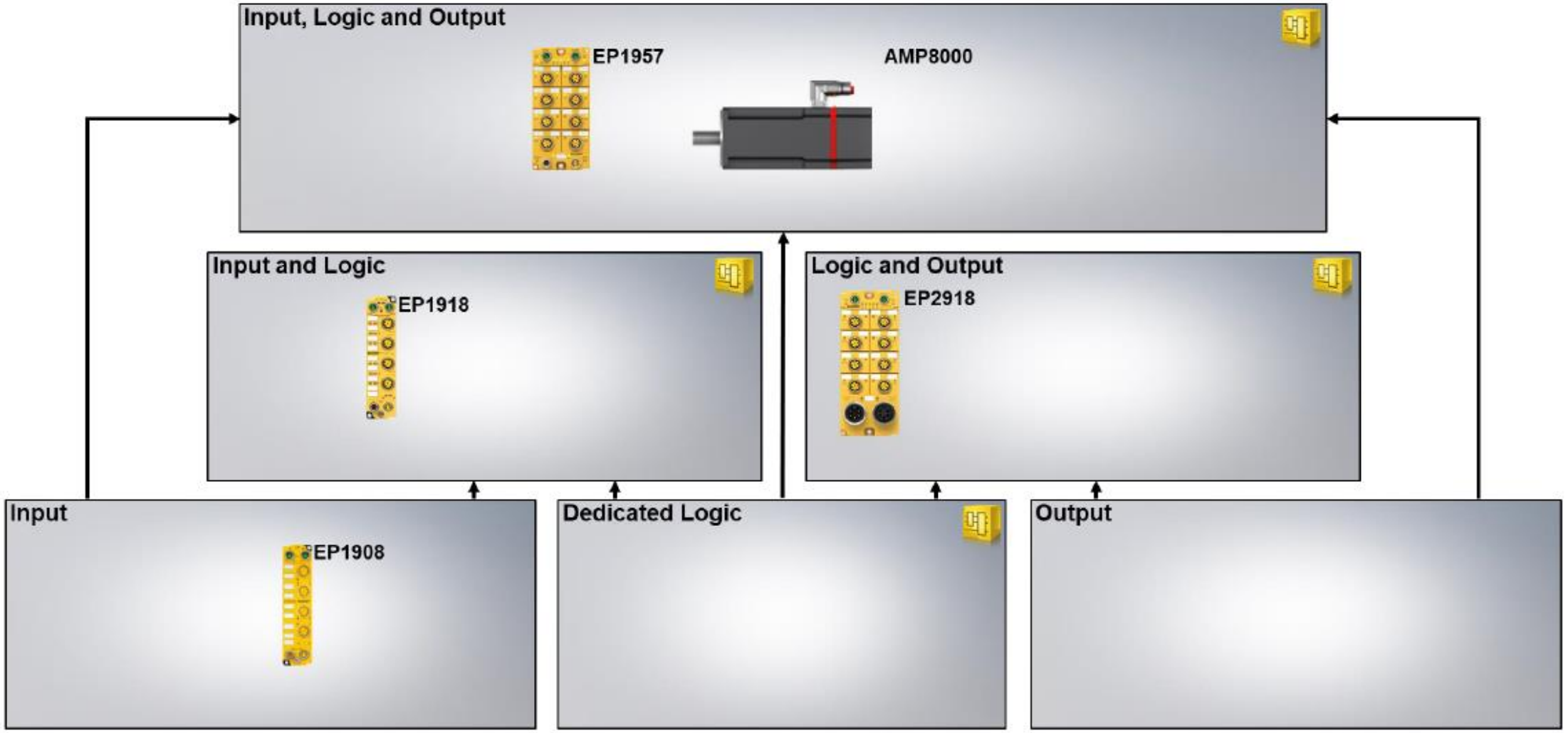
- —AX5000 AX5801
- —AX81xx-0100/AX82xx-0100
- —EL72xx-9014
- —EP7211-9034

Safe Motion

- —AX5000 AX5805/AX5806
- —AX81xx-0200/AX82xx-0200

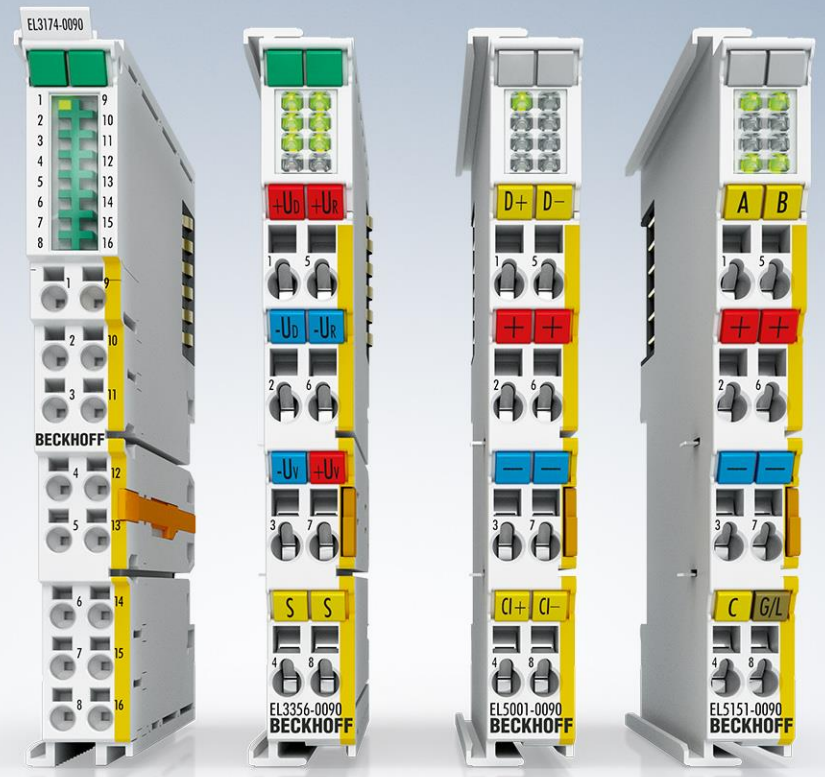
TwinSAFE IP67模块

BECKHOFF



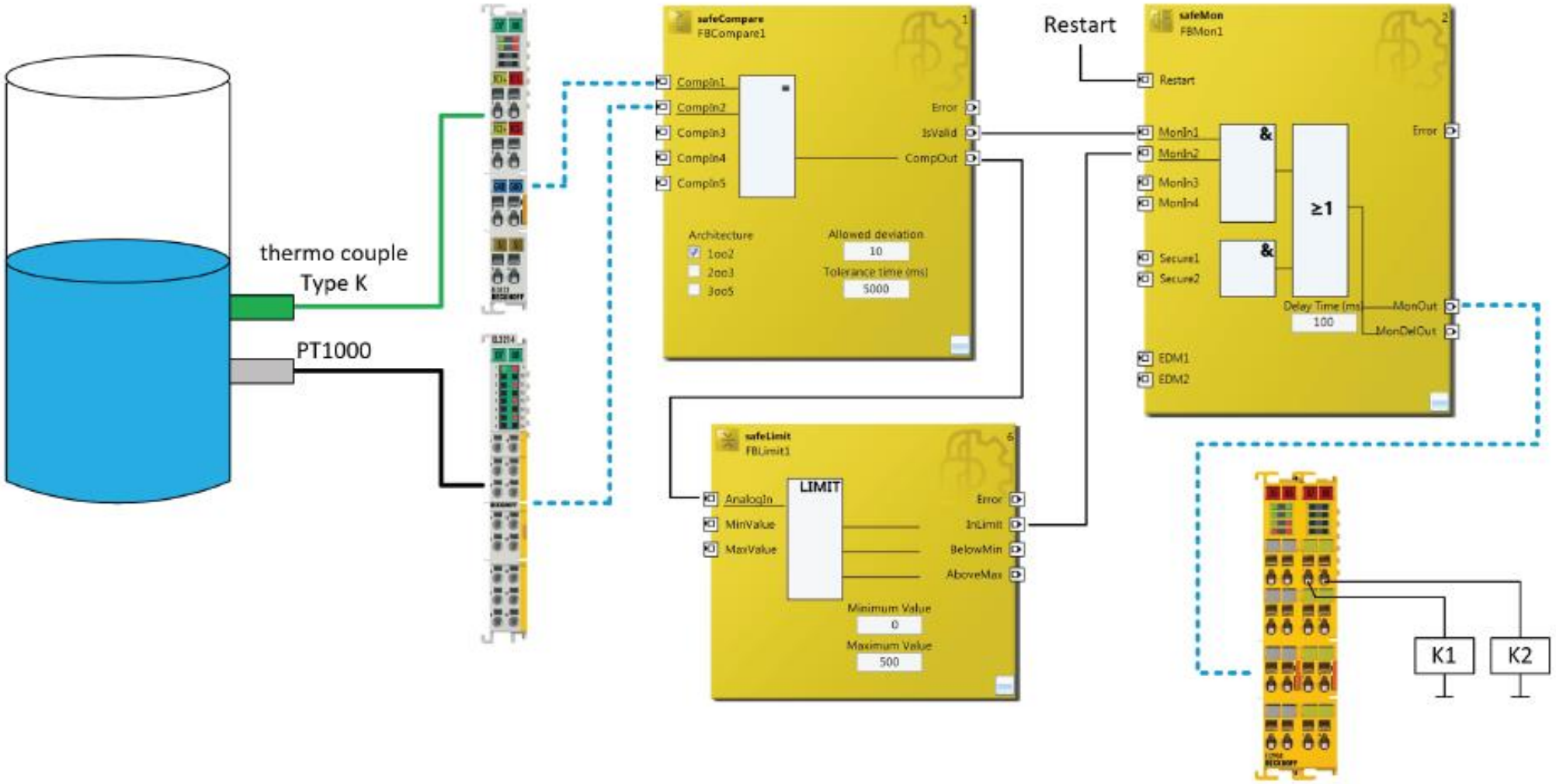
TwinSAFE SC (Single Channel)

BECKHOFF



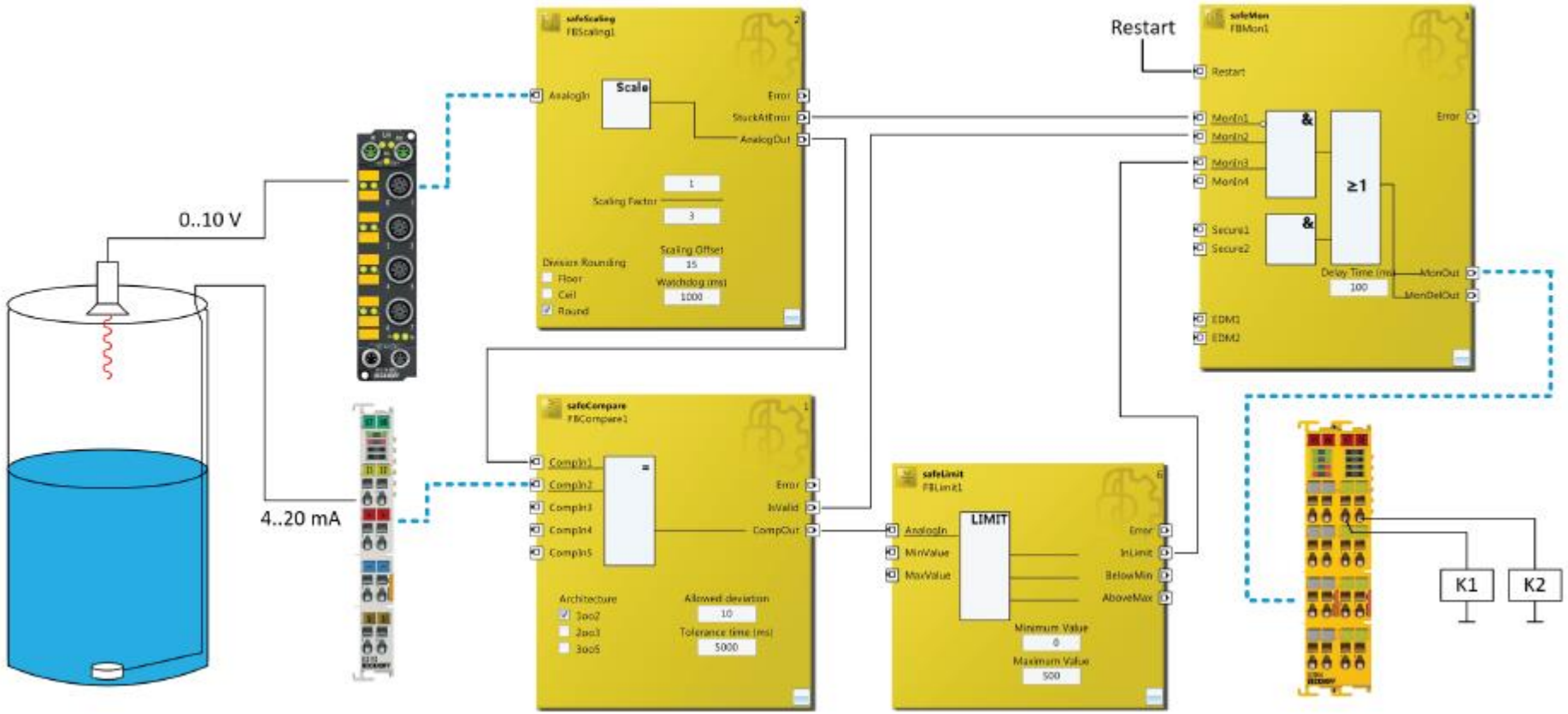
TwinSAFE SC | 温度监控回路

BECKHOFF



TwinSAFE SC | 液位监控回路

BECKHOFF



倍福TwinSAFE功能安全系统

BECKHOFF

功能安全

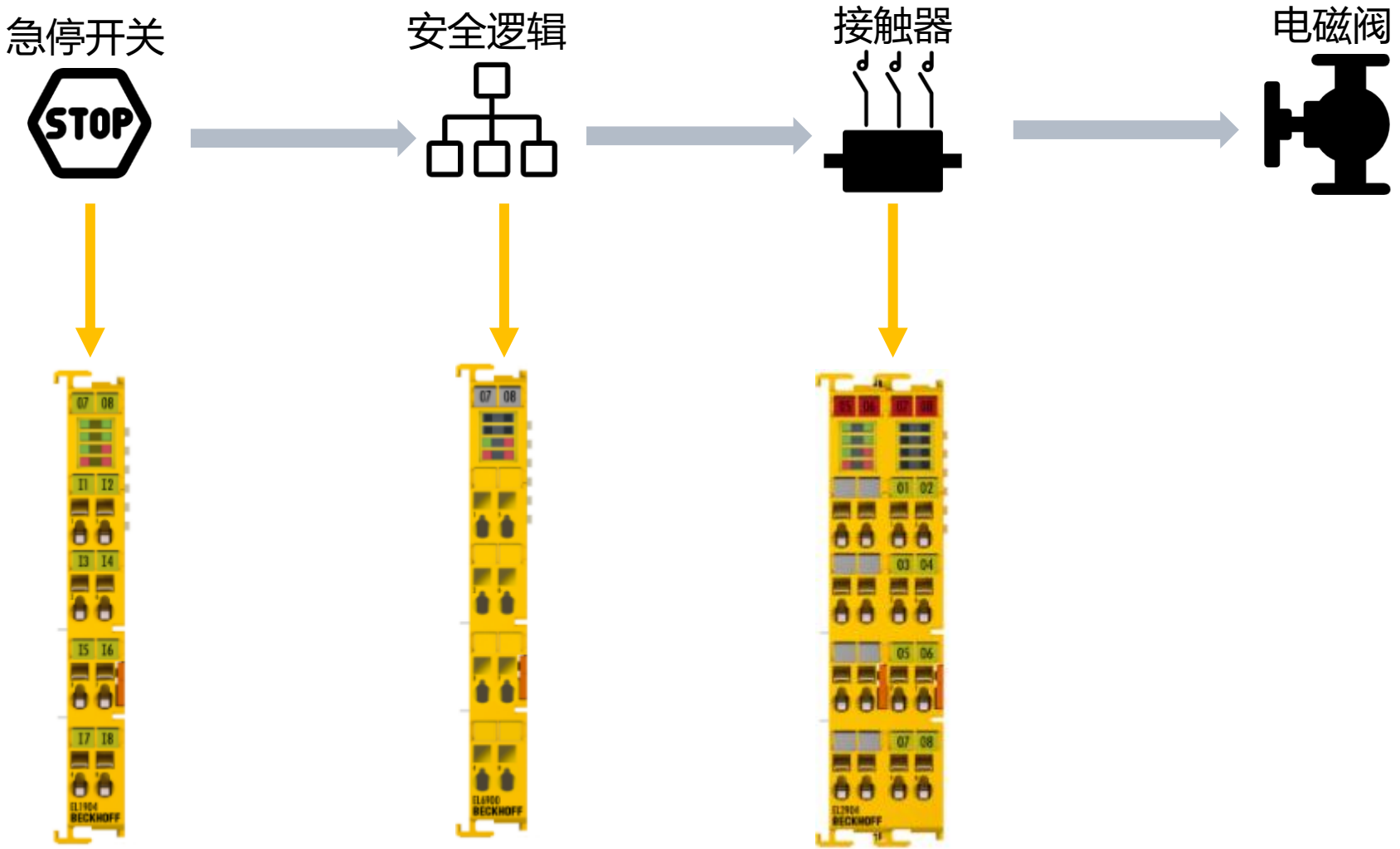
TwinSAFE

产品介绍

安全架构

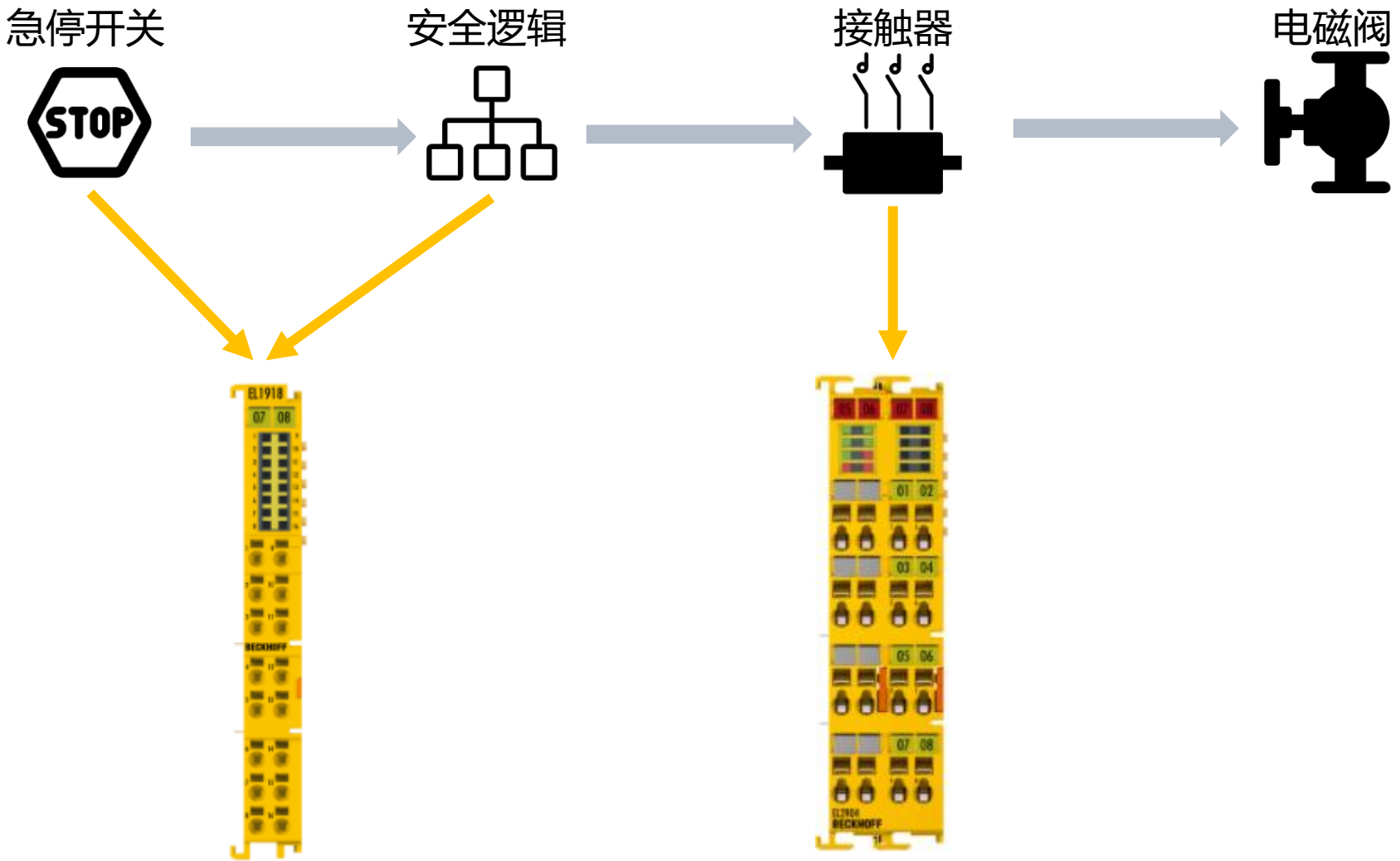
安全架构——传统安全解决方案

BECKHOFF



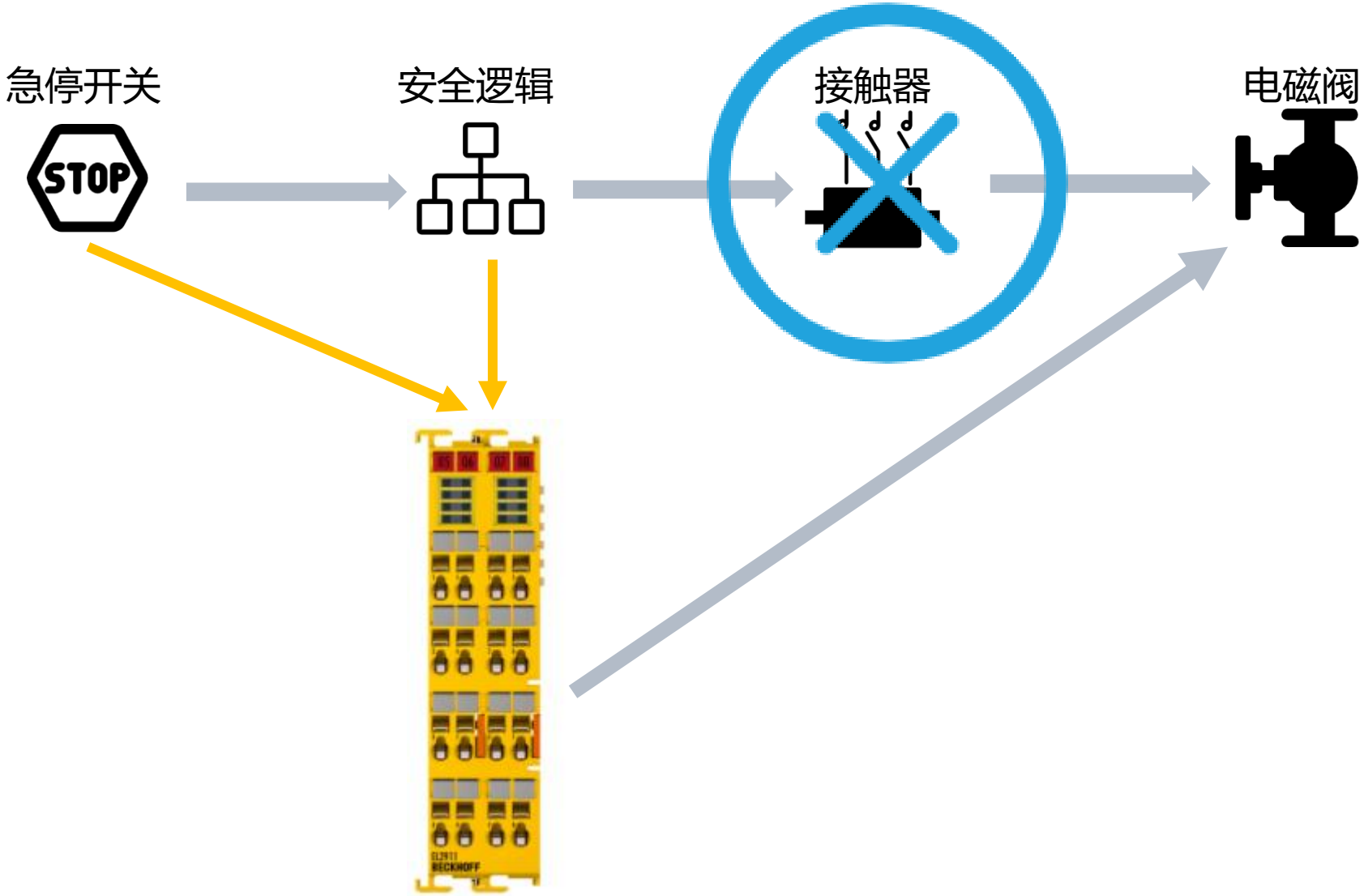
安全架构——紧凑型控制方案

BECKHOFF



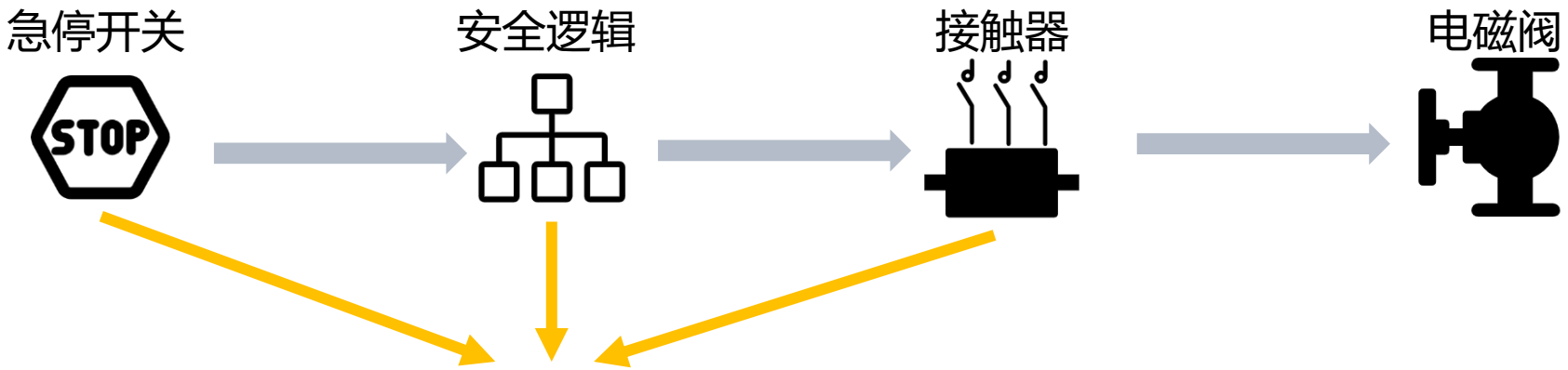
安全架构——紧凑型控制方案

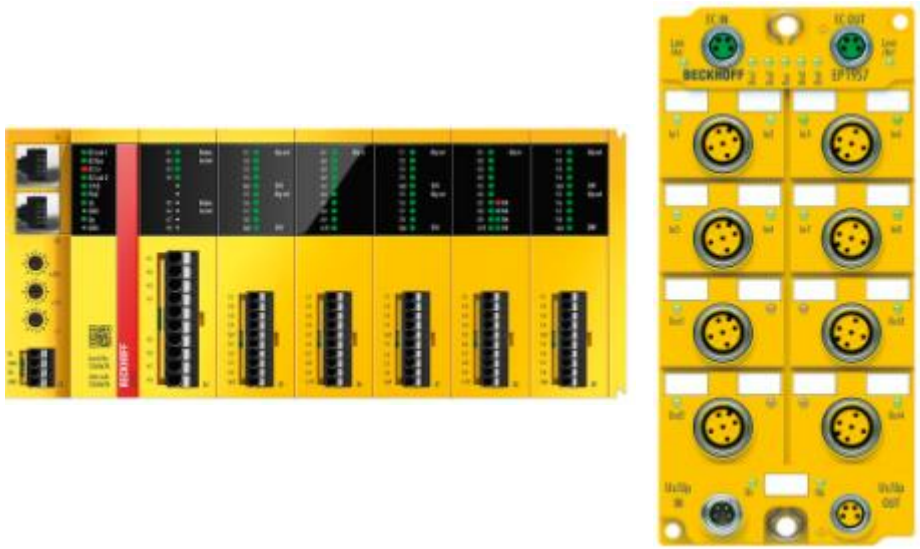
BECKHOFF



安全架构——独立PLC方案

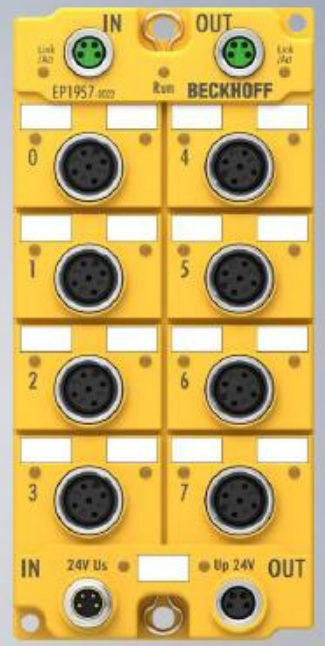
BECKHOFF

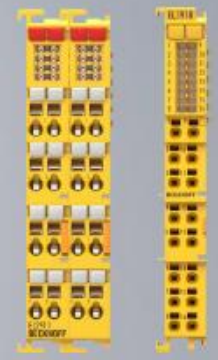




所有新的安全模块均带有安全逻辑功能

BECKHOFF





THANKS

感谢聆听