Pneumatic and electrical modules of the valve terminal CPX/VTSA-F-CB – the perfect platform for your safety concept

Fieldbus nodes and Industrial Ethernet

Type	CPX-FB13	CPX-FB43	CPX-M-FB44	CPX-M-FB45	CPX-FB36	CPX-FB37
Order code	195740	8116369	8116370	8116371	1952451	2735960
Part no.	195740	8116369	8116370	8116371	1952451	2735960
Fieldbus protocol	PROFIBUS DP	PROFINET IO			Modbus TPC / EtherNet/IP	EtherCAT®
Fieldbus interface	Sub-D, 9-pin, socket M12, 5-pin, B-coded, socket and pin	M12, 5-pin, D-coded	AIDA®, push-pull	AIDA®, fibre-optic cable	M12, 5-pin, D-coded	M12, 5-pin, D-coded
Inputs	6 bytes	64 bytes	64 bytes	64 bytes	32 bytes	64 bytes
Outputs	6 bytes	64 bytes	64 bytes	64 bytes	32 bytes	64 bytes

AIDA = Automation Initiative of German Domestic Automobile Manufacturers

Control block: CODESYS embedded control with OPC-UA

Type	CPX-CEC-S1-V3	CPX-CEC-C1-V3	CPX-CEC-M1-V3
Order code	1136	1135	1134
Part no.	3472625	3473128	3472765
Programming, interface, connection	CODESYS controller with serial interface (Sub-D, RS232) for connecting PCs for programming as well as for operator units such as front-end display FED. Ethernet 10/100 Base-T (Sub-D).	CODESYS controller with CANopen master for connecting additional field devices. Type M1 additionally with SoftMotion library for 3D interpolation.	
Baud rate	Ethernet 10/100 Base-T (Sub-D).		
Description	The optional front-end controllers CPX-CEC, as stand-alone controller or in parallel with a bus node, enable simultaneous access via Ethernet and an integrated web server, as well as autonomous preprocessing. Access via Modbus/TCP and EasyIP is also possible. Commissioning, programming and diagnostics using the Festo software tools or CODESYS provided by Festo.		

Smart functions for FB4X

MQTT

Type	MQTT
Order code	1153
Part no.	
Description	For FB3, FB4x, FB61 + MQTT Additional protocol to PROFINET for exporting specific data from the valve terminal to the cloud

Diagnostic tools

Type	FAS	MFT	Adapter cable
Order code			NEFC-M12-USV-3-1U1G5
Part no.	Festo Maintenance Tool	Festo Automation Suite	567432
Description	Error location and error type (CPX error messages), plain-text error messages, no programming required, saving of hardware configuration, production of screenshots		USB to RS232 adapter cable

Electronics modules

Type	CPX-8DE	CPX-4DE	CPX-8DE-D	CPX-8NDE	CPX-16DE	CPX-M-16DE-D	CPX-8DE-8DA	CPX-4DA	CPX-8DA	CPX-8DA-H	CPX-2AE-U-I	CPX-2AA-U-I	CPX-4AE-I	CPX-4AE-U-I	CPX-4AE-P-B2	CPX-4AE-P-D10	CPX-4AE-T	CPX-4AE-TC	CPX-L-16DE-16-KL-3POL	CPX-L-8DE-8DA-16-KL-3POL	CPX-FVDA-P2	CPX-FBDE-P	CPX-P-8-DE-N	CPX-P-8-DE-N-IS	CPX-22E2DA
Order code	E	F	D	O	M	NM	Y	A	L	NL	U	P	I	NJ	NV	NY	T	NT	NB	NC	NG	ND	BR	BW	T25
Part no.	195750	195752	541480	543813	543815	550202	526257	195754	541482	550204	526168	526170	541484	573710	560361	560362	541486	553594	572606	572607	197159	197160	197161	565933	565934
Heating/screening																					Metal screening, metal housing				
Number of inputs	8	4	8	8	16	16	8	–	–	–	–	2	–	4	4	4	4	4	16	8	3	8	8	8	2 high-speed inputs
Number of outputs	–	–	–	–	–	–	8	4	8	8	–	–	2	–	–	–	–	–	–	8	–	–	–	–	2 high-speed outputs
Switching logic/resolution	PNP	PNP	PNP	NPN	PNP	PNP	PNP	PNP	PNP	PNP	12 bit	12 bit	12 bit	15 bit	10 bit	10 bit	12 bit	12 bit	PNP	PNP	PROFIsafe	PROFIsafe	NAMUR	NAMUR	PNP/PWM
Signal range	–	–	–	–	–	–	–	–	–	–	0 ... 10 V 0 ... 20 mA 4 ... 20 mA	0 ... 10 V 0 ... 20 mA 4 ... 20 mA	0 ... 20 mA 4 ... 20 mA	0 ... 10 V, 0 ... 20 mA 4 ... 20 mA, ±10 V, ±20 mA, ±5 V	1 ... 1 bar	0 ... 10 bar	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni200, Ni500, Ni1000, 2-, 3- or 4-wire technology	Type B, E, J, K, N, R, S, T, 2-wire technology	–	–	–	–	–	–	Intrinsically safe	Inputs up to 100 kHz/1 MHz at 24 V/5 V, outputs up to 20 kHz (PWM), controller for 24 V DC motor
Max. current supply per channel	0.5 A	0.5 A	0.5 A	0.5 A	0.5 A	0.5 A	0.5 A	1 A	0.5 A	2.5 A	0.7 A	2.8 A	0.7 A	0.7 A	–	–	–	–	0.25 A	0.25 A	1.5 A	0.5 A	–	–	–

Motion control technology modules – electric drives and servo-pneumatics

Type	CPX-CEC-C1-V3	CPX-CEC-M1-V3
Order code	1135	1134
Part no.	3473128	3472765
Fieldbus protocol	CODESYS	CODESYS Soft-Motion 3D
Description	Single-axis control, PTP asynchronous, CANopen master for connecting additional field devices	Multi-axis control, 3D interpolation

Connection block

Electronics module

Interlinking block

The connection technology for sensors and additional actuators offers a wide range of digital and analogue input and output modules and is freely selectable, as appropriate to your standard or application. Polymer or metal connection blocks can be combined as required:

Type	CPX-CMPX-C-1-IK1	CPX-CMIX-M1-1	CPX-CMAX-C1-1
Order code	1136	1135	T25
Part no.	548931	567417	548933
Moving mass	1 ... 300 kg horizontal 1 ... 100 kg vertical	–	1 ... 300 kg horizontal 1 ... 100 kg vertical
Mid-positions	Up to 2 freely programmable mid-positions, including via the fieldbus	–	–
Positioning/repetition accuracy	Accuracy ±0.25% of the displacement encoder length, but at least ±2 mm	DGCI and DNCI: ±0.01 mm Stroke-dependent potentiometer: +360 mm: ±0.01 mm +360 mm: ±0.06 mm	±0.2 mm
Controlled force at 6 bar	–	–	30...2700 N
Travel speed	–	–	Max. 3 m/s
Acceleration	–	–	Max. 30 m/s²
Extension	Soft Stop electric end-position cushioning in combination with proportional directional control valve VPWP for strokes up to 7 m	Max. cable length between controller and drive: 30 m	–
Description	End-position controller CPX-CMPX Fast travel between the mechanical end stops of the cylinder, moving gently and without impact into the end position + 2 mid-positions	Measuring module CPX-CMIX Turns pneumatic cylinders into sensors. And is the only one of its kind in the world thanks to fully digital data acquisition and data transfer. Repetition accuracy of ±0.01 mm with integration of digital transducers.	Servo-pneumatic positioner CPX-CMAX Position and force control for linear or rotary drives, directly actuated or selected from one of 64 configurable position sets.

*Depending on the measuring system

Subordinate, decentralised installation systems

Type	CPX-CP-4-FB	CPX-CTEL-4-M12-5POL	CPX-CTEL-2-M12-5POL-LK
Order code	T113 to T118	T4078 to T44	T45 to T48
Part no.	526705	1577012	2909563
Number of CP strings/connections	4 strings	4 connections	2 connections
String/cable length	Max. 10 m (string)	Max. 20 m	Max. 20 m
Number of modules per string/connection	Up to 4 strings with up to 4 modules each and up to 32 I/Os per string Power supply and bus interface via the same cable	One I-Port module per connection	One IO-Link® module per connection
Description	Installation system CPI Cost-optimised installation system for more than 5 subordinate stations such as valve terminals or I/O modules. Short tubing helps optimise cycle times and reduces installation costs.	Installation system CTEL Cost-optimised installation system for up to 4 Festo I-Port stations. Can be combined with a large I/O module portfolio such as CTSL Input modules.	The CPX-CTEL-2-M12-5POL-LK module enables the connection of further IO-Link® devices. It has 2 ports and can be combined with the bus nodes for PROFINET and SERCOS III.

Pneumatic interfaces for fieldbus interface

Type	VABA-S6-1-X2-F1-CB	VABA-S6-1-X2-I2-CB	VABA-S6-1-X2-CB	VABA-S6-1-X1-CB	VABA-S6-1-X2-3V-CB	VABA-S6-1-X1-3V-CB	VABA-S6-1-X2-3V-CB-AL	VABA-S6-1-X2-I1-CB-AL	VABA-S6-1-X2-I1-CB2-AL	VABA-S6-1-X2-F2-CB-AL	VABA-S6-1-X2-F2-CB-2-AL
Order code	RC	RD	RA	RA	RB	RB	KB	XC	PC	XD	PD
Part no.	8068260	8068261	8082876	8082877	8082878	8082879	8152438	8152437	8152435	8152436	8152434
Version	Metal	Metal	Metal	Polymer	Metal	Polymer	Metal	Metal	Metal	Metal	Metal
Description	With 3 safe internal zones (PROFIsafe)	With 2 safe internal zones and 1 safe output (PROFIsafe)	Without zones, without PROFIsafe	Without zones, without PROFIsafe	With zones, without PROFIsafe, 3 external power supplies 3xM12	With zones, without PROFIsafe, 3 external power supplies 3xM12	With left-hand adapter plate, for extending with 3 external power supplies 3xM12 for the zones	With left-hand adapter plate, for extending with 2 safe internal zones (PROFIsafe)	With left-hand adapter plate and additional power supply, for extending with 1 safe internal zones (PROFIsafe)	With left-hand adapter plate, for extending with 2 safe internal zones + 1 safe output (PROFIsafe)	With left-hand adapter plate and additional power supply, for extending with 2 safe internal zones + 1 safe output (PROFIsafe)

Tie rod for polymer interlinking blocks

Type	CPX-2A-1	CPX-2A-2	CPX-2A-3	CPX-2A-4	CPX-2A-5	CPX-2A-6	CPX-2A-7	CPX-2A-8	CPX-2A-9	CPX-2A-10	CPX-2A-1-E
Part no.	195718	195720	195722	195724	195726	195728	195730	195732	195734	195736	525618
Number of modules	1	2	3	4	5	6	7	8	9	10	Tie rod extension for 1 module

CPX extension

Type	CPX-EPR-EV-X	CPX-EPL-EV-X	CPX-M-EPR-EV-X	CPX-M-EPL-EV-X
Order code	2813282	2813284	2813286	2813288
Part no.	576313	576314	576315	576317
Description	Right-hand end plate for CPX extension	Left-hand end plate for CPX extension	Right-hand end plate for CPX extension	Left-hand end plate for CPX extension

End plates

Type	CPX-EPL-EV	CPX-EPR-EV	CPX-EPETE-EV	CPX-EPL-EV-S	CPX-M-EPL-EV	CPX-M-EPR-EV
Order code	T	T	EE	QE	QE	T
Part no.	195716	195714	538892	576315	550212	550214
Description	Left-hand end plate	Right-hand end plate	Earthing component	Left-hand end plate with system supply, IP20	Left-hand end plate	Right-hand end plate

CPX extension

Type	CPX-EPR-EV-X	CPX-EPL-EV-X	CPX-M-EPR-EV-X	CPX-M-EPL-EV-X
Order code	2813282	2813284	2813286	2813288
Part no.	576313	576314	576315	576317
Description	Right-hand end plate for CPX extension	Left-hand end plate for CPX extension	Right-hand end plate for CPX extension	Left-hand end plate for CPX extension

CONNECTION TECHNOLOGY

Connectors for fieldbus connection and technology modules

Type	FBS-SUB-9-GS-DP-B	FBA-2-M12-5POL-RK	CPX-AB-2-M12-RK-DP	NECU-M-S-B12G5-C2-PB	NECU-M-B12G5-C2-PB	CACR-S-B12G5-220-PB	NECU-S1W9-C2-APB	NECU-M-S-D12G4-C2-ET	FBS-RJ45-FP-GS	FBS-SCRJ-FP-GS	CPX-M-AK-C
Order code	GI	GF	GO	GA	GB	GC	GD	GZ	GI	GK	BC
Part no.	533216	533118	541519	1067905	1072328	1072328	534373	539129	552000	570517	568753
Description	Fieldbus plug, Sub-D, IP65/IP67, 9-pin, pin	Fieldbus connection, 2x M12, B-coded	Fieldbus connection, 2x M12, B-coded	Sub-D, IP20, for PROFIBUS with terminating resistor and programming interface	Straight plug/screw terminal M12x1, 4-pin, B-coded, screened, D-coded, Industrial Ethernet	Terminating resistor	Sub-D, IP20, for PROFIBUS with terminating resistor and programming interface	Straight plug/screw terminal M12x1, 4-pin, B-coded, screened, D-coded, Industrial Ethernet	Plug, RJ45 (Ethernet, push-pull)	Plug, fibre-optic cable (Ethernet, push-pull)	Cover cap for push-pull

Extremely flexible connection technology

Type	CPX-AB-4-M12X2-5POL	CPX-AB-8-M8-3POL	CPX-AB-4-HARZ-4POL	CPX-AB-8-KL-4POL	CPX-AB-2-SUB-BU-25POL	CPX-AB-4-M12-8POL	CPX-AB-8-M8X2-4POL	CPX-AB-4-M12X2-5POL-R	CPX-AB-8-KL-4POL	AK-8KL	CPX-AB-8-M12X2-5POL	CPX-AB-S-4-M12	CPX-M-4-M12X2-5POL	CPX-M-8-M12X2-5POL	CPX-AB-8-M12X2-5POL	CPX-P-AB-2XKL-8POL	CPX-P-AB-KBUS-4POL	CPX-P-AB-2XKL-8POL-BDE-N-IS	CPX-P-AB-KBUS-4POL-BDE-N-IS
Order code	A	B	H	J	B	C	GQ	GW	KI	KT	W	EY	KA	KB	GV	BR	BXK	BW	BXW
Part no.	195704	195706	525636	195708	525676	526178	561754	561754	195708	195710	526164	526164	569747	569935	569939	569939	569939	569595	569595
Connection	M12, 5-pin	M8, 3-pin	Harax, 4-pin	CageClamp, 4-pin	Sub-D, 25-pin	M12, 8-pin	M8, 4-pin	M12, 5-pin	CageClamp, 4-pin, with covering hood in IP65	M12, 5-pin	Harax, 4-pin	M18, 5-pin	M12, 5-pin	M12, 5-pin	M12, 5-pin	Terminal	M16, 6-pin	Terminal	M12, 4-pin
Number of sockets	4	8	4	1	1	4	8	4	1	4	4	8	4	8	8	8	4	8	4
Degree of protection	IP65/IP67	IP65/IP67	IP65/IP67	IP20	IP65/IP67	IP65/IP67	IP65/IP67	IP65/IP67	IP65/IP67	IP65/IP67	IP65/IP67	IP65/IP67	IP65/IP67	IP65/IP67	IP65/IP67	IP20	IP65/IP67	IP20	IP65/IP67
Housing/screening	Metal screening		Metal screening		Metal screening						Metal screening		Metal screening, metal housing				Metal screening		Metal screening
Combinations																			
CPX-8DE	E	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-4DE	F	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-8DE-D	D	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-8NDE	O	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-16DE	M			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-M-16DE-D	NM													■	■				
CPX-8DE-8DA	Y			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-4DA	A	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-8DA	L	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-8DA-H	NL												■	■	■				
CPX-2AE-U-I	U	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-2AA-U-I	P	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-4AE-I	I	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-4AE-U-I	NI	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-4AE-T	T	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-4AE-TC	NT	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CPX-P8DE-N	BR															■		■	
CPX-P8DE-N-IS	BW																■		■
CPX-FVDA-P2	NG																		
CPX-FBDE-P	ND																		

Interlinking blocks

Type	CPX-GE-EV	CPX-GE-EV-S	CPX-GE-EV-Z	CPX-GE-EV-V	CPX-GE-EV-S-7/8-5POL	CPX-M-GE-EV	CPX-M-GE-EV-S-7/8-5POL	CPX-GE-EV-Z-7/8-5POL	CPX-M-GE-EV-S-PP-5-POL	CPX-M-GE-EV-Z-PP-5-POL	CPX-M-GE-EV-FVO	CPX-M-GE-EV-S-M12-5POL	CPX-M-GE-EV-W-M12-5POL
Design	Polymer version, connected to the end plate via tie rods, modular					Metal version, individual linked, screwed-in, modular							
Order code	QD	QS	QZ	QV	QP	QM	QN	QA	QR/QN	QT	563058	QF	8098392	QA	8098392	QB	8098391
Part no.	195742	195746	195744	533577	541244	550206	550208	550210	563057	563058	567806	8098390	M12-5, 5-pin	M12-5, 5-pin	M12-5, 5-pin	M12-5, 5-pin	8098391
Connection	–	M18, 4-pin	M18, 4-pin	M18, 4-pin	7/8", 5-pin	–	7/8", 5-pin	7/8", 5-pin	AIDA, 5-pin	AIDA, 5-pin	–	interlinking block for PROFIsafe	M12-5, 5-pin	M12-5, 5-pin	M12-5, 5-pin	M12-5, 5-pin	M12-5, 5-pin
Description	Basic interlinking module in polymer	• 24 V sensors and electronics • 24 V actuators and valves • 0 V common • FE	Supply for: • 24 V sensors and electronics • 24 V actuators and valves • FE	Supply for: • 24 V sensors and electronics • 0 V actuators and valves • FE	Basic interlinking module in metal	Supply for: • 24 V sensors and electronics • 24 V actuators and valves • 0 V sensors and electronics • 0 V actuators and valves • FE

Safety@Festo: Pneumatic and electric modules of the valve terminal CPX/VTSA-F-CB – the perfect platform for your safety concept

The safety of people and machines is always paramount in all production areas

The sturdy, highly flexible and modular design makes this valve terminal extremely attractive for many applications.
Never before has a valve terminal offered this degree of freedom.

Both the flow-optimised VTSA-F-CB version with maximum output and the variety of implementation options for safety functions directly on the valve terminal contribute to this achievement.
With CPX/VTSA-F-CB, you can integrate pneumatic and electrical control chains easily, quickly and flexibly into all automation concepts – and in compliance with company-specific standards.

This is Safety@Festo – directly in the application.

NEW Up to 6 safe zones on one valve terminal
The new voltage concept and the modular design of CPX/VTSA-F-CB enable flexible safety zones for electrical and pneumatic sections. The valve terminal can thus be optimally designed and configured for the safety requirements in your application:
- Increased flexibility in the planning, design and engineering phase
- Up to 6 safe electrical zones possible. Safe shutdown takes place via external safety devices, outputs of safety controllers or via the internal PROFIsafe shut-off module.
- Reliable detection and evaluation of sensors or switches via the internal PROFIsafe input module
- Integration of pilot air switching valve, soft-start valve, vacuum ejector
- Combination of four valve sizes possible
- Wide selection of electrical and pneumatic connection options, valve functions and vertical stacking components

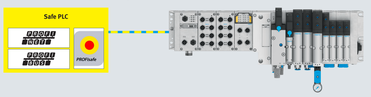
The benefits to you:
- Implementation of integrated control functions and flexible, safe electrical zones up to PLe Cat. 4 in one device. The implemented valve function may deviate from this.
- Improved diagnostics thanks to serial communication:
  Internal linking of the pneumatic and electrical section of the valve terminal and the elimination of external cable connections result in improved internal diagnostic options

Integration of the valve terminal into the control architecture

Valve terminals can be very easily integrated into existing control architectures and controlled using the standard fieldbus protocols. Alternatively, there are further options for safe shutdown of the valve terminal.

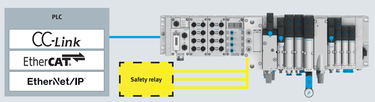
PROFIsafe network

The valve terminal VTSA-F-CB offers integrated PROFIsafe solutions for zone-specific actuation of up to 6 different safe valve zones.
In case of a safety request, one zone can be shut down independently of the other valves in another zone by setting a bit in the safety controller. Incidentally, safe inputs and external outputs can also be configured on the CPX/VTSA-F-CB.



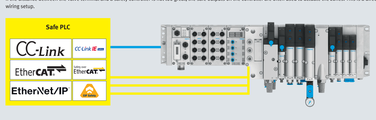
Safety relay

By integrating safety relays, actuation can take place decentrally without a higher-level safety controller.
This means that simple installations in particular can be carried out quickly and without programming.



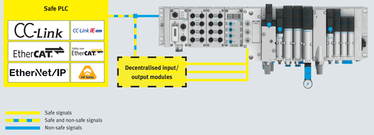
Safety controllers

If the distance between the valve terminal and a safety controller is not too great, the safe outputs on the controller are often used to actuate the zones. This is a direct wiring setup.

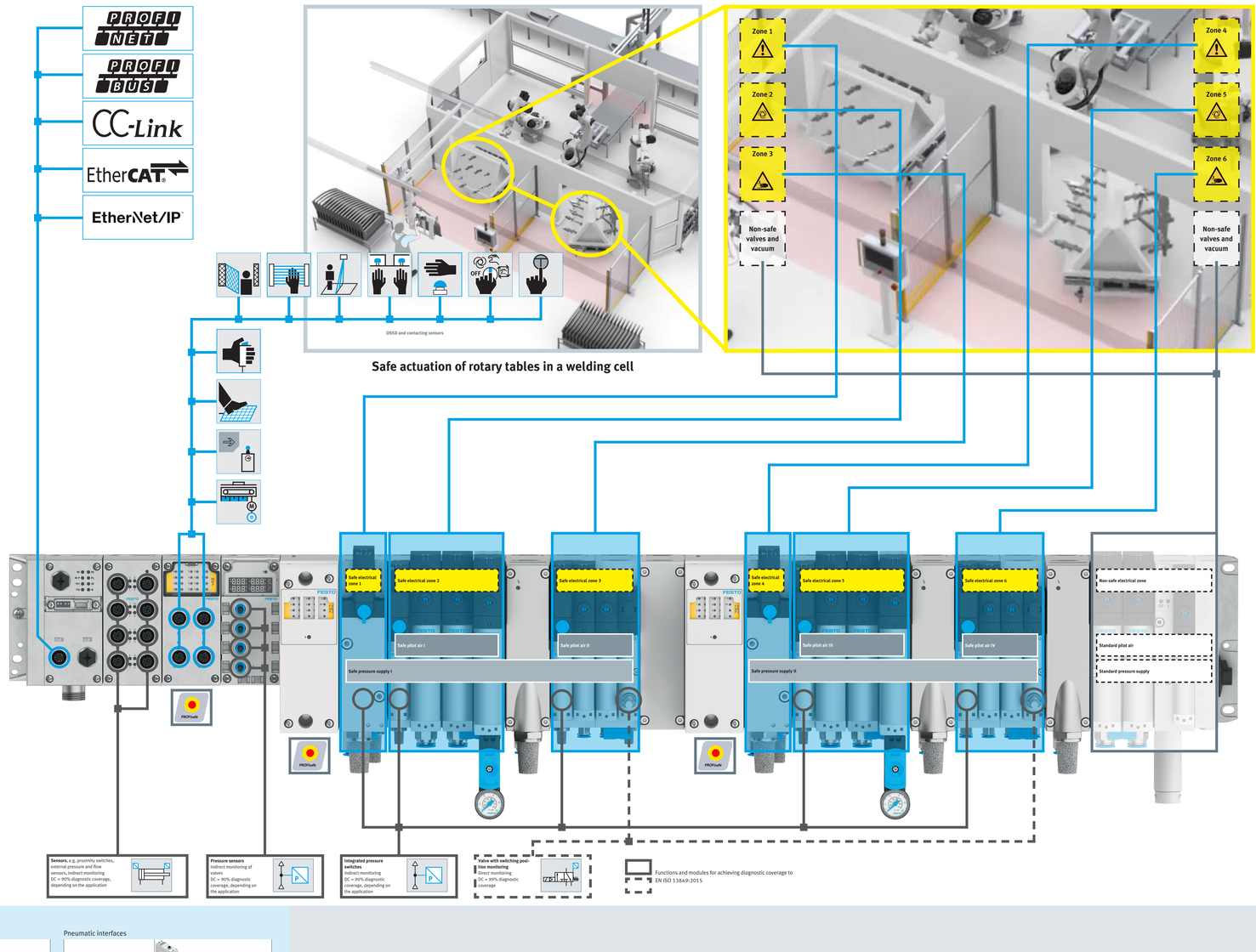


Decentralised input/output modules

Valve terminals as well as other actuators are often far away from the electrical control cabinet that houses the safety controller.
Decentralised input/output modules are used to cut down on the amount of wiring required and the associated wiring errors. If the outputs can be safely shut down with this module, they can take on the power supply of the individual zones on the valve terminal.



Safe signals
Safe and non-safe signals
Non-safe signals



Safe actuation of rotary tables in a welding cell

Online support

More detailed information

- Product information
- Explanation of safety sub-functions
- Selection aids

→ **www.festo.com/safe-pneumatics**

Online support

Application examples

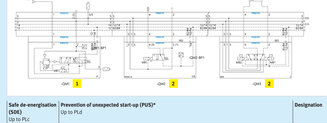
- Implementation of safety sub-functions
- Pneumatic and electric sample circuits
- Available free of charge

→ **www.festo.com/expert/application note safety**

FESTO

Sample configurations and circuits

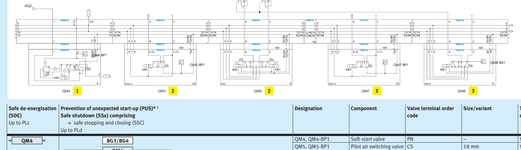
1. Sample circuit with 2 safe electrical voltage zones
Straightforward implementation of the prevention of unexpected start-up (PUS)* with available working air – or cylinder in position – and safe de-energisation (SDE) of the valve terminal as the error response.



Safe de-energisation (SDE) Up to PLe	Prevention of unexpected start-up (PUS)* Up to PLd	Designation	Component	Valve terminal order code	Size/variant	Tried-and-tested component
QM1	BG1/BG2	QM1, QM1-BP1	Soft-start valve	PN	–	Yes
	QM3 Preliminary stage / QM2 Main stage / QM2-BP1	QM2, QM2-BP1	Pilot air switching valve	CS	18 mm	Yes
		QM3	5/2-way, double solenoid (B52)	J	18 mm, 26 mm, 42 mm, 52 mm	Yes
	Not considered further as fault exclusion assumed	BG1, BG2	Proximity switch	–	–	n/a, sensor only for DC

This QR code provides information on the necessary fault exclusion

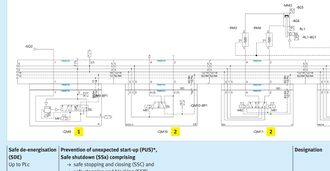
2. Sample circuit with 3 safe electrical voltage zones
The working valves (in this case, a closed 5/3-way valve) are separate from the pilot valves that actuate external components (in this case piloted check valves). The pilot valves can thus be enabled separately.



Safe de-energisation (SDE) Up to PLc	Prevention of unexpected start-up (PUS)* * Safe shutdown (SSx) comprising → safe stopping and closing (SSC) Up to PLd	Designation	Component	Valve terminal order code	Size/variant	Tried-and-tested component
QM4	BG1/BG4	QM4, QM4-BP1	Soft-start valve	PN	–	Yes
	QM6	QM5, QM5-BP1	Pilot air switching valve	CS	18 mm	Yes
	QM8 / QM8-BG1	QM7, QM7-BP1				
		QM6	5/3-way valve, closed (PJ/C)	G	18 mm, 26 mm, 42 mm, 52 mm	Yes
		QM8, QM8-BG1	5/2-way valve, single solenoid (MS1M), with switching position sensing	SO, SF	18 mm, 26 mm	Yes
	BG3/BG4	RM1, RM2	Piloted check valve	HGL-...	M5, G1/8, G1/4, G3/8, G1/2	Yes
			One-way flow control valve (piloted)	VFOF-...	G1/8, G1/4	Yes
		BG3, BG4	Proximity switch	–	–	n/a, sensor only for DC

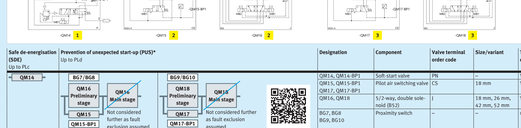
1) Leakage can cause a change in the position of the drive, depending on the application and current position.

3. Sample circuit with 2 safe electrical voltage zones
Vertical drives can be stopped via two ducts by trapping the compressed air in both cylinder chambers and using a brake.



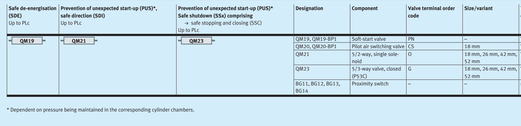
Safe de-energisation (SDE) Up to PLc	Prevention of unexpected start-up (PUS)*, Safe shutdown (SSx) comprising → safe stopping and closing (SSC) and → safe stopping and blocking (SSB) Up to PLe	Designation	Component	Valve terminal order code	Size/variant	Tried-and-tested component
QM9	QM12-BG1 / BG6/BG7 / BG6/BG7	QM9, QM9-BP1	Soft-start valve	PN	–	Yes
	QM12 / RM3 / RM6	QM10, QM10-BP1	Pilot air switching valve	CS	18 mm	Yes
	QM13 / RL1	QM13	5/2-way, double solenoid (B52)	J	18 mm, 26 mm, 42 mm, 52 mm	Yes
	QM13-BG1 / RL1-BG1	QM12, QM12-BG1 QM13, QM13-BG1	5/2-way valve, single solenoid (MS1M), with switching position sensing	SO, SF	18 mm, 26 mm	Yes
		RM3, RM6	Piloted check valve	HGL-...	M5, G1/8, G1/4, G3/8, G1/2	Yes
			One-way flow control valve (piloted)	VFOF-...	G1/8, G1/4	Yes
		RL1, RL1-BG1	Cylinder with holding brake	DFLG-.../DFLG-...	Piston ø: 40, 63, 100, 160 mm	Yes
			Holding brake	DAKS-...	Rod ø: 16, 20, 25, 40 mm	Yes
		BG5, BG6	Proximity switch	–	–	n/a, sensor only for DC

4. Sample circuit with 3 safe electrical voltage zones
Two machine zones can be actuated independently of each other. This concept can also be extended to 6 safe electrical voltage zones and 4 or 5 machine zones with the extension module.



Safe de-energisation (SDE) Up to PLc	Prevention of unexpected start-up (PUS)* Up to PLd	Designation	Component	Valve terminal order code	Size/variant	Tried-and-tested component
QM14	BG7/BG8	QM14, QM14-BP1	Soft-start valve	PN	–	Yes
	QM16 Preliminary stage / QM15 / QM15-BP1	QM15, QM15-BP1 QM17, QM17-BP1 QM16, QM18	Pilot air switching valve	CS	18 mm	Yes
			5/2-way, double solenoid (B52)	J	18 mm, 26 mm, 42 mm, 52 mm	Yes
	BG9/BG10	BG7, BG8 BG9, BG10	Proximity switch	–	–	n/a, sensor only for DC
	QM18 Preliminary stage / QM17 / QM17-BP1 / QM18 Main stage	This QR code provides information on the necessary fault exclusion				

5. Sample circuit with 3 safe electrical voltage zones
Different safety sub-functions can be implemented for different drives on the valve terminal. In this particular case, a configuration with 2 safe electrical voltage zones allows the creation of different safety circuits. A safety request (e.g. intervention in a light curtain) can thus only move some of the drives to a safe state. However, by pressing an emergency stop button all the drives can be moved to a safe state.



Safe de-energisation (SDE) Up to PLc	Prevention of unexpected start-up (PUS)*, safe direction (SDI) Up to PLc	Prevention of unexpected start-up (PUS)* Safe shutdown (SSx) comprising → safe stopping and closing (SSC) Up to PLc	Designation	Component	Valve terminal order code	Size/variant	Tried-and-tested component
QM19	QM21	QM23	QM19, QM19-BP1	Soft-start valve	PN	–	Yes
			QM20, QM20-BP1	Pilot air switching valve	CS	18 mm	Yes
			QM21	5/2-way, single solenoid	O	18 mm, 26 mm, 42 mm, 52 mm	Yes
			QM23	5/3-way valve, closed (PJ/C)	G	18 mm, 26 mm, 42 mm, 52 mm	Yes
			BG11, BG12, BG13, BG14	Proximity switch	–	–	n/a, sensor only for DC

* Dependent on pressure being maintained in the corresponding cylinder chambers.

1 2 3 Possible safe electrical shutdown via corresponding safe electrical zone
Block in the function channel
Diagnostic function for the corresponding block
Not considered further as fault exclusion assumed

Important notes:
These configuration examples are not binding and represent possible solutions for sample applications. They should not be regarded as complete, in particular with respect to configuration and equipment as well as any particular details for your specific application. The configuration examples are not custom solutions; they are intended only to offer support for typical tasks.
An FMEA must be carried out for the specific application.

All technical data (B10 values and "Tried-and-tested component", etc.) for Festo components provided in this document is up-to-date at the time of the first version (01.10.2021).
The user must verify that this data is up to date.

Input and output modules and pneumatic interfaces for actuating the valve terminal VTSA-F-CB via fieldbus

PROFIsafe input modules – easy to set up, plug & play

Type	CPX-FBDE-P
Configurator order code	ND
Part no.	3597434
Housing/screening	Metal screening, metal housing
Number of inputs	8
Number of outputs	–
Switching logic/resolution	PROFIsafe
Signal range	–
Max. current supply per channel	0.5 A

Reliable detection and evaluation of sensors or switches with OSSD functionality (with test signals) or floating contacts. Festo has therefore specified parameters for predefined, typical operating modes:
- 1 s simply a case of selecting the right mode for the sensor type being used
- Simple validation, module changes
- Easy option management

The PROFIsafe input module CPX-FBDE-P is a safe module for SIL3/PLe and "identification of tools" application. It requires no setup and programming with programming tools (e.g. Siemens Step7/TIA) or TCI applications and tools from other manufacturers

Key features:
- 4/8 safe channels PLe/category 4/SIL3
- Safety device to Machinery Directive 2006/42/EC
- Channel-granular passivation (only the channel in question is shut down)
- Monitoring of all 8 channels for:
  → External short circuit
  → Cross circuit
  → Discrepancy with 1oo2 evaluation

PROFIsafe output modules

Type	CPX-FVDA-P2
Configurator order code	ND
Part no.	1371590
Housing/screening	Metal screening, metal housing
Number of inputs	3
Number of outputs	–
Switching logic/resolution	PROFIsafe
Signal range	–
Max. current supply per channel	1.5 A

Dual channel, self-monitoring, electrical shutdown of the supply voltage to the valves in combination with controllers that support PROFIsafe
- Safe switching of outputs
- Fewer control cabinets and smaller footprint
- Monitoring the connection to the actuator, checking for possible faults
  → Wire break
  → External short circuit
  → Cross circuit

Key features:
- Communication with PROFIsafe protocol
- Category 3
- Performance Level e
- Control architecture: two channels
- Safety device to Machinery Directive 2006/42/EC
- 1 safe channels (channel 0 = US2 shutdown)
- Two additional M12 outputs (max. 1.5 A, channel 1 + 2)

Pneumatic interfaces

Type	VABA-S6-1-X2-F2-CB-AL	VABA-S6-1-X2-F2-CB2-AL
Order code	KD	PD
Part no.	8153436	8153434
Version	Metal	Metal
Description	With left-hand adapter plate, for extending with 2 safe internal zones + 1 safe output	With left-hand adapter plate and additional power supply, for extending with 2 safe internal zones + 1 safe output

Dual channel, self-monitoring, electrical shutdown of 2 internal voltage zones on the valve terminal as well as of an external supply voltage to further actuators in combination with controllers that support PROFIsafe
- Safe switching of outputs
- Fewer control cabinets and smaller footprint
- Monitoring the connection to the actuator, checking for possible faults
  → Wire break
  → External short circuit
  → Cross circuit

Key features:
- Communication with PROFIsafe protocol
- Category 3
- Performance Level e
- Control architecture: two channels
- Safety device to Machinery Directive 2006/42/EC
- 2 safe voltage zones, internal valve terminal
- 1 safe output suitable for external use (connection: M12)
- Integrated diagnostics
  → Undervoltage of valve terminal
  → Short circuit and wire break per solenoid coil

Application examples with output module and pneumatic interface for VTSA-F-CB with one safe output suitable for external use in combination with PROFIsafe

Safety door switch

Light curtain

Safety door switch

Laser scanner

Contacting sensors
The function of sensors with mechanical switching contacts must be checked regularly using an external signal. The Festo PROFIsafe input module provides this test pulse.

Typical examples

Two-hand control

Emergency stop button

Mode selector switch

Simple switches

Enable switch

Safety shut-off mat

Limit switch

Displacement encoder

OSSD sensors
Sensors with this functionality perform regular self-checks.
When using OSSD sensors, the safe inputs must be suitable for signals with test pulses.

Typical examples

Light curtain

Safety door switch

Laser scanner

Important note

The combinations of the valve function and performance level (PL) shown here can be achieved with the appropriate valve terminal configuration.
A performance level of up to PLe is possible with further measures and the linking of valves.

Valve functions and their safety functions on a valve terminal type VTSA-F-CB

Description of possible safety functions			Soft-start valve	Pilot air switching valve	2x 2/2-way valve, single solenoid, normally closed	2x 3/2-way valve, single solenoid, normally open	2x 3/2-way valve, single solenoid, normally closed	2x 3/2-way valve, single solenoid, mixed position + 3 x closed + 3 x open	5/2-way valve, single solenoid	5/2-way valve, double solenoid	5/3-way valve, mid-position pressurised 1)	5/3-way valve, mid-position closed 1)	5/3-way valve, mid-position exhausted 1)	Pressure regulator plate	Flow control plate
		Order code	PN, PM	CT, CS	VC, VV	K, P	K, Q	H, R	M, O, SQ, SS	L, D	B	G	E	Z, Zx, Zxx	X
	SDE Safe de-energisation	The SDE function enables the downstream pneumatic system to be safely disconnected and exhausted.	With corresponding safe shutdown of the electrical zone	Up to PLc											
	SEZ Safe energisation	The SEZ function permits safe energisation using a defined force/time function (soft-start function).	With corresponding safe shutdown of the electrical zone	Up to PLc											
	PUS Prevention of unexpected start-up	The PUS function prevents the start position of the valve from changing and leading to an unexpected start-up of a machine function.	With corresponding safe shutdown of the electrical zone	Up to PLc	For the supplied valves in the same pilot air zone up to PLc	Up to PLe									
			With further measures/components	Up to PLe	For the supplied valves in the same pilot air zone and in a safe electrical zone up to PLd					In combination with a pilot air switching valve or exhausted pilot air up to PLd			This QR code provides information on the necessary fault exclusion		
	SSC Safe stopping and closing	The supply to or dissipation of energy from at least one chamber of the pneumatic drive is shut off, and the energy that has thus been saved can be used for the shutdown.	With corresponding safe shutdown of the electrical zone			Up to PLc						Up to PLc			
	SDI Safe direction	The SDI function prevents the drive from moving in the incorrect direction.	With corresponding safe shutdown of the electrical zone					Up to PLc							
	SBC Safe brake control	The SBC function provides a safe output signal for controlling an external holding brake or clamping unit.	With corresponding safe shutdown of the electrical zone					Up to PLc							
	Safe equilibrium of torque (SET)	The SET function prevents the pneumatic drive from deviating from the torque equilibrium by more than a specified value.	With corresponding safe shutdown of the electrical zone			Up to PLc					Up to PLc				
	STO Safe torque off	The power supply to the pneumatic drive is interrupted. The chambers of the pneumatic drive are exhausted so that no force (torque) can be generated that leads to a dangerous movement.	With corresponding safe shutdown of the electrical zone				Up to PLc					Up to PLc			
	SLT Safely limited torque/force	The SLT function prevents the pneumatic drive from exceeding the permissible force (torque).	With a corresponding safe shutdown of the electrical zone and feedback into a safe working air zone with an OR gate											Up to PLb	
	SLS Safely limited speed	The SLS function prevents the pneumatic drive from exceeding the permissible speed.	With corresponding safe shutdown of the electrical zone in combination with a valve in reversible mode or an OR gate												Up to PLb

1811449 2021/10 – Errors and omissions excepted