Explosion protection

Relevant equipment identification for system solutions

ATEX control cabinet

Component	Equipment category	Identification			Type of ignition protection		Gas/dust group	Temperature class	X identification	Equipment protection level (EPL)	IP protection	Explosion-proof ambient temperature
		CE	ATEX	Ex	Non-electrical	Electrical						
Control cabinet	II 3 G	CE	Ex	Ex	—	nA	IIC	—	—	Gc	IP66	–20 °C ≤ Ta ≤ +70 °C
	II 3 D	CE	Ex	Ex	—	tc	IIIC	—	—	Dc	IP66	–20 °C ≤ Ta ≤ +70 °C
Valve terminal	II 3 G	CE	Ex	Ex	—	nA	IIC	T4	X	Gc	IP20	0 °C ≤ Ta ≤ +50 °C
Remote I/O	II 3 (1) G	CE	Ex	Ex	—	nA [ia Ga]	IIC	T4	X	Gc	IP20	–5 °C ≤ Ta ≤ +50 °C
	II (1) D	CE	Ex	Ex	—	[ia Da]	IIIC	—	—	—	IP20	–5 °C ≤ Ta ≤ +50 °C
Air preparation unit	II 2 G	CE	Ex	Ex	h	—	—	T6	X	—	—	+5 °C ≤ Ta ≤ +60 °C
	II 2 D	CE	Ex	Ex	h	—	—	T 60 °C	X	—	—	+5 °C ≤ Ta ≤ +60 °C
Cable connectors	II 2 G	CE	Ex	Ex	—	eb	IIC	—	—	Gb	IP68	–40 °C ≤ Ta ≤ +75 °C
	II 2 D	CE	Ex	Ex	—	tb	—	—	—	Db	IP68	–40 °C ≤ Ta ≤ +75 °C
Pneumatic bulkhead fittings	II 3 G	CE	Ex	Ex	—	ec	IIC	T6	—	Gc	IP65	–10 °C ≤ Ta ≤ +60 °C
	II 3 D	CE	Ex	Ex	—	tc	IIIC	T 60 °C	—	Dc	IP65	–10 °C ≤ Ta ≤ +60 °C

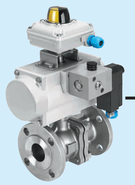
The overall assessment of the control cabinet solution, with the above components, gives the following equipment identification:

II 3 (1) G	CE	Ex	Ex	—	nA ec [ia Ga]	IIC	T4	X	—	IP65	+5 °C ≤ Ta ≤ +40 °C**
II 3 (1) D	CE	Ex	Ex	—	tc [ia Da]	IIIC	T 50 °C*	—	—	IP65	+5 °C ≤ Ta ≤ +40 °C**

* Temperature class for dust: lowest maximum ambient temperature for all components
** Maximum permitted ambient temperature of the control cabinet taking into account the power loss of all components

ATEX process valve unit

Component	Equipment category	Identification			Type of ignition protection		Gas/dust group	Temperature class	X identification	Equipment protection level (EPL)	IP protection	Explosion-proof ambient temperature
		CE	ATEX	Ex	Non-electrical	Electrical						
Sensor box	II 1 G	CE	Ex	Ex	—	ia	IIC	T5	—	Ga	IP67	–20 °C ≤ Ta ≤ +70 °C
	II 1 D	CE	Ex	Ex	—	ia	IIIC	T 108 °C	—	Da	IP67	–20 °C ≤ Ta ≤ +70 °C
Quarter turn actuator	II 2 G	CE	Ex	Ex	h	—	—	T4	X	—	IP65	–20 °C ≤ Ta ≤ +80 °C
	II 2 D	CE	Ex	Ex	h	—	—	T 105 °C	—	—	IP65	–20 °C ≤ Ta ≤ +80 °C
Solenoid valve	II 2 G	CE	Ex	Ex	—	ia	IIC	T5	—	Gb	IP64	–30 °C ≤ Ta ≤ +65 °C
	II 2 D	CE	Ex	Ex	—	ia	IIIC	T 95 °C	—	Db	IP64	–30 °C ≤ Ta ≤ +65 °C
Ball valve	No potential ignition sources											



The possible area of application of the process valve unit is based on the classification of the above components:

II 2 G	—	—	Ex	h	ia	IIC	T4	X	—	IP64	–20 °C ≤ Ta ≤ +65 °C
II 2 D	—	—	Ex	h	ia	IIIC	T 108 °C	—	—	IP64	–20 °C ≤ Ta ≤ +65 °C

Types of ignition protection

Degree of protection	Protection principle	Europe/International: ID code	Europe/International: Type of ignition protection	Europe/International: ATEX zones	Europe/International: Standard	North America NEC/CEC 505/506: ID code	North America NEC/CEC 505/506: Type of ignition protection	North America NEC/CEC 505/506: ATEX zones	North America NEC/CEC 505/506: Standard	North America NEC/CEC 500: ID code	North America NEC/CEC 500: ATEX zones	North America NEC/CEC 500: Standard
Electrical equipment												
Increased safety	Preventing sparks and temperatures	Ex e	eb	Zone 1	IEC 60079-7	AEx e	eb	Class I, Zone 1	UL 60079-7 ISA 60079-7 CSA C22.2 No. 60079-7	—	—	—
			ec	Zone 2			ec					
Flameproof enclosure	Preventing the explosion being transmitted to the outside	Ex d	da	Zone 0	IEC 60079-1	AEx d	da	Class I, Zone 1	UL 1203 ISA 60079-1 CSA 60079-1 FM 3615	—	—	—
			db	Zone 1			DB					
			dc	Zone 2			dc					
Protected through the enclosure	The ignition source is separated from the explosive dust atmosphere	Ex t	ta	Zone 20	IEC 60079-31	AEx t	ta	Zone 20	UL 60079-31 ISA 60079-31 CSA C22.2 No. 60079-31	—	—	—
			tb	Zone 21			tb	Zone 21				
			tc	Zone 22			tc	Zone 22				
Intrinsic safety	Limiting energy of sparks and temperatures	Ex i	ia	Zone 0/20	IEC 60079-11	AEx i	ia	Class I, Zone 0 / Zone 20	UL 60079-11 ISA 60079-11 CSA C22.2 No. 60079-11 FM 3610	(IS)	Class I, Div 1 Class II, Div 1 Class III, Div 1	UL 913 FM 3610 C22.2 No.157
			ib	Zone 1/21			ib	Class I, Zone 1 / Zone 21				
			ic	Zone 2/22			ic	Class I, Zone 2				
Pressure-proof encapsulation	The ignition source is separated from the explosive atmosphere	Ex p	pxb/pyb	Zone 1/21	IEC 60079-2	AEx p	px	Class I, Zone 1 / Zone 21	UL 60079-2 ISA 60079-2 CSA C22.2 No. 60079-2	X / Y	Class I, Div 1 Class II, Div 1	NFPA 496 FM 3620
							py					
			pzc	Zone 2/22			pz	Class I, Zone 2		Z	Class I, Div 2 Class II, Div 2	NFPA 496 FM 3620
Encapsulation	The ignition source is separated from the explosive atmosphere	Ex m	ma	Zone 0/20	IEC 60079-18	AEx m	ma	Class I, Zone 0 / Zone 20	UL 60079-18 ISA 60079-18 CSA C22.2 No. 60079-18	—	—	—
			mb	Zone 1/21			mb	Class I, Zone 1 / Zone 21				
			mc	Zone 2/22			mc	Class I, Zone 2				
Explosion proof	Containing explosion and extinguish flames	—	—	—	—	—	—	—	—	(XP)	Class I, Div 1	UL 1203 FM 3615 C22.2 No.30
Non-sparking	Preventing sparks	Ex n	nA	Zone 2	IEC 60079-15	AEx n	nA	Class I, Zone 2	UL 60079-15 ISA 60079-15 CSA C22.2 No. 60079-15	—	—	—
			nC									
			nR									
Non-sparking	—	—	—	—	—	—	—	—	—	(NI)	Class I, Div 2	ISA 12.12.01 FM3611 C22.2 No. 213
Sand filled	Preventing the explosion being transmitted to the outside	Ex q	q	Zone 1	IEC 60079-5	AEx q	q	Class I, Zone 1	UL 60079-5 ISA 60079-5 CSA 22.2 No. 60079-5	—	—	—
			qb									
Oil immersion	The ignition source is separated from the explosive atmosphere	Ex o	ob	Zone 1	IEC 60079-6	AEx o	ob	Class I, Zone 1	UL 60079-6 ISA 60079-6 CSA C22.2 No. 60079-6	—	—	—
			oc	Zone 2			oc					
Non-electrical equipment												
Constructional safety	Ensuring that an ignition source cannot arise	c	h	Zone 1/21 Zone 2/22	ISO 80079-37 EN ISO 80079-37 (EN 13463-5)							
Ignition source monitoring	Preventing an ignition source from becoming active	b	h	Zone 1/21 Zone 2/22	ISO 80079-37 EN ISO 80079-37 (EN 13463-6)							
Liquid immersion	Preventing the explosive atmosphere from reaching the ignition source	k	h	Zone 1/21 Zone 2/22	ISO 80079-37 EN ISO 80079-37 (EN 13463-8)							
Pressurised enclosure	Preventing the explosive atmosphere from reaching the ignition source	p	h	Zone 1/21 Zone 2/22	IEC 60079-2 EN 60079-2 (EN 13463-7)							
Flameproof enclosure	Preventing flame propagation via a housing	d	h	Zone 1/21 Zone 2/22	IEC 60079-1 EN 60079-1 (EN 13463-3)							
Protected through the enclosure	Preventing the explosive atmosphere from reaching the ignition source	t	h	Zone 1/21 Zone 2/22	IEC 60079-31 EN 60079-31							

Potentially explosive areas

Temporary behaviour of the flammable material in potentially explosive areas	Europe/International: Potentially explosive areas	Europe/International: Equipment group	Europe/International: Equipment category			North America NEC/CEC 505/506: Risk classification	North America NEC/CEC 505/506: Potentially explosive areas			North America NEC/CEC 500: Risk classification	North America NEC/CEC 500: Potentially explosive areas	
Gas, mist, liquid												
Constant, long periods, frequent	Zone 0	II	1G	—	—	Class I	Zone 0	—	—	Class I	Division 1	—
Occasional	Zone 1	II	1G	2G	—		Zone 0	Zone 1	—		Division 1	—
Normally not, only for short periods	Zone 2	II	1G	2G	3G		Zone 0	Zone 1	Zone 2		Division 1	Division 2
Dust												
Constant, long periods	Zone 20	II	1D	—	—	—	Zone 20	—	—	Class II	Division 1	—
Occasional	Zone 21	II	1D	2D	—		Zone 20	Zone 21	—		Division 1	—
Normally not, only for short periods	Zone 22	II	1D	2D	3D		Zone 20	Zone 21	Zone 22		Division 1	Division 2
Fibres												
Constant, long periods	—	—	—			—	—			Class III	Division 1	—
Occasional											Division 1	—
Normally not, only for short periods											Division 1	Division 2
Methane, pulverised coal												
Constant	Carbon mining	I	M1	—		—	—			—	—	
Frequent	Carbon mining	I	M1	M2								

Equipment protection level

Europe/International: Equipment protection level (EPL)			North America NEC/CEC 505/506: Equipment protection level (EPL)		
—	—	Ga	—	—	Ga
—	Gb	Ga	—	Gb	Ga
Gc	Gb	Ga	Gc	Gb	Ga
—	—	Da	—	—	Da
—	Db	Da	—	Db	Da
Dc	Db	Da	Dc	Db	Da
—			—		
—	Ma		—		Ma
Mb	Ma		Mb		Ma

Equipment identification

		Potentially explosive area**		Type of ignition protection***	Gas/dust group	Temperature class	Equipment protection level
Europe/International							
Electrical equipment							
IECEx			Ex	db [ia Ga]	IIC	T5	Gb
ATEX	CE 158* Ex	II 2 (1) G	Ex	db [ia Ga]	IIC	T5	Gb
Non-electrical equipment							
IECEx			Ex	h	IIC	T5	Gb
ATEX	Ex	II 2 G	Ex	h	IIC	T5	Gb
North America							
NEC/CEC 505		Class I, Zone 1	AEx	db [ia Ga]	IIC	T4	Gb
NEC/CEC 506		Zone 21	AEx	db [ia Da]	IIIC	T 120 °C	Db
NEC/CEC 500		Class I, Division 1			Group C, D	T4	

* Number of notified body
** Values in round brackets indicate that the related device provides circuits for equipment of Category 1.
*** Values in square brackets indicate that the related device provides intrinsically safe circuits for equipment in other zones (here Zone 0).

Certificate identification

	Notified body	Year		Certification number	Additional condition
IECEx					
IECEx	BVS	17		0116	X
ATEX					
	BVS	17	ATEX	I 135	X

Information, operating instructions and certificates are available at www.festo.com/supportportal

Standards

Region/country	Standards
Europe	ATEX
Brazil	Inmetro
China	Nespi, CNEX
Korea	Kosha, KOGAS
India	PESO
Russia	EAC (formerly: GOST R)
USA, Canada	UL, FM, CSA
Australia, New Zealand	IECEx
South Africa	SANS

Gas/dust groups

Flammable material	Europe/International: Gas/dust group	North America NEC/CEC 505/506: Gas/dust group	North America NEC/CEC 500: Gas/dust group
Mines susceptible to firedamp			
Methane	I	I	—
Areas with potentially explosive gas atmospheres			
Propane	IIA	II A	Group D
Ethylene	IIB	II B	Group C
Hydrogen	IIC	II C	Group B
Acetylene	IIC	II C	Group A
Areas with potentially explosive dust atmospheres			
Combustible lint	IIIA	III A	—
Non-conductive dust	IIIB	III B	—
Conductive dust	IIIC	III C	—
Non-carbonaceous dust	—	—	Group G
Carbonaceous dust	—	—	Group F
Metallic dust	—	—	Group E

Safe automation with explosion-proof products and solutions from Festo


Remote I/O


Valve terminals


Solenoid valves


Sensor boxes


Actuators


Air preparation units

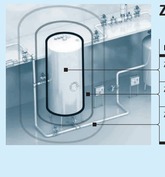
Temperature classes

Ignition temperature of gas		Max. surface temperature of the equipment		Europe/International: Temperature class	Europe/International: Applicable equipment	North America NEC/CEC 505: Temperature class	North America NEC/CEC 505: Applicable equipment	North America NEC/CEC 500: Temperature class	North America NEC/CEC 500: Applicable equipment
>450 °C	>842 °F	450 °C	842 °F	T1	T1 to T6	T1	T1 to T6	T1	T1 to T6
>300 ... ≤450 °C	>572 ... ≤842 °F	300 °C	572 °F	T2	T2 to T6	T2	T2 to T6	T2	T2 to T6
>280 ... ≤300 °C	>536 ... ≤572 °F	280 °C	536 °F					T2A	T2A to T6
>260 ... ≤280 °C	>500 ... ≤536 °F	260 °C	500 °F					T2B	T2B to T6
>230 ... ≤260 °C	>446 ... ≤500 °F	230 °C	446 °F					T2C	T2C to T6
>215 ... ≤230 °C	>419 ... ≤446 °F	215 °C	419 °F					T2D	T2D to T6
>200 ... ≤215 °C	>392 ... ≤419 °F	200 °C	392 °F	T3	T3 to T6	T3	T3 to T6	T3	T3 to T6
>180 ... ≤200 °C	>356 ... ≤392 °F	180 °C	356 °F					T3A	T3A to T6
>165 ... ≤180 °C	>329 ... ≤356 °F	165 °C	329 °F					T3B	T3B to T6
>160 ... ≤165 °C	>320 ... ≤329 °F	160 °C	320 °F					T3C	T3C to T6
>135 ... ≤160 °C	>275 ... ≤320 °F	135 °C	275 °F	T4	T4 to T6	T4	T4 to T6	T4	T4 to T6
>120 ... ≤135 °C	>248 ... ≤275 °F	120 °C	248 °F					T4A	T4A to T6
>100 ... ≤120 °C	>212 ... ≤248 °F	100 °C	212 °F	T5	T5 to T6	T5	T5 to T6	T5	T5 to T6
> 85 ... ≤100 °C	>185 ... ≤212 °F	85 °C	185 °F	T6	T6	T6	T6	T6	T6

In a dust atmosphere, details of the maximum surface temperature in °C/°F

Ignition temperatures

Gas	Ignition temperature	
Ammonia	630 °C	1166 °F
Methane	595 °C	1103 °F
Hydrogen	560 °C	1040 °F
Propane	470 °C	878 °F
Ethylene	425 °C	797 °F
Butane	365 °C	689 °F
Acetylene	305 °C	581 °F
Cyclohexane	259 °C	498 °F
Diethyl ether	170 °C	338 °F
Carbon disulphide	95 °C	203 °F



Zone classification

IECEx	NEC/CEC 505/506	NEC 500
Zone 0/20	Class I / Zone 0 Zone 20	Class I / Div 1 Class II / Div 1 Class III / Div 1
Zone 1/21	Class I / Zone 1 Zone 21	
Zone 2/22	Class I / Zone 2 Zone 22	Class I / Div 2 Class II / Div 2 Class III / Div 2

Degree of protection to IEC 60529 IPXX

1st digit: Protection against contact and foreign objects		2nd digit: Protection against ingress of liquids								
		No protection	Vertical water drops	Diagonal water drops	Spraying water	Splash water	Water jets	Powerful water jets	Temporary immersion	Prolonged immersion*
		IP ... 0	IP ... 1	IP ... 2	IP ... 3	IP ... 4	IP ... 5	IP ... 6	IP ... 7	IP ... 8
No protection	IP 0 ...	IP 00	—	—	—	—	—	—	—	—
Size of foreign objects ≥ 50 mm	IP 1 ...	IP 10	IP 11	IP 12	—	—	—	—	—	—
Size of foreign objects ≥ 12,5 mm	IP 2 ...	IP 20	IP 21	IP 22	IP 23	—	—	—	—	—
Size of foreign objects ≥ 2,5 mm	IP 3 ...	IP 30	IP 31	IP 32	IP 33	IP 34	—	—	—	—
Size of foreign objects ≥ 1 mm	IP 4 ...	IP 40	IP 41	IP 42	IP 43	IP 44	—	—	—	—
Dust protection	IP 5 ...	IP 50	—	IP 52	IP 53	IP 54	IP 55	IP 56	—	—
Dustproof	IP 6 ...	IP 60	—	—	—	IP 64	IP 65	IP 66	IP 67	IP 68

* Immersion depth and immersion time must be agreed! IP69K – Water for high-pressure/steam-jet cleaning

Degree of protection to NEMA standards

NEMA	Application: inside	Application: outside	Explanation
1	•	—	Protection against falling dirt.
2	•	—	Protection against ingress of water drops and falling dirt.
3	•	•	Protection against ingress of rain and hail and wind-driven dust. No damage during ice formation on the housing.
3R	•	•	Protection against ingress of rain, sleet. No damage during ice formation on the housing.
3S	•	•	Protection against ingress of rain, sleet and wind-driven dust. External mechanism remains operational despite the accumulation of ice.
4	•	•	Protection against ingress of falling rain, splash water and water jets. No damage during ice formation on the housing.
4x	•	•	Protection against ingress of falling rain, splash water and water jets. No damage during ice formation on the housing, corrosion protection.
5	•	—	Protection against dust and falling dirt and dropping, non-corrosive liquids.
6	•	•	Protection against ingress of dust and water jets and water due to temporary submersion. No damage during ice formation on the housing.
6P	•	•	Protection against ingress of dust and water jets and water due to longer submersion. No damage during ice formation on the housing.
7	•	—	For installation in potentially explosive areas classified as Class I, Division 1, Groups A, B, C or D.
8	•	•	For installation in potentially explosive areas classified as Class I, Division 1, Groups A, B, C or D.
9	•	—	For installation in potentially explosive areas classified as Class II, Division 1, Groups E, F, or G.
10	Mining		Housing that meets the requirements of the Mine Safety and Health Administration.
11	•	—	Protection against ingress of water drops and corrosion protection due to immersion in oil.
12, 12K	•	—	Protection against ingress of dust, dirt and water drops.
13	•	—	Protection against ingress of dust, splash water, oil and non-corrosive liquids.

The following applies to all tables: • Use is possible — Use is not possible or not intended

... clearly explained

1135920 en 2018/10 – Errors and omissions excepted