Explosion-Proof Components Guide

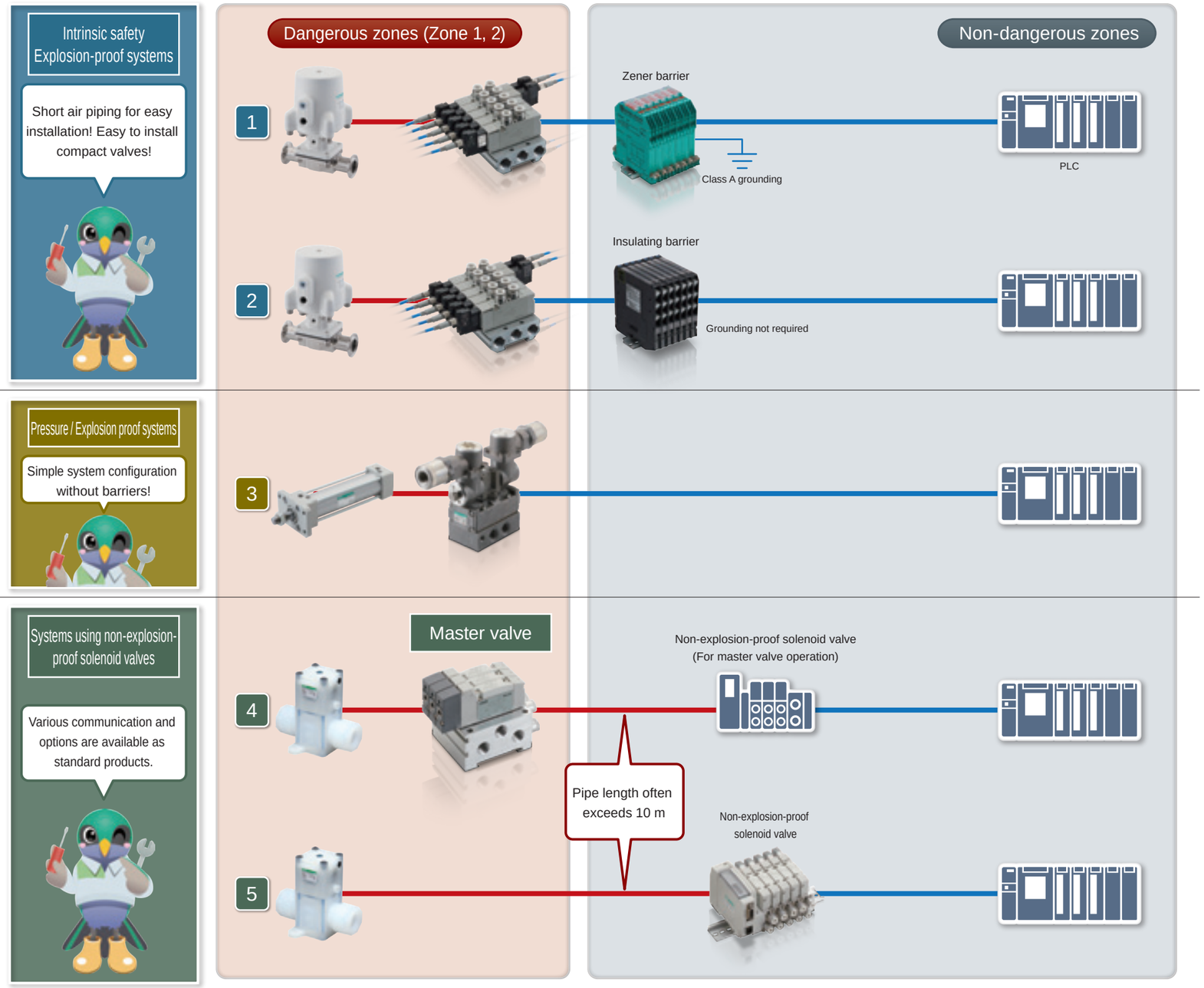
CKD Corporation
CC-1494AA 3

An extensive lineup of CKD explosion-proof components

CKD offers the best explosion-proof system configuration for use in explosion-proof atmospheres, including intrinsically safe, explosion-proof, and master valves, to suit various applications.

Zone 0	Zone 1	Zone 2	IECEx	JPEx	NEPSI	CCC	Ex	KCs	TS
Can be used in Zone0	Can be used in Zone1	Can be used in Zone2	International explosion-proof (IECEx)	Japan Explosion-Proof Certification Region Japan	GB Standard Certification Region China	CCC Standard Certification Region China	ATEX COMMAND AUTHENTICATION Region Europe	KOSHA Standard Certification Region South Korea	TS Authentication Region Taiwan

System configuration



System	Solenoid valve installation space	Actuator Responsivity	Air Piping
1	◎	◎	Short
2	◎	◎	Short
3	△	◎	Short
4	◎	○	Long
5	◎	△	Long

◎: Excellent, ○: Good, △:Conditional

Intrinsic safety explosion-proof Valve

Pilot operated 3, 5-port valve

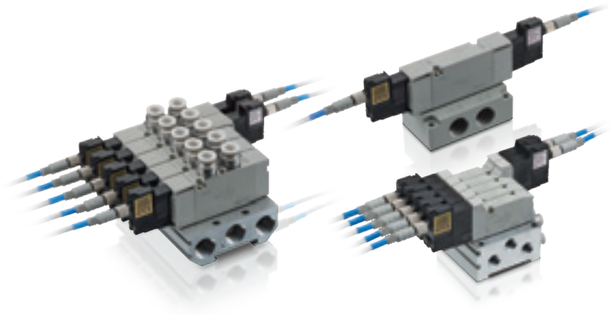
4GD/E EJ

Certification Region: Japan (JPEx)

Zone 1 Zone 2

Ex ib IIC T4 Gb

JPEx



Specs

- Cylinder bore size: up to ø160
- Working pressure range: 0.2 MPa to 0.7 MPa
- Degree of protection: IP67
- Voltage : 12 VDC

Features

- Realizes the smallest explosion-proof class valve width of 10 mm.
- 4 sizes: 10 mm, 15mm, 18mm, and 23.5mm. Rich lineup from space-saving to large flow rate
- High durability of 50 million cycles
- Max. No. of manifold stations: 15 to 20
  * Differs depending on solenoid valve size, DIN rail or direct mount
- Lineup includes 2 built-in 3-port valves. Two single acting actuators can be driven by one valve. Contributes to a significant reduction in the number of manifolds.

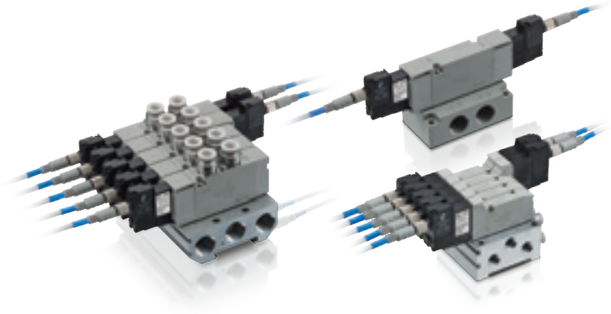
Pilot operated 3, 5-port valve

4GD/E EA

Certified Region: Europe (ATEX) / International (IECEx)

Zone 1 Zone 2

Ex ib IIC T4 Gb II2G Ex ib IIC T4 Gb



Specs

- Cylinder bore size: up to ø160
- Working pressure range: 2 to 7 bar
- Degree of protection: IP67
- Voltage: 12 VDC

Features

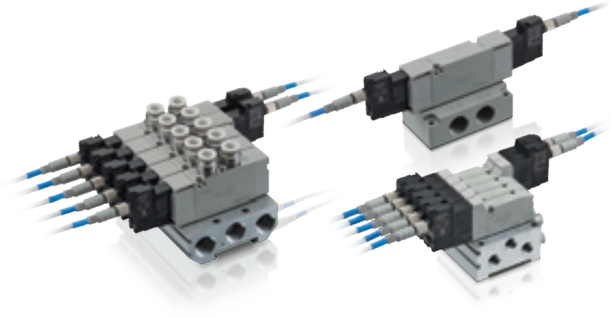
- Realizes an explosion-proof minimum class valve width of 10mm.
- 4 sizes: 10 mm, 15mm, 18mm, and 23.5mm. Rich lineup from space-saving to large flow rate
- G thread standard compliance
- High durability of 50 million cycles
- Max. No. of manifold stations: 15 to 20
  * Differs depending on solenoid valve size and direct mount
- Lineup includes 2 built-in 3-port valves. Two single acting actuators can be driven by one valve. Contributes to a significant reduction in the number of manifolds.

Pilot operated 3, 5-port valve

4GD/E EX

Certification Region:
China (NEPSI, CCC)/International (IECEx)/
Korea (KOSHA)/Taiwan (TS)

Zone 1 Zone 2 Ex ib IIC T4 Gb



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Variety of valve options Intrinsic safety explosion-proof

For details of each product, refer to the CKD website (https://www.ckd.co.jp/en/).

Prevents manual misoperation Standard

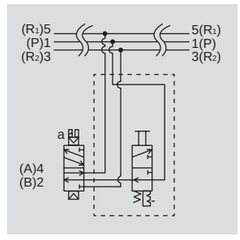
Manual override has a protective cover.

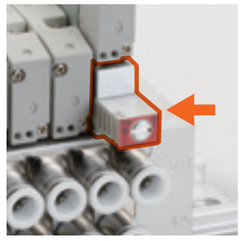
Operation indicator

Pressurization status is indicated by an indicator that operates only with air pressure. Contributes to improved maintenance of solenoid valves.

In-stop valve spacer

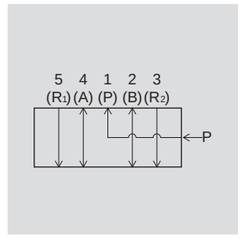
Air can be stopped for each valve. Valves can be replaced individually without stopping production line operation.

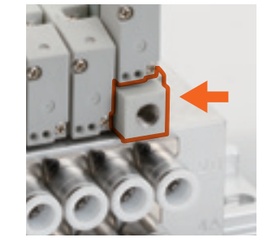




Air supply spacer

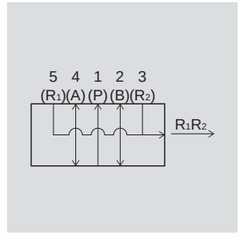
Air can be supplied at different pressures for each valve. Ideal for adjusting the thrust of cylinders by increasing or decreasing the pressure of individual valves.

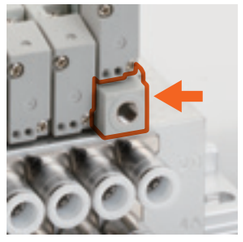




Exhaust spacer*

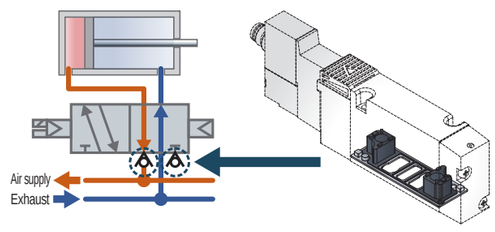
Individual exhaust prevents single acting cylinder misoperation.





Exhaust check valve*

Equipped as standard with both metal base and resin block. (4G*1 to 4G*3 EJ compatible)



* When using the A/B/R connection for the valve switching position classification, the exhaust spacer is recommended. (When using an A/B/R connection with a malfunction protection valve, it is more difficult for the actuator to be actuated by external forces.)

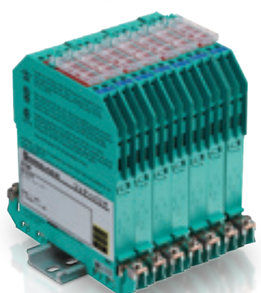
For details of each product, refer to the CKD website (https://www.ckd.co.jp/en/).

Zener barrier

Z728 1CH

Manufacturer: Pepperl+Fuchs Inc .
Refer to the Pepperl+Fuchs Inc. catalog for detailed specifications.

* Also available from CKD.



Certification Region: Japan/International (IECEx)/Europe (ATEX)/China (NEPSI, CCC) / Korea (KOSHA)/Taiwan (TS)

[Ex ia] IIC

Specs

- Intrinsic safety circuit max. voltage Uo:28V
- Intrinsic safety circuit max. current Io:93mA
- Intrinsic safety circuit max. power Po:0.65W
- Intrinsic safety circuit allowable capacitance Co:0.083 μF
- Intrinsic safety circuit allowable inductance Lo:3.05mH
- Operating ambient temperature range: -20 to 60°C
- Current limiting resistance: 300 Ω

Zener barrier

Z779 2CH

Manufacturer: Pepperl+Fuchs Inc .
Refer to the Pepperl+Fuchs Inc. catalog for detailed specifications.

* Also available from CKD.

Certification Region:Japan/International (IECEx)/Europe (ATEX)/China (NEPSI, CCC) / Korea (KOSHA)/Taiwan (TS)

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- Intrinsic safety circuit max. power Po:0.65W
- Intrinsic safety circuit allowable capacitance Co:0.083 μF
- Intrinsic safety circuit allowable inductance Lo:3.05mH
- Operating ambient temperature range: -20 to 60°C
- Current limiting resistance: 301 Ω

Guide to max. cable length between barrier and valve

Type	Barrier	Cable size			
		0.5 mm²	0.75 mm²	0.9 mm²	1.25 mm²
Zener barrier 1CH	Z728	500m	700m	800m	1000m
Zener barrier 2CH	Z779	500m	700m	800m	1000m
Insulating barrier 1CH type	D5048S	200m	300m	400m	500m

*1: The cable length is a guide. Check the specifications of the cable to be used.
*2: The above calculations are based on the low power instrumentation cable JKPEV.
*3: Maximum cable length at 20°C. Note that the maximum cable length changes depending on the operating conditions such as ambient temperature.

Recommended barrier

Type	Type	Manufacturer	Certification Region
Zener barrier 1CH type	MTL7728	Cooper Industries	JPEx
Insulating barrier 1CH type	KFDO-SD2-Ex1.1045	Pepperl and Fuchs	JPEx,ATEX,IECEx,NEPSI
	MTL5525	Cooper Industries	JPEx

Insulating barrier (intrinsic safety explosion-proof structure)

D5048S 1CH

Supply source: IDEC Co., Ltd. (Manufacturer: G.M.I)
Refer to the catalog of IDEC or G.M.I. for detailed specifications.

* Also available from CKD.

Certification Region: Japan/International (IECEx)/Europe (ATEX)/China (NEPSI, CCC) / Korea (KOSHA)/Taiwan (TS)

[Ex ia] IIC

Specs

- Intrinsic safety circuit max. voltage Uo:24.8V
- Intrinsic safety circuit max. current Io:108mA
- Intrinsic safety circuit max. power Po:667mW
- Intrinsic safety circuit allowable capacitance Co:0.113 μF
- Intrinsic safety circuit allowable inductance Lo:1.42mH
- Operating ambient temperature range: -40 to 70°C

* If the output voltage of the control component fluctuates significantly, consider using an insulating barrier with stable output voltage.

Insulating barrier (intrinsic safety explosion-proof structure)

EXDO-11 1CH

Supply sources:Bei ji an
Refer to the Bei ji an catalog for detailed specifications.

* Also available from CKD.

Certified Region: China (NEPSI, CCC)

[Ex ia Ga] IIC **[Ex ia Da] IIIC**

Specs

- Intrinsic safety circuit max. voltage Uo:28V
- Intrinsic safety circuit max. current Io:93mA
- Intrinsic safety circuit max. power Po:0.65W
- Intrinsic safety circuit allowable capacitance Co:0.05 μF
- Intrinsic safety circuit allowable inductance Lo:2.4mH

Insulating barrier (intrinsic safety explosion-proof structure)

EXDO-22 2CH

Supply sources:Bei ji an
Refer to the Bei ji an catalog for detailed specifications.

* Also available from CKD.

Certified Region: China (NEPSI, CCC)

[Ex ia Ga] IIC **[Ex ia Da] IIIC**

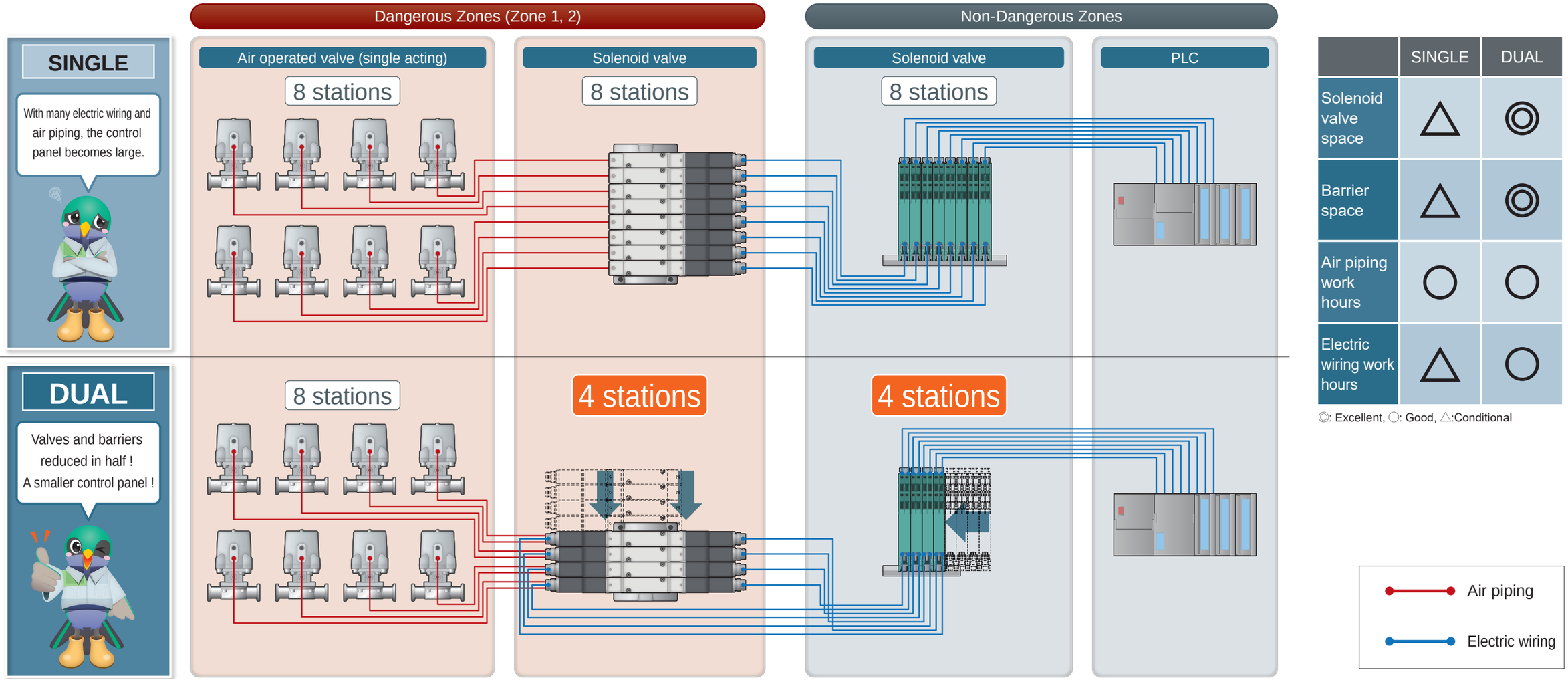
Specs

- Intrinsic safety circuit max. voltage Uo:28V
- Intrinsic safety circuit max. current Io:93mA
- Intrinsic safety circuit max. power Po:0.65W
- Intrinsic safety circuit allowable capacitance Co:0.05 μF
- Intrinsic safety circuit allowable inductance Lo:2.4mH

Intrinsic safety explosion-proof

With CKD Solenoid valves 1/2 and barriers 1/2

For details of each product, refer to the CKD website (https://www.ckd.co.jp/en/).

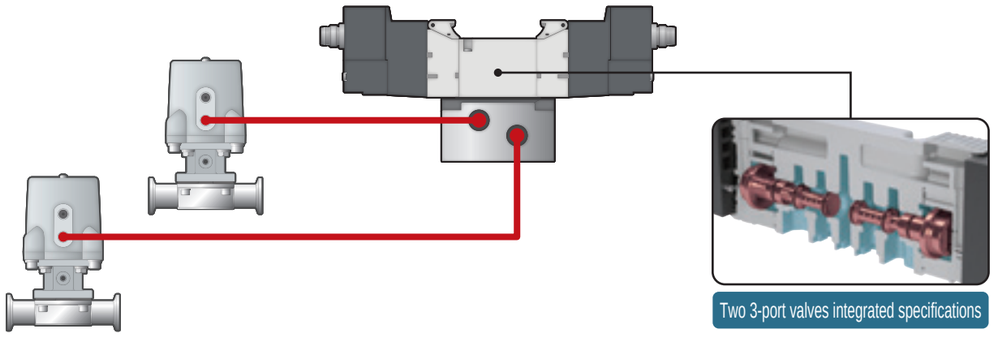


	SINGLE	DUAL
Solenoid valve space	△	◎
Barrier space	△	◎
Air piping work hours	○	○
Electric wiring work hours	△	○

◎: Excellent, ○: Good, △:Conditional

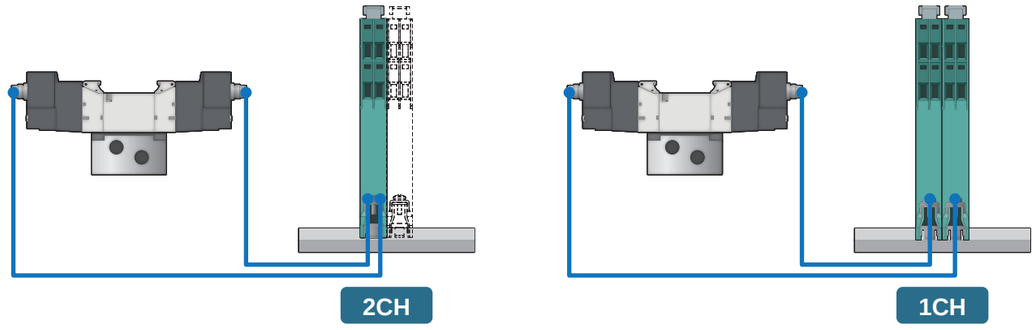
Solenoid valve

Two single acting actuators can be controlled with one manifold station.
Solenoid valves can be installed even in narrow spaces.



Barrier

2CH type barrier that can drive two solenoid valves with one barrier is available.
Barrier installation space is reduced by half.



It can also be connected to a 1 ch barrier. Refer to the barriers on pages 6 and 7 for details.

Intrinsic safety explosion-proof Input component system for use in Zone 1, 2

Check the working conditions of the barrier switch.

For details on each product, refer to the CKD website (https://www.ckd.co.jp/en/).

Dangerous Zones (1 and 2)

Cylinder switch

Zone 1 Zone 2

Explosion-proof specifications are not available for discrete cylinder switches.
However
- When using it in Japan, check that the specifications conform to those of IDEC's EB9Z-A relay barrier connection switch.
- When used outside Japan, the product can be used as a simple components in a certified Region of IDEC EB3C (relay barrier).

Specifications

Switch type	2-wire reed	Indicator lamp	None
Load voltage	12 VDC / 24 VDC	Load current	50 mA or less

Applicable cylinder

SW-T5□

□: Lead wire direction
H: Straight (photo)
V: L-shaped

Pressure switch

Zone 1 Zone 2

Explosion-proof specifications are not available for discrete pressure switches.
However
- When using it in Japan, check that the specifications conform to those of IDEC's EB9Z-A relay barrier connection switch.
- When used outside Japan, the product can be used as a simple components in a certified Region of IDEC EB3C (relay barrier).

Specifications

Working fluid	Compressed air	Max. working pressure	1.0 MPa
Set pressure	0.1 to 0.6 MPa		

FR unit connection image

General purpose installation

APS-6D-W-FL459606

FR unit Connection

P4100-□-W-FLA79598

□: Port size (ø8, ø10, ø15)

Non-Dangerous Zones

Barrier (intrinsic safety explosion-proof structure)

Explosion-proof performance [Ex ia Ga] IIC

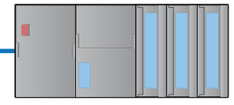
Certification Region

International	IECEx	South Korea	KCS
North America	FM / UL / c-UL	Taiwan	TS
Europe	CE / ATEX / UKCA	Japan	DEKRA
China	Ex-CCC		

IDEC

Relay barrier (intrinsic safety explosion-proof structure)

EB3C



PLC

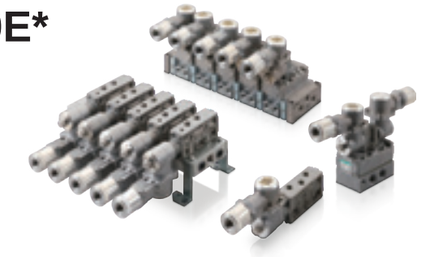
- Compliant with International Explosion-Proof Guidelines 2015Ex, 2020Ex and technical standards.
- A wide variety of models are available, from 1-circuit to 16-circuit units.
- The 16-circuit models are available with a connector type for easy connection to PLCs.
- No grounding is required for the DC power supply type.
- Relay output and transistor output (sink/source) are available on the non-intrinsic safety circuit side.
- Refer to the catalog, instruction manual, etc., issued by IDEC Co., Ltd. for the working conditions when connecting a switch and relay barrier.

Purchases can be made from IDEC Co., Ltd.
Refer to the IDEC catalog for detailed specifications.

For details of each product, refer to the CKD website (https://www.ckd.co.jp/en/).

Pilot operated 5-port valve

4F**0E*



Certification Region:
Japan/China (NEPSI, CCC)/
Korea (KOSHA)/Taiwan (ITRI)

Zone 1 Zone 2 Exd II BT4

Specs
- Cylinder bore size: up to ø250
- Working pressure range: 0.2 MPa to 0.7 MPa
- Degree of protection: IP65
- Voltage: 12, 24 VDC, 100, 110, 200, 220 VAC

Features
- Valve width: 51 mm, 60 mm, 68 mm, 74 mm, 91 mm, Diverse valve lineup of 5 types.
- Compatible with outdoor use (IP65)
- Selectable electric wire cable diameter range: ø7.5 to ø13.5
- Max. No. of manifold stations: 10

Direct acting 2-port valve

AB41EX4
AB41EX2

Certification Region:
Japan/China (NEPSI, CCC)/
Korea (KOSHA)

Zone 1 Zone 2 Exd II BT4

Specs
- Working fluids: Compressed air/Low vacuum/Water/Kerosene/Oil
- Actuation: NC (Normally Closed)
- Port size: Rc1/4, 3/8
- Working pressure differential: 0 to 5 MPa
- Voltage: 12, 24, 48, 100 VDC, 100, 200 VAC

Features
- Compatible with outdoor use (IP65)
- Selectable electric wire cable diameter range: ø7.5 to ø13.5

* China (NEPSI, CCC) certified products are the AB4*E2/E4 Series.

Direct acting 3-port valve

AG41EX4
AG43EX4
AG44EX4

Certification Region:
Japan/China (NEPSI, CCC)/
Korea (KOSHA)

Zone 1 Zone 2 Exd II BT4

Specs
- Working fluids: Compressed air/Low vacuum/Water/Kerosene/Oil
- Actuation: Universal, NC pressurization, NO pressurization
- Port size: Rc1/4, 3/8
- Working pressure differential: 0 to 1.5 MPa
- Voltage: 12, 24, 48, 100 VDC, 100, 200 VAC

Features
- Compatible with outdoor use (IP65)
- Selectable electric wire cable diameter range: ø7.5 to ø13.5

* China (NEPSI, CCC) certified products are the AG4*E4 Series.

Pilot operated 2-port valve

AP11EX4
AP21EX4
AP11EX2
AP21EX2

Certification Region:
Japan/China (NEPSI, CCC)/
Korea (KOSHA)

Zone 1 Zone 2 Exd II BT4

Specs
- Working fluids: Compressed air/Water/Kerosene/Oil
- Actuation: NC (Normally Closed)
- Port size: Rc1/4, 3/8, 1/2, 3/4, 1
- Working pressure differential: 0.05 to 1.2 MPa
- Voltage: 12, 24, 48, 100 VDC, 100, 200 VAC

Features
- Compatible with outdoor use (IP65)
- Selectable electric wire cable diameter range: ø7.5 to ø13.5

* China (NEPSI, CCC) certified products are the AP**E2/E4 Series.

Pilot kick 2-port valve

ADK11EX4

Certification Region:
Japan/China (NEPSI, CCC)/
Korea (KOSHA)

Zone 1 Zone 2 Exd II BT4

Specs
- Working fluids: Compressed air/Low vacuum/Water/Kerosene/Oil
- Actuation: NC (Normally Closed)
- Port size: Rc1/2, 3/4, 1
- Working pressure differential: 0 to 1.0 MPa
- Voltage: 12, 24, 48, 100 VDC, 100, 200 VAC

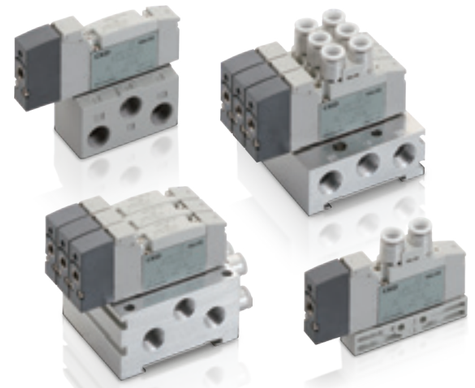
Features
- Compatible with outdoor use (IP65)
- Selectable electric wire cable diameter range: ø7.5 to ø13.5

* China (NEPSI, CCC) certified products are the ADK1*E4 Series.

Pilot operated 3, 5-port valve

Zone 0 Zone 1 Zone 2

4GA/BR



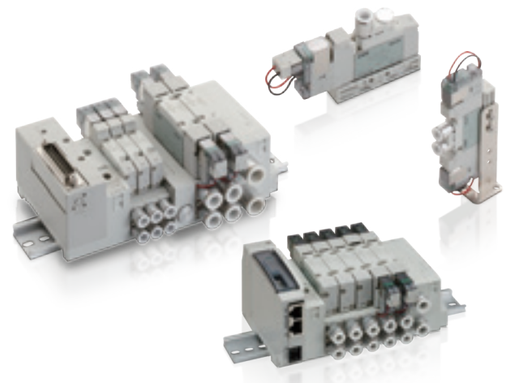
Specs
- Compatible cylinder bore size up to ø100
- Working pressure range
  - Main pressure: 0 MPa to 0.7 MPa
    *2-position single: 0.2MPa to 0.7MPa
  - Pilot signal pressure: 0.2 MPa to 0.7 MPa
    *2 position single:(0.6 × main pressure + 0.06) to 0.7MPa

Features
- Valve width: 10mm, 15mm, 18mm. Diverse lineup of 3 types of valves.
- High durability of 100 million cycles

Non-explosion-proof solenoid valve

Pilot operated 3, 5-port valve

4GA/BR



Specs
- Compatible cylinder bore size up to ø160
- Working pressure range 0.2 MPa to 0.7 MPa
- Degree of protection IP40

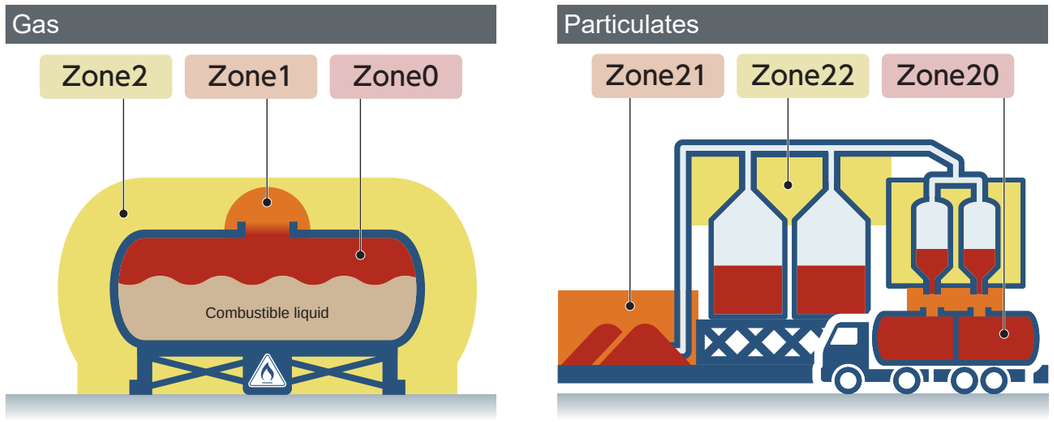
Features
- Compatible with various communications
  EtherNet/IP, DeviceNet, EtherCAT, CC-Link, CC-Link IE Field Basic, CC-Link IE Field, IO-Link, PROFINET, PROFIBUS-DP
- Valve width: 10 mm, 15 mm, 18 mm, 23.5 mm. Diverse lineup of 4 types of valves.
- High durability of 100 million cycles
- Responsivity: 12ms and up

Reference materials

Explosion-proof

This concept is to prevent explosions of gas vapors due to sparks and high temperatures generated by electrical components in dangerous zones where explosive gas atmospheres may be generated, and to ensure the safe use of electrical equipment.

Examples of Dangerous Zones



Components Category	Dangerous zone (Gas)	Dangerous zone (Particulates)	Explanation of Dangerous Zones
1	Zone 0	Zone 20	Zones where explosive atmospheres exist continuously or for long periods of time. (Over 1000 hours/year. *1)
2	Zone 1	Zone 21	Zones where explosive atmospheres may be generated during normal operation of plants, etc. (10 to 1000 hours per year. *1)
3	Zone 2	Zone 22	Areas where explosive atmospheres are not likely to be generated during normal operation of the plant, etc., and even if they are generated, they will exist only for a short period of time. (1 to 10 hours/year *1)

* 1 Time to generate explosive atmosphere

Explosion-proof performance display example

Intrinsic safety explosion-proof [ATEX]

II | 2G | Ex ib | II C T4 | Gb
Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

Japan Explosion-Proof Certification [IECEx, GB]

Ex ib | II C T4 | Gb
Ⓒ Ⓓ Ⓔ

Pressure and explosion proof

Ex d | II B T4
Ⓒ Ⓓ

Ⓐ Category

Code	Applications	Atmosphere
I	Mines	Methane
II	Plant	Gas / Steam
III	Dust	Powder

Ⓑ Component category

Code	Component category	Protection level	Zones (Gas / Dust)
1	Category 1	Very high	Zone 0 / 20
2	Category 2	High	Zone 1 / 21
3	Category 3	Normal	Zone 2 / 22

G: Gas (Gas) D: Dust

Ⓒ Explosion proof structure

Technical standard type and code	Zone 0	Zone 1	Zone 2
Pressure and explosion proof structure **Ex d**	×	○	○
Intrinsic safety explosion-proof structure **Ex ia, Ex ib**	×	○	○

Ⓓ Typical explosive gas group and temperature class

Group Temperature class	T1	T2	T3	T4	T5
II A	Acetone Ammonia Carbon monoxide Ethyl acetate Toluene Propane Benzene Methanol Methane Ethane Acetic acid	Ethanol Butane Isoamyl acetate Acetic anhydride	Gasoline Hexane	Acetaldehyde	
II B	City gas	Ethylene Ethylene oxide		Ethyl ether	
II C	Hydrogen	Acetylene			Carbon disulfide

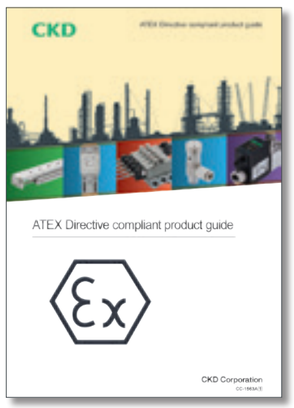
Ⓔ Protection level

Ga	Components with extremely high level of protection, usable in Class 0 Dangerous Zones
Gb	Components with a high level of protection, usable in Class 1 Dangerous Zones
GC	Components with an enhanced protection level, usable in Class 2 Dangerous Zones

Related products

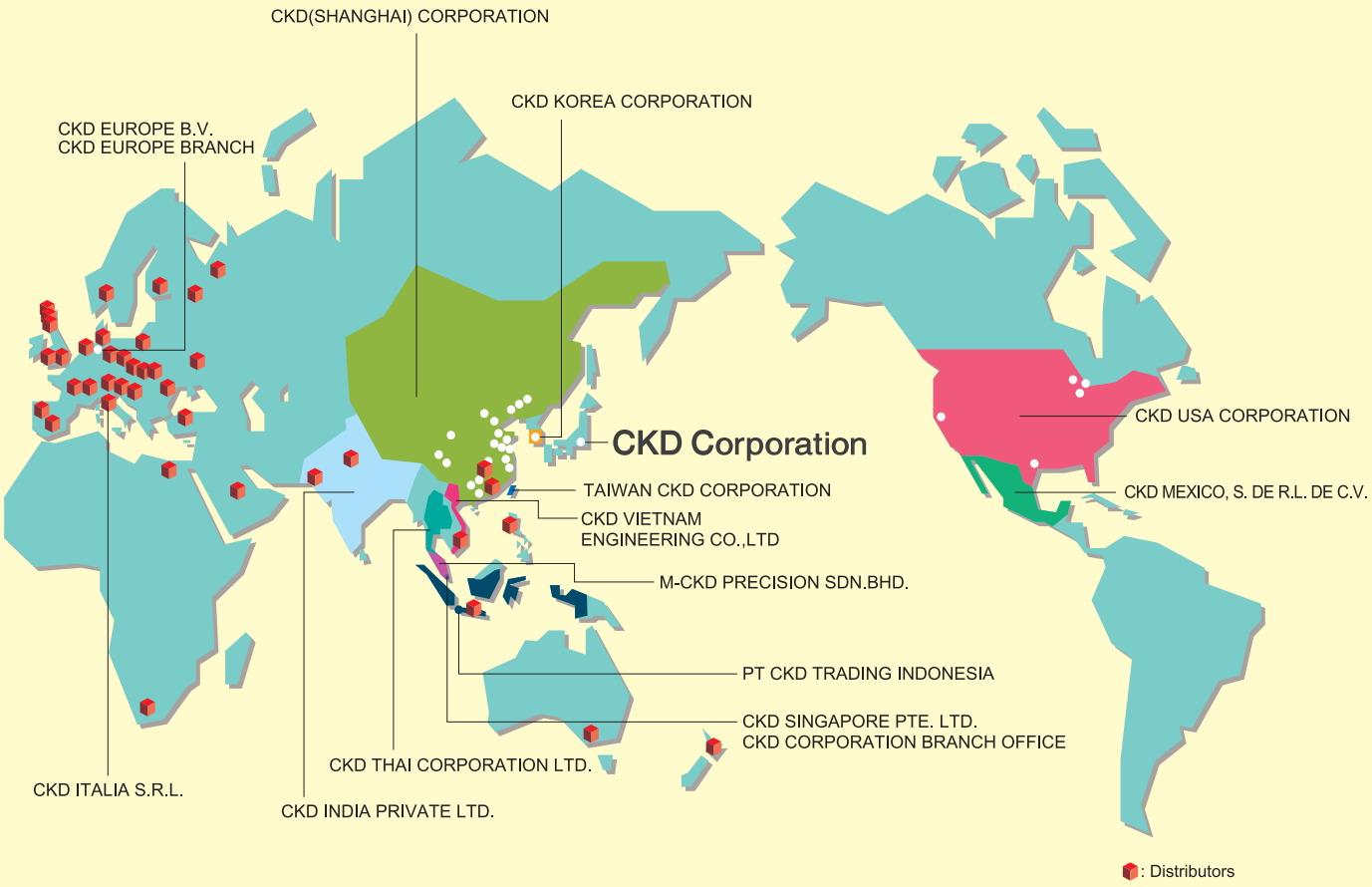
ATEX Directive compliant product guide

- The ATEX Directive compliant products which can be used in Europe are listed.
- Complete lineup of components including cylinders, solenoid valves, and FR units required for pneumatic system configuration.



(Catalog No. CC-1563A)

WORLD-NETWORK



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