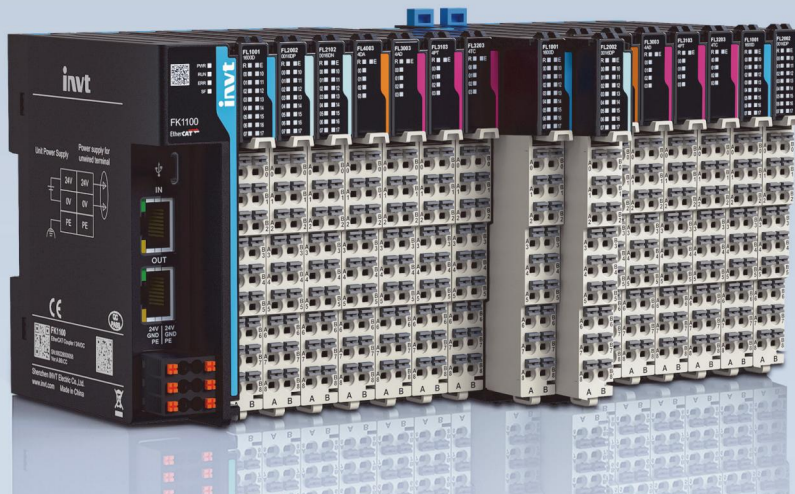


# Flex Series I/O System Catalog





# About Us





# Corporate Introduction

INVT (Shenzhen INVT Electric Co., Ltd) has been concentrating on industry automation and energy power since its foundation in 2002 and is committed to "Providing the best product and service to allow customers more competitiveness". INVT goes public in 2010 and is the first A-share listed company (002334) in Shenzhen Stock Exchange in the industry. At present, INVT owns 15 subsidiaries and more than 4000 employees, over 40 branches, forming a sales network covering more than 100 overseas countries and regions.

INVT has been awarded as the Key High-tech Enterprise of National Torch Plan based on mastering of key technologies in power electronics, auto control and IT. With business covering industry automation, electric vehicle, network power and rail transit, INVT has established 11 R&D centers nationwide, boasts more than 1300 patents and owns the first lab in the industry awarded ACT qualification from TÜV SÜD, UL-WTDP and CNAS National Lab. The industrial parks in Shenzhen and Suzhou aim to provide customers with advanced integrated product development design management, comprehensive product R&D test and auto informational production. The worldwide INVT branches and warranty service centers are ready to offer customers all-around back-ups including professional solutions, technical trainings and service support.

In the next decade, INVT will continue to take " **Sincere Virtuous, Professional Aspiring**" as our business philosophy, enhance core business sectors including industrial automation, electric vehicle, network power and rail transit based on the three major technologies in industry automation and energy power fields, and strive to become a leading, responsible and harmonic international professional group armed with proper product structure, leading technologies, efficient management, robust profitability and superior competitiveness.



## Industrial Park in Suzhou

Group's core industrial base and R&D center in East China



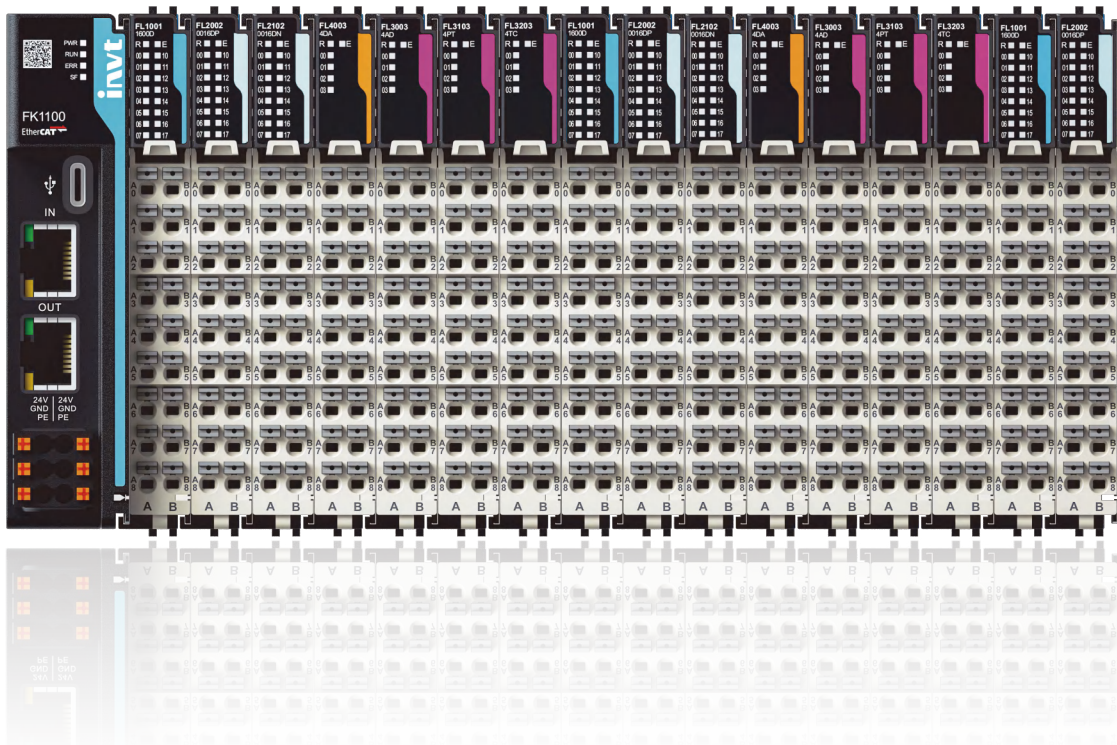
## Industrial Park in Guangming Shenzhen

Group headquarters, new product development and new business incubation base



# Flex series new generation distributed I/O system

INVT Flex series I/O system is a flexible, reliable, and efficient signal transmission system. The system is able to access to multiple standard communication networks, and equipped with rich signal modules to facilitate the deployment of personalized solutions while saving cabinet space, helping you develop more competitive personalized solutions.



## Flexible

Rich communication couplers and I/O modules enable the flexible design of control systems.



## Efficient

Fully upgraded F-BUS bus with a 100-megabit communication rate creates a high real-time communication system.



## Reliable

Tight connection using the gold plating process ensures stable and reliable signal transmission.

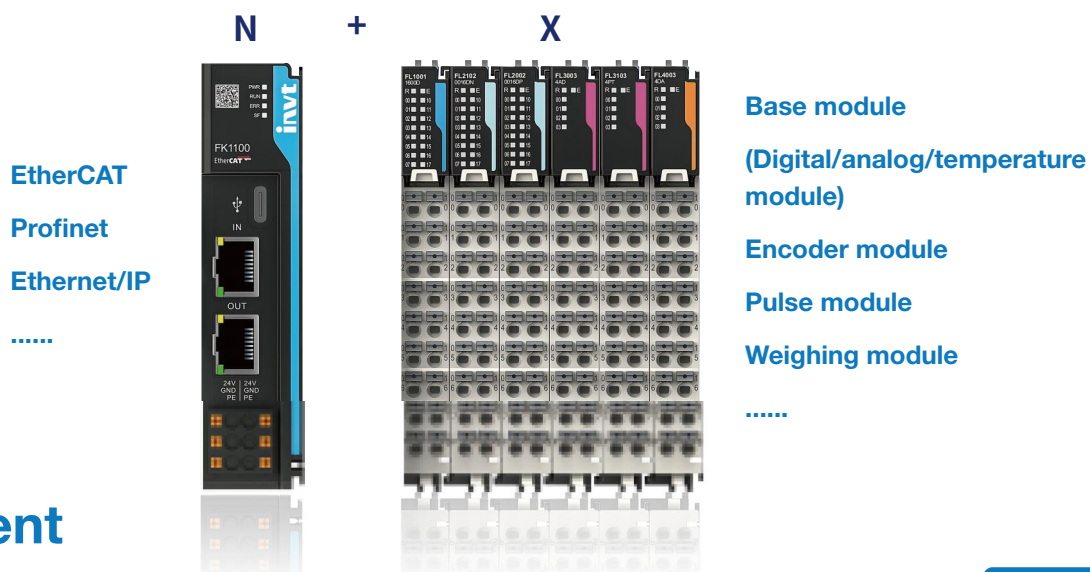


## Compact

Ultra-thin design significantly saves cabinet space and helps the equipment layout miniaturization.

# Flexible

The open **Flex series I/O system** adopts a **modular design**, supporting various bus network, and is equipped with rich signal modules to create personalized solutions. By importing the device description file to a third-party host controller, the module configuration can be achieved without specialized software configuration.



# Efficient

The system is equipped with a **100Mbps F-BUS** backplane bus, with a response of I/O refresh in microseconds, achieving high-speed information exchange.





# Reliable

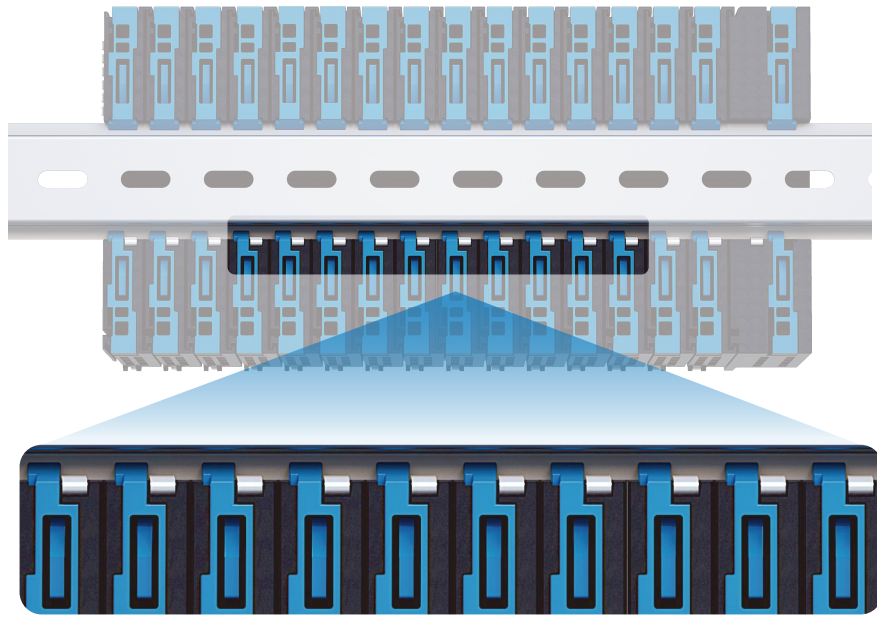
Spring-loaded connection technology and 5u" gold plating process keep the connectors away from various types of corrosion and ensure a long service life of connectors.



The entire series adopts three-resistance coating to prevent dust, moisture, and salt spray, meeting a wider range of operating conditions and extending service life.



Reliable grounding, further enhancing anti-interference capability.

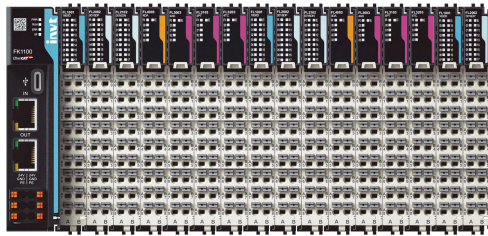
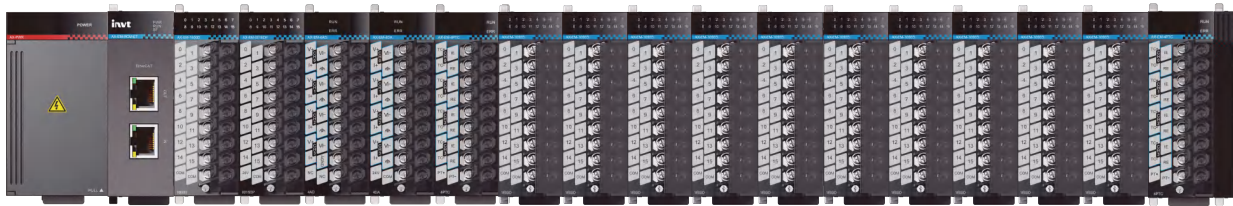


Capable of operating in **-25~55°C** and at an altitude of **3000m**, fearless of freezing weather.



# Compact

12mm ultra-thin design, saving 64% of the cabinet space, achieving miniaturization of the cabinet.

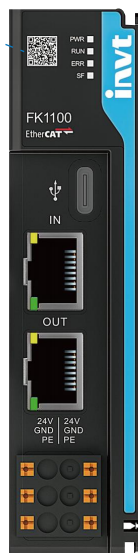


← **64%  
space saving** →

# Easy installation

The wiring diagram is printed on the module so the wiring can be completed without referencing a user manual. By scanning the QR code on the front, you can obtain an electronic version of the user manual for more information.

E-manual



Wiring diagram

E-manual

Model, module type



## Tool-free quick connection

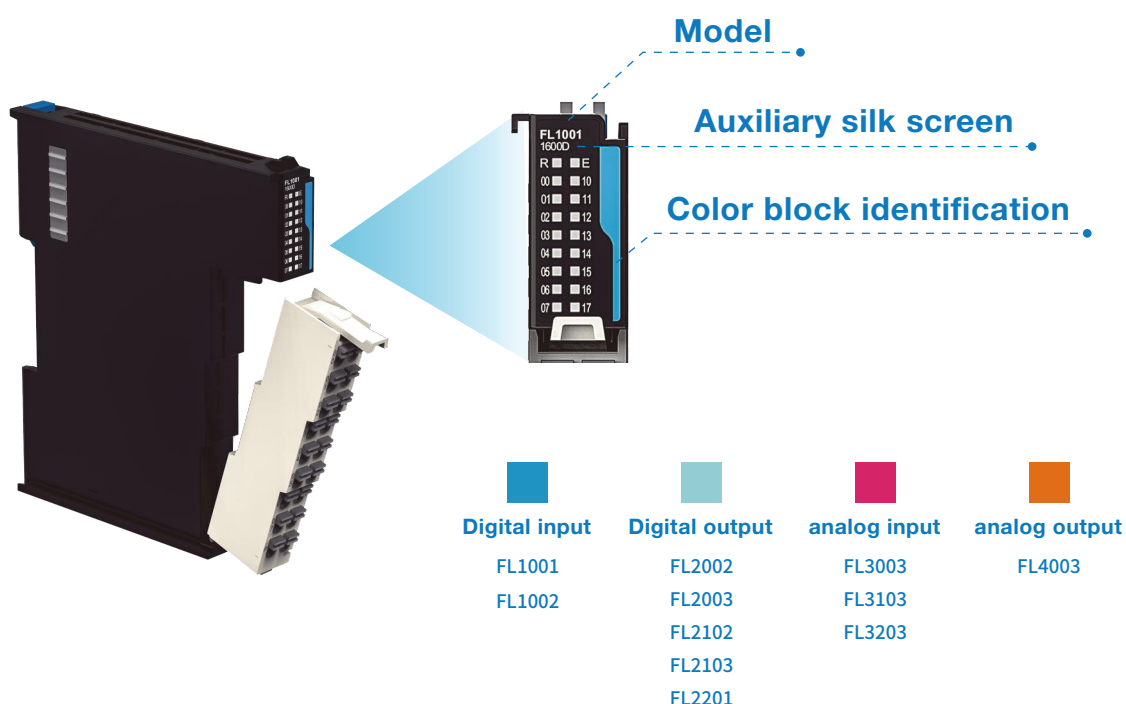
**PUSH IN connection technology** enables easy installation without any tools, with a 70% improvement in wiring efficiency compared to screw terminals, effectively reducing installation time while ensuring good reliability.



Direct plug-in connection, effectively reducing installation time

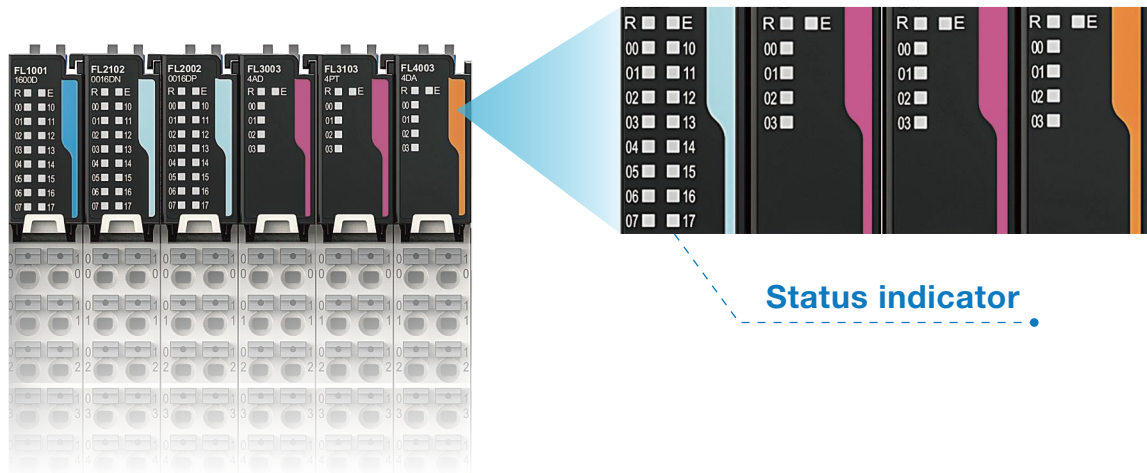
## Clear identification

Different modules are distinguished by **color blocks and auxiliary codes**, making identification and positioning more accurate and convenient.



## Channel-level diagnosis

Each channel has a **status indicator light**, and each module can independently display its working status. The operating status and fault information are clear at a glance.



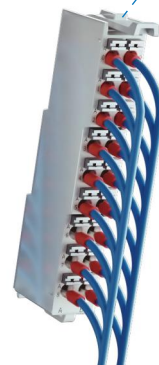
## Easy to maintain

**Longitudinal sliding connection** allows terminal assembly and disassembly without moving the left and right modules. Adopting a two-section modular design, the wiring terminals can be disassembled separately without repeated wiring.

### Longitudinal sliding connection



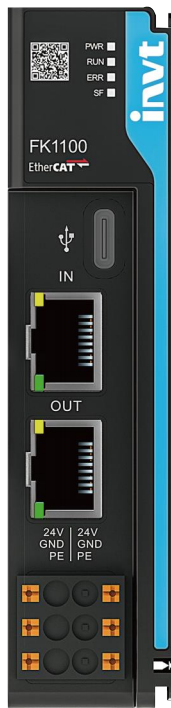
### Detachable separately





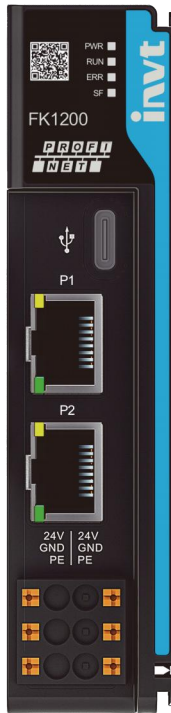
# Specification parameters

## Communication coupler (EtherCAT)



Item	Specifications			
Ordering code	11016-00005			
Model	FK1100			
Product type	EtherCAT communication coupler			
Power supply	Rated voltage	24VDC (-15% – +20%)		
	Power consumption of module	<10W		
	Isolation	No isolation		
	Power supply protection	Protection against reverse connection, overcurrent, and surges		
interface	USB2.0	×1, for module upgrade		
	RJ45	×2, EtherCAT IN&OUT		
	EtherCAT slave	Synchronization method	Distributed clocks or input and output synchronization	
		Physical layer	100BASE-TX	
		Baud rate	100Mbit/s	
		Output distance	Less than 100m between two nodes	
		Transmission mode	Full duplex	
		Topology structure	Linear, star-shape, tree-shape	
		Slave address range	Assigned by the system	
		Quantity of input PDO	Up to 768 bytes	
		Quantity of output PDO	Up to 768 bytes	
		Input mailbox size	Up to 128 bytes	
	Output mailbox size	Up to 128 bytes		
	Expansion bus	Number of I/O expansions	16, internal bus. The coupler can automatically identify the I/O type and quantity on the backplane	
Output power supply		5V/3.5A		
Certification	CE, RoHS			
Environment	IP rating	IP20		
	Working temperature	-25°C–55°C		
	Working humidity	10%–95%RH (no condensation)		
	Air	No corrosive gas		
	Storage temperature	-40°C–70°C (RH<90%RH, no condensation)		
	Altitude	Lower than 3000m		
	Pollution degree	Degree 2, compliant with IEC61131-2		
	Anti-interference	2kV power cable compliant with IEC61000-4-4		
	EMC anti-interference level	Zone B, IEC61131-2 (General industrial environment)		
	Vibration resistant	IEC60068-2-6 5Hz–8.4Hz, vibration amplitude of 3.5mm, 8.4Hz–150Hz, acceleration 9.8m/s <sup>2</sup> , 100 minutes for each in X, Y, and Z directions (10 times, 10 minutes each time, a total of 100 minutes)		
	Impact resistance	IEC60068-2-27, 9.8m/s <sup>2</sup> , 11ms, X/Y/Z, 3 times for each of 3 axes and 6 directions		
Installation method	35mm standard rail			
Weight (kg)	Net: 0.25	Gross: 0.28		
Dimensions W×H×D(mm)	Product dimension: 25×105×96 Package dimension: 29×109×100			

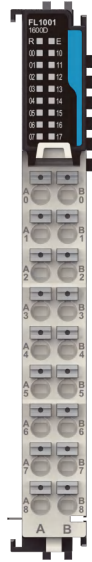
## communication coupler (Profinet)



Item	Specifications			
Ordering code	11016-00012			
Model	FK1200			
Product type	PROFINET communication coupler			
Power supply	Rated voltage	24VDC (-15% - +20%)		
	Power consumption of module	<10W		
	Isolation	No isolation		
	Power supply protection	Protection against reverse connection, overcurrent, and surges		
interface	USB2.0	x1, for module upgrade		
	RJ45	x2, Profinet P1&P2		
	Profinet slave	Physical layer	100BASE-TX	
		Baud rate	100Mbit/s	
		Output distance	Less than 100m between two nodes	
		Transmission mode	Full duplex	
		Topology structure	Linear, star-shape, tree-shape	
		Communication protocol	Profinet IO Device	
		Communication mode	RT	
		Communication period	Min. 1ms	
		Process data zone	Input max. 1440 bytes, output max. 1440bytes; IM0-IM3	
		Profinet switch function	Supports networking function	
		Ethernet service	Supports TCP/IP, SNMP, LLDP, ping, arp	
		Port diagnosis	Supported	
		Port disabling	Supported	
		Factory settings reset	Supported	
Expansion bus	Number of I/O expansions	16, internal bus. The coupler can automatically identify the I/O type and quantity on the backplane		
	Output power supply	5V/3.5A		
Certification	CE, RoHS			
Environment	IP rating	IP20		
	Working temperature	-25°C-55°C		
	Working humidity	10%-95%RH (no condensation)		
	Air	No corrosive gas		
	Storage temperature	-40°C-70°C (RH<90%RH, no condensation)		
	Altitude	Lower than 3000m		
	Pollution degree	Degree 2, compliant with IEC61131-2		
	Anti-interference	2kV power cable compliant with IEC61000-4-4		
	EMC anti-interference level	Zone B, IEC61131-2 (General industrial environment)		
	Vibration resistant	IEC60068-2-6 5Hz-8.4Hz, vibration amplitude of 3.5mm, 8.4Hz-150Hz, acceleration 9.8m/s <sup>2</sup> , 100 minutes for each in X, Y, and Z directions (10 times, 10 minutes each time, a total of 100 minutes)		
	Impact resistance	IEC60068-2-27, 9.8m/s <sup>2</sup> , 11ms, X/Y/Z, 3 times for each of 3 axes and 6 directions		
Installation method	35mm standard rail			
Weight (kg)	Net: 0.25	Gross: 0.28		
Dimensions W×H×D(mm)	Product dimension: 25×105×96 Package dimension: 29×109×100			

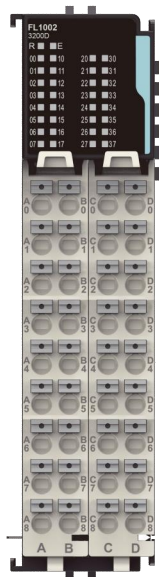


## Digital input



Item	Performance Specification
Ordering code	11016-00004
Model	FL1001
Product type	Digital input, supporting source type/sink type
Power loss,typ	0.75W
Number of channels	16
Input type	Source/sink
Input voltage	DC24V ± 10%
Input current,typ	7mA
Max. input frequency	500Hz (duty ratio: 40%–60%)
Port filter time	Setting range: 1–65535 (default 1000), unit: 10μs; 1000 indicates 10ms. Able to set two groups of filter parameter. Every eight channels use a group of filter parameter
Signal of logic 1	≥15V DC
Signal of logic 0	≤5V DC
OFF-ON response time	100μs
ON-OFF response time	100μs
Isolation method	Optocoupler
Input frequency decrease	Derate by 75% when operating at 55°C (with no more than 12 input points that are on at the same time), or by 10°C when all input points are on
Weight (kg)	Net: 0.15                      Gross: 0.18
DimensionsW×H×D(mm)	Product dimension: 12.5×105×96 Package dimension: 17.5×109×100

## Digital input



Item	Performance Specification
Ordering code	
Model	FL1002
Product type	Digital input, supporting source type/sink type
Power loss,typ	0.75W
Number of channels	32
Input type	Source/sink
Input voltage	DC24V ± 10%
Input current,typ	7mA
Max. input frequency	500Hz (duty ratio: 40%–60%)
Port filter time	Setting range: 1–65535 (default 1000), unit: 10μs; 1000 indicates 10ms. Able to set two groups of filter parameter. Every eight channels use a group of filter parameter.
Signal of logic 1	≥15V DC
Signal of logic 0	≤5V DC
OFF-ON response time	100μs
ON-OFF response time	100μs
Isolation method	Optocoupler
Input frequency decrease	Derate by 75% when operating at 55°C (with no more than 12 input points that are on at the same time), or by 10°C when all input points are on
Weight (kg)	Net: 0.30                      Gross: 0.33
DimensionsW×H×D(mm)	Product dimension: 25×105×96 Package dimension: 29×109×100

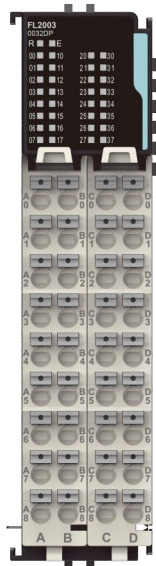
Contact local sales personnel for specific delivery times

## Digital output (source type)



Item	Specifications
Ordering code	11016-00006
Model	FL2002
Product type	Digital output, transistor source type output, active high
Power loss,typ	0.75W
Number of channels	16
External power	DC24V(-15% ~ +20%)
Output voltage	24V±10%
Max. output frequency	1kHz
Max. load	Resistive load: 0.5A/point; 2A/module
	Inductive load: 7.2W/point, 12W/module
	Illumination load: 5W/point, 18W/module
Leakage current/point	<10μA
OFF-ON	100μs
ON-OFF	100μs
Protection against overheat/overcurrent/overvoltage	Supported
Exception check of external power	Supported
Isolation method	Magnetic
Short-circuit protection output	Yes
Weight (kg)	Net: 0.15                      Gross: 0.18
DimensionsW×H×D(mm)	Product dimension: 12.5×105×96 Package dimension: 17.5×109×100

## Digital output (source type)

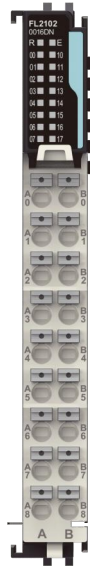


Item	Specifications
Ordering code	
Model	FL2003
Product type	Digital output, transistor source type output, active high
Power loss,typ	0.75W
Number of channels	32
External power	DC24V(-15% ~ +20%)
Output voltage	24V±10%
Max. output frequency	1kHz
Max. load	Resistive load: 0.5A/point; 2A/module
	Inductive load: 7.2W/point, 12W/module
	Illumination load: 5W/point, 18W/module
Leakage current/point	<10μA
OFF-ON	100μs
ON-OFF	100μs
Protection against overheat/overcurrent/overvoltage	Supported
Exception check of external power	Supported
Isolation method	Magnetic
Short-circuit protection output	Yes
Weight (kg)	Net: 0.30                      Gross: 0.33
DimensionsW×H×D(mm)	Product dimension: 25×105×96 Package dimension: 29×109×100

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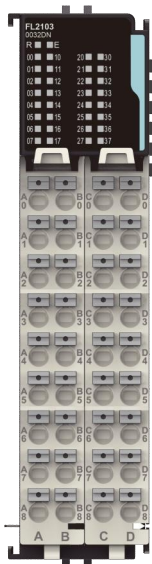


## Digital output (sink type)



Item	Specifications
Ordering code	11016-00003
Model	FL2102
Product type	Digital output, transistor sink type output, active low
Power loss,typ	1W
Number of channels	16
External power	DC24V(-15% ~ +20%)
Output voltage	24V±10%
Max. output frequency	1kHz (duty ratio: 40%~60%)
Max. load	Resistive load: 0.5A/point, 4A/module
	Inductive load: 7.2W/point, 24W/module
	Illumination load: 5W/point, 18W/module
Leakage current/point	<10μA
OFF-ON	100μs
ON-OFF	100μs
Protection against overheat/overcurrent/overvoltage	Supported
Exception check of external power	Supported
Isolation method	Magnetic
Short-circuit protection output	Yes
Weight (kg)	Net: 0.15                      Gross: 0.18
DimensionsW×H×D(mm)	Product dimension:12.5×105×96 Package dimension: 17.5×109×100

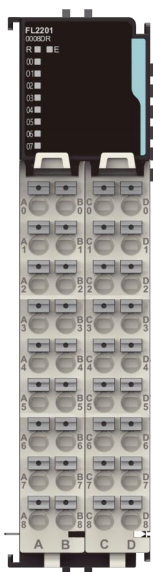
## Digital output (sink type)



Item	Specifications
Ordering code	
Model	FL2103
Product type	Digital output, transistor sink type output, active low
Power loss,typ	1W
Number of channels	32
External power	DC24V(-15% ~ +20%)
Output voltage	24V±10%
Max. output frequency	1kHz (duty ratio: 40%~60%)
Max. load	Resistive load: 0.5A/point, 4A/module
	Inductive load: 7.2W/point, 24W/module
	Illumination load: 5W/point, 18W/module
Leakage current/point	<10μA
OFF-ON	100μs
ON-OFF	100μs
Protection against overheat/overcurrent/overvoltage	Supported
Exception check of external power	Supported
Isolation method	Magnetic
Short-circuit protection output	Yes
Weight (kg)	Net: 0.30                      Gross: 0.33
DimensionsW×H×D(mm)	Product dimension: 25×105×96 Package dimension: 29×109×100

Contact local sales personnel for specific delivery times

## Digital output (relay)



Item	Performance Specification
Ordering code	11016-00009
Model	FL2201
Product type	Digital output, relay output
Power loss,typ	1.5W
Number of channels	8
Contact type	N.O. contact
Contact load (resistive)	3A 250VAC/30VDC
Max. switching voltage	250VAC/125VDC@0.3A
Max. switching current	5A
Service life of relay	Electrical: 100,000 times
	Mechanical: 20,000,000 times
OFF-ON response time	≤15ms
ON-OFF response time	≤10ms
Weight (kg)	Net: 0.30
	Gross: 0.33
DimensionsW×H×D(mm)	Product dimension: 25×105×96
	Package dimension: 29×109×100

## Analog input



Item	Specifications
Ordering code	11016-00011
Model	FL3003
Product type	4 channels of analog input
Power loss,typ	1W
Number of channels	4
Voltage range	±5V, ±10V, +5V, +10V
Current range	0–20mA, 4–20mA, ±20mA
Accuracy in room temperature (of 25°C)	Voltage±0.1%FS, current±0.1%FS
Converting speed	320μs/channel
Max. common-mode voltage between channels	30VDC
Disconnection detection	Support (only voltage)
Isolation method	Between I/O port and power supply: isolated
	Between channels: not isolated
Resolution	16 bits
Weight (kg)	Net: 0.15
	Gross: 0.18
DimensionsW×H×D(mm)	Product dimension: 12.5×105×96
	Package dimension: 17.5×109×100

## Analog output



Item	Specifications
Ordering code	11016-00008
Model	FL4003
Product type	4 channels of analog output
External power	24VDC (-15%~20%)
Power loss,typ	0.75W
Number of channels	4
Voltage range	±5V, ±10V, 0-5V, 1-5V, 0-10V
Current range	0-20mA, 4-20mA
Accuracy in room temperature (of 25°C)	Voltage±0.1%FS, current±0.1%FS
Converting speed	40µs/channel
Min. load resistance during voltage output	1kΩ
Max. load resistance during current output	600Ω
Disconnection detection	Support (only current)
Isolation method	Between I/O port and power supply: isolated
	Between channels: not isolated
Resolution	16 bits
Weight (kg)	Net: 0.15                      Gross: 0.18
DimensionsW×H×D(mm)	Product dimension: 12.5×105×96
	Package dimension: 17.5×109×100

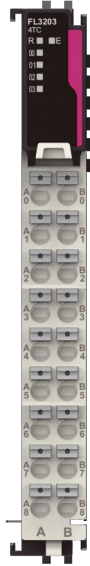
## Temperature measuring (thermistor)



Item	Specifications
Ordering code	11016-00007
Model	FL3103
Product type	4 channels of thermistor input
Power loss,typ	1.25W
Number of channels	4
Wiring method	Two-, three-, or four-wire
Supported thermal resistors	PT100, PT500, PT1000, CU100
Sensitivity	0.0625 /0.0625
SamplePeriod	240ms/channel (typical value)
Accuracy in room temperature (of 25°C)	±0.3%FS
Accuracy in working temperature	±1%FS
Filter time	Adjustable
Accuracy in working temperature	±1%FS
Isolation method	Between I/O port and power supply: isolated
	Between channels: not isolated
Weight (kg)	Net: 0.15                      Gross: 0.18
DimensionsW×H×D(mm)	Product dimension: 12.5×105×96
	Package dimension: 17.5×109×100



## Temperature measuring (thermocouple)

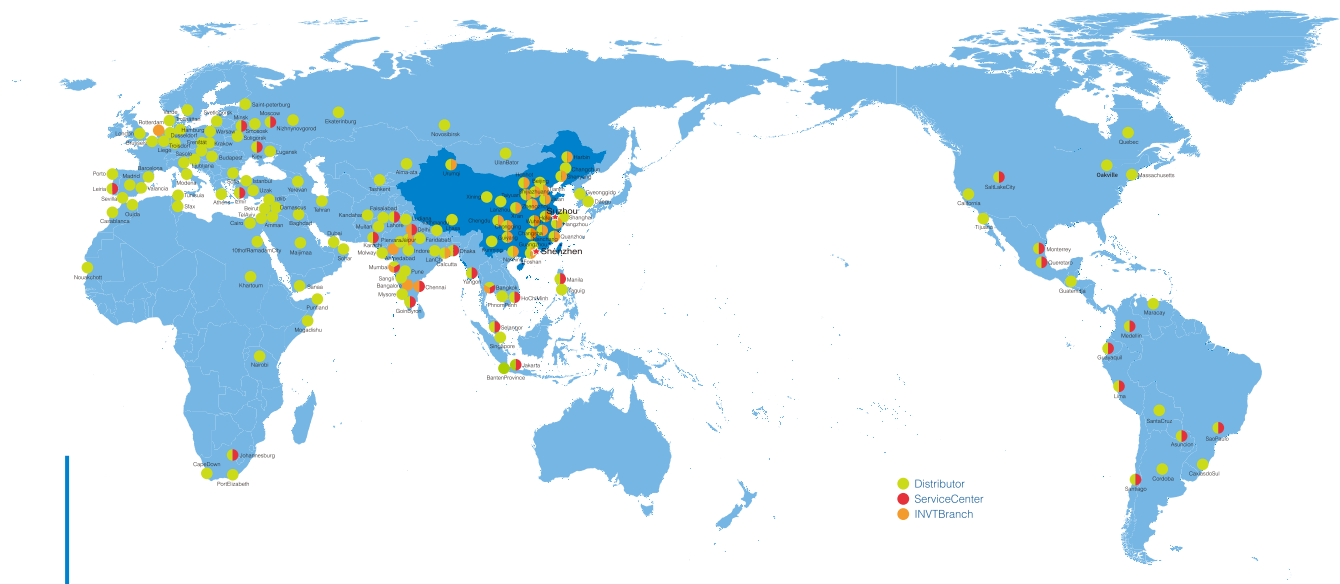


Item	Specifications
Ordering code	11016-00010
Model	FL3203
Product type	4 channels of thermocouple input
Power loss,typ	1.25W
Number of channels	4
Supported thermocouples	Types B, E, J, K, N, R, S, and T
Sensitivity	0.0625°C/0.0625°F
SamplePeriod	360ms/channel
Accuracy in room temperature (of 25°C)	±0.1%FS+cold junction compensation error
Accuracy in working temperature	±0.3%FS+cold junction compensation error
Cold junction compensation method	Internal
Disconnection detection	Supported
Isolation method	Between I/O port and power supply: isolated
	Between channels: not isolated
Weight (kg)	Net: 0.15                      Gross: 0.18
DimensionsW×H×D(mm)	Product dimension: 12.5×105×96
	Package dimension: 17.5×109×100

## Ordering list

Ordering code	Model	Product type	Specifications
11016-00005	FK1100	Communication coupler (EtherCAT)	Coupler, EtherCAT, 24VDC; RoHS
11016-00012	FK1200	Communication coupler (Profinet)	Coupler, Profinet,24VDC;RoHS
11016-00004	FL1001	Digital input	Digital input module, 16 channels, supporting the source and sink types, 500mA@ 24 VDC inputs; RoHS
11016-00006	FL2002	Digital output (source type)	Digital output module, with 16 channels of PNP transistor output, 500mA @ 24 VDC; RoHS
11016-00003	FL2102	Digital output (sink type)	Digital output module, with 16 channels of NPN transistor output, 500mA @ 24 VDC; RoHS
11016-00009	FL2201	Digital output (relay)	Digital output module, with 8 channels of relay output, dry contact, 3A @ 30VDC/250VAC; RoHS
11016-00011	FL3003	Analog input	Analog input module; 4 channels, 16-bit resolution, room-temperature accuracy±0.1%FS; RoHS
11016-00008	FL4003	Analog output	Analog output module; 4 channels, 16-bit resolution, room-temperature accuracy±0.1%FS; RoHS
11016-00007	FL3103	Temperature measuring (thermistor)	Thermistor, 4 channels, 24-bit resolution, sensitivity of 0.1°C/°F; RoHS
11016-00010	FL3203	Temperature measuring (thermocouple)	Thermocouples, 4 channels, 24-bit resolution, sensitivity of 0.1°C/°F; RoHS

# INVT marketing service network



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 Overseas subsidiaries and offices\* **8**  
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*Your trusted industry automation solution provider*



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  - New Energy Vehicle Powertrain System
  - New Energy Vehicle Charging System
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