Extension module extends function of PLC base unit. It offers function like: IO point extension, logic processing, data calculation, analog-digital conversion, and so on.

Module models

Model	Description
Module of FGs series	
FGs-E16R	16 channels relay type digital output module
FGs-E16T	16 channels transistor type digital output module
FGs-E16X	16 channels digital input module
FGs-E8X8R	8 channels digital input, 8 channels relay type digital output module
FGs-E8X8T	8 channels digital input, 8 channels transistor type digital output module
FGs-E4AI2AO	4 channels analog input, 2 channels analog output module
FGs-E8AI	8 channels analog input module
FGs-E4TC	4 channels temperature measuring module
Module of FGR series	
FGR-E12R	12 channels relay type digital output module
FGR-E16T	16 channels transistor type digital output module
FGR-E16X	16 channels digital input module
FGR-E8X8R	8 channels digital input, 8 channels relay type digital output module
FGR-E8X8T	8 channels digital input, 8 channels transistor type digital output module
FGR-E4AI	4 channels analog input module
FGR-E8AI	8 channels analog input module
FGR-E4AI2AO	4 channels analog input, 2 channels analog output module
FGR-E2AO	2 channels analog output module
FGR-E4TC	4 channels temperature measuring module

So far, there are extension module as shown in Table 1.1.

Table 1.1

- Number of digital input/output module channels is octonary. (For instance: X1000~X1007, X1010~X1017)
- Number of analog input/output module points is decimal, and each module occupies 4 or 8 data registers. (For instance: AI100~AI103, AI110~AI113)
- The **FGs** and **FGm** series PLC base unit supports at most 8 **FGs-E** extension modules regardless of their types.
- FGR series PLC base unit supports at most 1 **A-E** attachment and 3 **FGR-E** extension modules.
- A-E attachment can be regarded as part of PLC base unit, it extends digital IO points and the number follows close with PLC base unit. (For instance: X0010~X0017, Y0010~Y0017)

Configuration in SamSoar II

Configuration should be completed by upper software **SamSoar II** before using extension module. The following shows procedures to configure the **FGs-E** and **FGR-E** extension modules.

1. Open the SamSoar II, Click [Project]→[PLC parameter setting] or icon 🔙, select

corresponding PLC model, take FGRE-C8X8T as example.

S PLC parameter Setting				
Retentive Zone Settings	Expansion Module	Filter Set	ting	Other
Device Model	Communication Parameters		Password	l Setting
PLC Type	Details			
FGs_16MR_AC	PLC Type			
FGs_16MT_AC	X Range	0 ~ 17	7	
FGe 22MT AC	Y Range	0 ~ 17	7	
FGs 48MR AC	M Range	0 ~ 82	55	
FGs 48MT AC	S Range	0 ~ 99	9	
FGs_64MR_AC	T Range	0 ~ 25	5	
FGs_64MT_AC	C Range	0 ~ 25	5	
FGm_64MT_AC	D Range	0 ~ 83	03	
FGRB_C8X8T	CV Range	0 ~ 25	5	
FGRS_C8X8T	TV Range	0 ~ 25	5	
	Al Range	0 ~ 31		
FGRE C8X8T V2	AO Range	0 ~ 31		
	, i i i i i i i i i i i i i i i i i i i			-
	Yes(Y)	Canc	el(<u>C</u>)	Help(<u>H</u>)

Figure 2. 1

2. Click [Extension Module] Tab, enter setting page.



Figure 2.2

3. Tick the option [Use Extension Module] to enable the setting.





Select module type and tick [Enabled] to enable it. User can also check the module automatically by click [Auto check] when PLC is in communication with **SamSoar II**. PLC should be in STOP state during checking, and after checking, the manual added modules will be replaced according to actual checked case.

<u>s</u>	
The PLC has to be STOP to autocheck the expansion modules, then return to RUN since done, shall we continue?	Adjust expansion parameters corrosponding to PLC?
Yes(<u>Y</u>) No(<u>N</u>)	Yes(<u>Y</u>) No(<u>N</u>)





Take **FGR-E4AI2AO** as example, this module can input and output analog quantity, user can enter module setting by click the added module, and set mode, sampling average, Digital quantity range of each channel.

S Expansion Module Setting	
Module Type FGr_E4AI2AO 👻 Enabled	
Used Registers Al100 ~ Al103 AO100 ~ AO101 Version:2001.0.0 Barcode:	
Input	
Channel AI0 - Enabled Mode 0-5V	~
Sampling average 4	
Offset D 1000	
Digital Quantity Range 0 - 65535	
Output	
Channel AO0 Channel Mode 0-5V	Ŧ
Digital Quantity Range 0 - 65535	
Yes(<u>Y</u>) Cancel(<u>C</u>) Dele	te

Figure 2. 6

Digital input/output module

Digital input/output module include FGs-E16R, FGs-E16T, FGs-E16X, FGs-E8X8R, FGs-E8X8T, FGR-E12R, FGR-E16T, FGR-E16X, FGR-E8X8R, FGR-E8X8T. This chapter takes FGs-E8X8T as example to introduce usage of digital input/output module.

Module specification

FGs-E8X8T extends input and output terminal of PLC base unit, the usage is same as ordinary inputs/outputs (not high-speed) of PLC base unit.

Module specification refers to following table (details of more models refer to hardware manual).

Input voltage	24V±20%/DC				
Output voltage	6~30V/DC				
Inductive load maximum	80W				
Resistive load maximum	0.3A				
Table 3-1					

- Wring of inputs depends on the if the input is drain type or source type.
- Terminal number of input and output are octal.
- 4 common ends (COM1~COM3) of outputs is shorted, so they take same effect.

Terminal introduction



Figure 3.1

Shown as figure above, **X0~X7** are input points, **S/S** is common end of inputs, **Y0~Y7** are output points, **COM0~COM3** are common ends of outputs.

Wiring diagram

Digital input



Figure 3. 2

Digital output



Figure 3. 3

Register allocation

The inputs and outputs have corresponding soft elements in the ladder diagram, and the register allocation of all 8 digital input/output modules (**FGR-E** series only support 4 extension modules) refer to following tables:

	Module1	Module2	Module3	Module4
Input	X1000~X1017	X1100~X1117	X1200~X1217	X1300~X1317
Output	Y1000~Y1017	Y1100~Y1117	Y1200~Y1217	Y1300~Y1317
	Module5	Module6	Module7	Module8
Input	Module5 X1400~X1417	Module6 X1500~X1517	Module7 X1600~X1617	Module8 X1700~X1717

Table 3. 2

The modules don't reach 16 input/output points can only use the front registers.

Analog input/output module

Analog input/output module include **FGs-E4AI2AO**, **FGs-E8AI**, **FGR-E4AI**, **FGR-E8AI**, **FGR-E4AI2AO**, **FGR-E2AO**. This chapter takes **FGs-E4AI2AO** module as example to introduce usage of analog input/output module.

Module specification

FGs-E4AI2AO module converts analog quantity inputs (voltage/current) of 4 input points into digital quantities, and transfer them to PLC base unit. Additionally, this module can also output analog quantities form the 2 output points.

Module specification refers to following table (details of more models refer to hardware manual).

	Voltage input	Current input	Voltage output	Current output	
Analog quantity range	0~5V, 0~10V	4~20mA	0~5V, 0~10V	4~20mA	
Input maximum	±15V 40mA		-	-	
Resolution	1/4095	(12-bit)	1/65535 (16-bit)		
Accuracy	±5	‰	±5‰		
Conversion rate	1ms	s/ch	1ms/ch		
Analog output power supply		24V±10%	/DC, 100mA		

Table 4.1

- Input and output have different modes: 0~5V voltage mode, 0~10V voltage mode, and 4~20mA current mode.
- The input has 12-bit resolution, and output has 16-bit resolution.
- The power supply of analog part and digital part is separate.
- User can set digital range (high limit and low limit) of the conversion, the analog quantity will scale linearly according to the range.

Terminal introduction





Figure above shows the terminals of **FGs-E4AI2AO** module. there are two terminals (485A and 485B) can be used for RS485 serial port communication (Only **FGs-E** series modules have this function, **FGR-E** series modules have no this function). Details of these terminal refer to following table:

	Channel	Terminal	Description
		A+	Anode of input channel 0
	Input CH0	RA	Connect to A+ under current mode
		A-	Cathode of input channel 0
		B+	Anode of input channel 1
	Input CH1	RB	Connect to B+ under current mode
		В-	Cathode of input channel 1
Analog quantity input		C+	Anode of input channel 2
	Input CH2	RC	Connect to C+ under current mode
		C-	Cathode of input channel 2
		D+	Anode of input channel 3
	Input CH3	RD	Connect to D+ under current mode
		D-	Cathode of input channel 3
		V0	Voltage output anode of output channel 0
	Output CH0	10	Current output anode of output channel 0
		M0	Cathode of output channel 0
Analog quantity output		V1	Voltage output anode of output channel 1
	Output CH1	11	Current output anode of output channel 1
		M1	Cathode of output channel 1
PS495 communication	-	485A	RS485+
	-	485B	RS485-

Table 4. 2

Wiring diagram



• Voltage analog quantity input

Figure 4. 2

• Current analog quantity input



Figure 4. 3

• Voltage analog quantity output



Figure 4. 4

• Current analog quantity output



Figure 4.5

Register allocation

The analog input quantities and analog output quantities have corresponding soft elements in the ladder diagram, and the register allocation of all 8 digital input/output modules (FGR-E series only support 4 extension modules) refer to following tables:

Input Analog to digital CH0 Al100 Al110 Al120 Al130 Al140 Al150 Al160 Al170 CH1 Al101 Al111 Al121 Al131 Al141 Al151 Al161 Al171 CH2 Al102 Al112 Al122 Al132 Al142 Al152 Al162 Al172 CH3 Al102 Al112 Al122 Al132 Al142 Al152 Al162 Al172 CH3 Al103 Al113 Al123 Al133 Al143 Al153 Al163 Al173 CH4 Al104 Al114 Al124 Al134 Al144 Al154 Al164 Al174 CH4 Al105 Al115 Al125 Al135 Al145 Al155 Al164 Al174 CH4 Al106 Al116 Al126 Al136 Al146 Al155 Al166 Al176 CH6 Al106 Al117 Al127 Al137 Al146 Al157		Module1	Module2	Module3	Module4	Module5	Module6	Module7	Module8
CH0 AI100 AI110 AI120 AI130 AI140 AI150 AI160 AI170 CH1 AI101 AI111 AI121 AI131 AI141 AI151 AI161 AI171 CH2 AI102 AI112 AI122 AI132 AI142 AI152 AI162 AI172 CH3 AI103 AI113 AI123 AI133 AI143 AI153 AI163 AI173 CH4 AI103 AI113 AI123 AI133 AI143 AI153 AI163 AI173 CH4 AI104 AI114 AI124 AI133 AI143 AI153 AI163 AI174 CH4 AI104 AI114 AI124 AI134 AI144 AI154 AI164 AI174 CH5 AI105 AI115 AI125 AI135 AI145 AI155 AI165 AI175 CH6 AI106 AI116 AI127 AI137 AI146 AI156 AI166 AI176 CH7 <td>Input</td> <td colspan="8">Analog to digital</td>	Input	Analog to digital							
CH1 Al101 Al111 Al121 Al131 Al141 Al151 Al161 Al171 CH2 Al102 Al112 Al122 Al132 Al142 Al152 Al162 Al172 CH3 Al103 Al113 Al123 Al133 Al143 Al153 Al162 Al172 CH3 Al103 Al113 Al123 Al133 Al143 Al153 Al163 Al173 CH4 Al104 Al114 Al124 Al134 Al143 Al153 Al163 Al173 CH4 Al104 Al114 Al124 Al134 Al144 Al154 Al164 Al174 CH5 Al105 Al115 Al125 Al135 Al145 Al155 Al165 Al175 CH6 Al106 Al116 Al126 Al136 Al146 Al156 Al166 Al176 CH7 Al107 Al117 Al127 Al137 Al147 Al157 Al167 Al177 Output<	CH0	AI100	AI110	AI120	AI130	AI140	AI150	AI160	AI170
CH2 AI102 AI112 AI122 AI132 AI142 AI152 AI162 AI172 CH3 AI103 AI113 AI123 AI133 AI143 AI153 AI163 AI173 CH4 AI104 AI114 AI123 AI133 AI143 AI153 AI163 AI173 CH4 AI104 AI114 AI124 AI134 AI144 AI154 AI164 AI174 CH5 AI105 AI115 AI125 AI135 AI145 AI155 AI166 AI174 CH6 AI106 AI116 AI125 AI135 AI145 AI155 AI166 AI175 CH6 AI106 AI116 AI126 AI136 AI146 AI156 AI166 AI176 CH7 AI107 AI117 AI127 AI137 AI147 AI157 AI167 AI177 Output Digital to analog CH0 AO100 AO110 AO120 AO130 AO140 AO150 AO160	CH1	AI101	AI111	AI121	AI131	AI141	AI151	AI161	AI171
CH3 Al103 Al113 Al123 Al133 Al143 Al153 Al163 Al173 CH4 Al104 Al114 Al124 Al134 Al144 Al154 Al163 Al173 CH5 Al105 Al114 Al124 Al134 Al144 Al154 Al164 Al174 CH5 Al105 Al115 Al125 Al135 Al145 Al155 Al165 Al175 CH6 Al106 Al116 Al126 Al136 Al146 Al156 Al166 Al176 CH7 Al107 Al117 Al127 Al137 Al147 Al157 Al166 Al176 CH7 Al107 Al117 Al127 Al137 Al147 Al157 Al167 Al177 Output Digital to analog CH0 AO100 AO110 AO120 AO130 AO140 AO150 AO160 AO170 CH0 AO100 AO110 AO121 AO131 AO141 AO151 AO151	CH2	AI102	AI112	AI122	AI132	AI142	AI152	AI162	AI172
CH4 Al104 Al114 Al124 Al134 Al144 Al154 Al164 Al174 CH5 Al105 Al115 Al125 Al135 Al145 Al155 Al165 Al175 CH6 Al106 Al116 Al126 Al136 Al146 Al155 Al166 Al176 CH7 Al107 Al117 Al127 Al137 Al147 Al157 Al166 Al176 CH7 Al107 Al117 Al127 Al137 Al147 Al157 Al167 Al177 Output Digital to analog CH0 AO100 AO110 AO120 AO130 AO140 AO150 AO160 AO170 CH0 AO100 AO110 AO121 AO131 AO140 AO150 AO160 AO170	CH3	AI103	AI113	AI123	AI133	AI143	AI153	AI163	AI173
CH5 Al105 Al115 Al125 Al135 Al145 Al155 Al165 Al175 CH6 Al106 Al116 Al126 Al136 Al146 Al156 Al166 Al176 CH7 Al107 Al117 Al127 Al137 Al147 Al157 Al167 Al177 Output Digital to analog CH0 AO100 AO110 AO120 AO130 AO140 AO150 AO160 AO170 CH0 AO100 AO110 AO120 AO130 AO140 AO150 AO160 AO170	CH4	AI104	AI114	AI124	AI134	AI144	AI154	AI164	AI174
CH6 Al106 Al116 Al126 Al136 Al146 Al156 Al166 Al176 CH7 Al107 Al117 Al127 Al137 Al147 Al157 Al167 Al177 Output Digital to analog CH0 AO100 AO110 AO120 AO130 AO140 AO150 AO160 AO170 CH4 AO141 AO141 AO151 AO151 AO151 AO151	CH5	AI105	AI115	AI125	AI135	AI145	AI155	AI165	AI175
CH7 Al107 Al117 Al127 Al137 Al147 Al157 Al167 Al177 Output Digital to analog Digital to analog AO100 AO110 AO120 AO130 AO140 AO150 AO160 AO170 CH0 AO101 AO110 AO120 AO130 AO140 AO150 AO160 AO170	CH6	AI106	AI116	AI126	AI136	AI146	AI156	AI166	AI176
Output Digital to analog CH0 AO100 AO110 AO120 AO130 AO140 AO150 AO160 AO170 CH4 AO101 AO111 AO121 AO121 AO141 AO151 AO151 AO151 AO151 AO151	CH7	AI107	AI117	AI127	AI137	AI147	AI157	AI167	AI177
CH0 AO100 AO110 AO120 AO130 AO140 AO150 AO160 AO170 CH1 AO111 AO121 AO121 AO121 AO141 AO150 AO160 AO170	Output	Digital to analog							
	CH0	AO100	AO110	AO120	AO130	AO140	AO150	AO160	AO170
CHI AOTUI AOTII AOTZI AOTZI AOTZI AOTZI AOTZI AOTZI AOTZI AOTZI	CH1	AO101	AO111	AO121	AO131	AO141	AO151	AO161	AO171

Table 4.3

The modules don't reach 8 input channels or 2 output channels can only use front registers.

Temperature measuring module

Temperature measuring module include: **FGs-E4TC**, **FGR-E4TC**. This chapter takes **FGs-E4TC** module as example to introduce usage of temperature measuring module.

Module specification

FGs-E4TC supports thermal resistance and thermocouple input, it calculates the analog inputs and get the digital quantity of temperature.

Module specification refers to following table (details of more models refer to hardware manual).

Resolution	1/65535 (16-bit)
Accuracy	5‰
Conversion rate	30ms/ch, 60ms/ch, 120ms/ch, 250ms/ch
Analog output power supply	24V±10%/DC, 100mA

Table 5. 1

- FGs-E4T supports K-thermocouple, T-thermocouple, PT100, NI120.
- User can set offset of each channel to compensate the measuring quantity.
- User can set measuring mode of each channel (conversion rate and sampling times).
- The power supply of analog part and digital part is separate.
- The measuring quantity is stored integer, it is 10 times of actual temperature, and unit is °C.

Terminal introduction

	0	v	N	С	N	С	N	С	N	С	48	5A
24	v	N	С	N	С	N	С	N	С	48	5B	
	A	.1	В	0	B	3	С	1	D	0	D	3
A	0	A	3	В	1	С	0	С	3	D	1	

Figure 5.1

Figure above shows the terminals of **FGs-E4TC** module. there are two terminals (485A and 485B) can be used for RS485 serial port communication (Only **FGs-E** series modules have this function, **FGR-E** series modules have no this function). Details of these terminal refer to following table:

	Channel	Terminal	Description
		4.0	Thermocouple: measuring end (hot end) of channel 0;
		70	Thermal resistance: one end of channel 0, connect to bule wire.
	Input	۸1	Thermocouple: compensation end (cold end) of channel 0;
	CH0	AI	Thermal resistance: one end of channel 0, connect to red wire.
		4.2	One end of channel 0, for thermal resistance only, connect to another
		AS	blue wire (three- wire system).
		PO	Thermocouple: measuring end (hot end) of channel 1;
		во	Thermal resistance: one end of channel 1, connect to bule wire.
	Input	D1	Thermocouple: compensation end (cold end) of channel 1;
Analog quantity	CH1	DI	Thermal resistance: one end of channel 1, connect to red wire.
		B3	One end of channel 1, for thermal resistance only, connect to another
			blue wire (three- wire system).
Input	Input CH2	CO	Thermocouple: measuring end (hot end) of channel 2;
			Thermal resistance: one end of channel 2, connect to bule wire.
		C1	Thermocouple: compensation end (cold end) of channel 2;
		CI	Thermal resistance: one end of channel 2, connect to red wire.
		C3	One end of channel 2, for thermal resistance only, connect to another
			blue wire (three- wire system).
		00	Thermocouple: measuring end (hot end) of channel 3;
		DU	Thermal resistance: one end of channel 3, connect to bule wire.
	Input	ח1	Thermocouple: compensation end (cold end) of channel 3;
	CH3	DI	Thermal resistance: one end of channel 3, connect to red wire.
		5 S	One end of channel 3, for thermal resistance only, connect to another
		03	blue wire (three- wire system).
RS485	-	485A	RS485+
communication	-	485B	RS485-

Table 5. 2

Wiring diagram

• K-thermocouple



Figure 5. 2

• PT100 thermal resistance



Figure 5. 3

Register allocation

The temperature measuring quantity share same register with analog input quantity, so that the allocation rule is same with allocation rule of analog input quantity. Details refer to following tables.

	Module1	Module2	Module3	Module4	Module5	Module6	Module7	Module8
Input	Measuring temperature							
CH0	AI100	AI110	AI120	AI130	AI140	AI150	AI160	AI170
CH1	AI101	AI111	AI121	AI131	AI141	AI151	AI161	AI171
CH2	AI102	AI112	AI122	AI132	AI142	AI152	AI162	AI172
CH3	AI103	AI113	AI123	AI133	AI143	AI153	AI163	AI173
CH4	AI104	AI114	AI124	AI134	AI144	AI154	AI164	AI174

Error case

Indicator LED error state

The indicator LED of extension module can show the running state itself. Following ta	able
shows how indicator light displays under error cases.	

Indicator	Frror case	Solution			
light display		30000			
ERR LED		1 Check if DLC is supplied			
lights on	Communication error				
RUN LED	between extension and PLC.	2. Check if configuration is right, and redownload the project.			
flashes		3. Connect to technicians if it is not solved after several tries.			
ERR LED		1 Redownload the project if permitted			
lights off	Extension module running	Redownload the project in permitted.			
RUN LED	error.	2. Power on PLC again.			
flashes		3. Connect to technicians if it is not solved after several tries.			
		1. Check nearby high-power devices that may bring interference,			
		and turn off them if permitted.			
		2. Check if extension module connects to high-power loads, and			
ERR LED flashes		make sure the output points is relay type but not transistor			
	between PLC and extension	type when connect to high-power loads. Disconnect the loads			
	module.	if needed.			
		3. Check if the 24V/220V power supply of PLC is stable.			
		4. Connect to technicians if it is not solved after several tries.			
POW LED	Firmuara arrar	Update the firmware, or send back exchange.			
flashes					

Table 6.1

- When extension module is running normally, the **ERR** LED lights off, the **PWR** and **RUN** LED lights on.
- Extension module should be enabled before use.
- Extension module gets power supply from PLC.

System special function register of extension module error

Register	Description
M8046	Error flag bit of extension module initialization.
M8184	Extension module 1 communication error.
M8185	Extension module 2 communication error.
M8186	Extension module 3 communication error.
M8187	Extension module 4 communication error.
M8188	Extension module 5 communication error.
M8189	Extension module 6 communication error.
M8190	Extension module 7 communication error.
M8191	Extension module 8 communication error.

Table 6. 2

User can also refer to appendix of instruction manual.