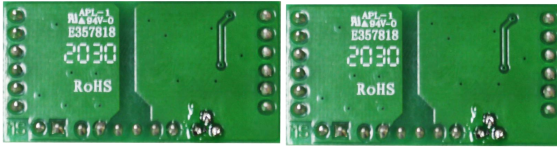


S6 Standard MODBUS-RTU Communication Module

User Manual



1 Introduction

S6 module supports standard MODBUS-RTU communication protocol. It can be installed into instrument's COM slot. The device's AF parameter must be set to 0 (available for firmware version 8.x). S6 supports range of 1~32. The reason to limit the range is the increasing of polling time. Communication settings are 8 data bits, 1 stop bit, no parity and baud rate from 9600 bps or 19200 bps. It supports 3 function codes 03H, 06H and 10H. Function code 03H can read a maximum of 120 words. When the parameters of a device are within 120 words, it can be read at a time. Function code 10H has writing length of 8 words. In multi-channel devices the parameter register is determined according to the Cn parameters (referring to the register table). One device occupies only one address (even multi-channel devices). As a result, maximum 32 units of 6-channel device can be connected in a communication line.

2 Function Code Description

2.1 Function Code 03H (Read Holding Register)

Standard MODBUS-RTU response format:

	Addr.	Function Code	Starting address of Read Registering	Length of register to read	CRC
No. of bytes	1	1	2	2	2

For example, to read the 00H of device with 1,

Addr	Function Code	Starting	No. of registers to read	CRC
01H	03H	00H 00H	00H 01H	84H 0AH

The response format:

	Addr.	Function	Data Length	Data	CRC
No. of bytes	1	1	1	2	2

Example of response:

Addr.	Function	Data Length	Data	CRC
01H	03H	02H	00H 64H	B9H AFH

2.2 Function Code 06H (Write a single Holding Register)

Write request format:

	Addr.	Function	Register	Value	CRC
No. of bytes	1	1	2	2	2

For example, to write 1000 in 04H register of the device with 1, the write command is as follows

Addr.	Function	Register Addr	Value	CRC
01H	06H	00H 04H	03H E8H	C8H B5H

Response format:

	Addr.	Function	Register Addr	Data	CRC
No. of bytes	1	1	2	2	2

Response of the above example:

Addr.	Function	Register Addr	Value	CRC
01H	06H	00H 04H	03H E8H	C8H B5H

2.3 Function Code 10H (Write multiple holding registers)

Request format:

	Addr.	Function code	Start register	No of Registers	Byte count	Values	CRC
No. of Bytes	1	1	2	2	1	No. of data * 2	2

For example, to write 1000 to 04H register of device with 1, the write command is as below,

Addr.	Function code	Start register	No of Registers	Byte count	Values	CRC
01H	10H	00H 04H	00H 01H	02H	03H E8H	A7H 6AH

Response format:

	Addr.	Function code	Start register	No. of Registers	CRC
No. of Bytes	1	1	2	2	2

Example of response for above request:

Addr.	Function	Start register	No. of Registers	CRC
01H	10H	00H 04H	00H 01H	40H 08H

3 List of Holding Registers

3.1 Parameter list of

AI-516/516P/518/518P/526/526P/716/716P/719/719PV8.x

AI-516/516P/518/518P/526/526P/716/716P/719/719P

Register	Parameter	Read/Write	Description
0	MV (% output)	Read only	Range -100% to 100%
1	ALM (Alarm)	Read only	Note 1
2	PV (Process Value)	Read only	
3	SV (Set Value)	Read /Write	Same unit as measured value
4	HIAL (High alarm)	Read /Write	Same unit as measured value
5	LOAL (Low alarm)	Read /Write	Same unit as measured value
6	HDAL (High Deviation Alarm)	Read /Write	Same unit as measured value
7	LDAL (Low Deviation Alarm)	Read /Write	Same unit as measured value
8	AHYS (Alarm return difference)	Read /Write	Same unit as measured value
9	CTRL (Control)	Read /Write	0: ONOFF 1: APID 2: nPID 3: PoP 4: SoP
10	P (Proportional band)	Read /Write	Same unit as measured value
11	I (Integration band)	Read /Write	second(s)
12	D (Differentiation band)	Read /Write	0.1 second(s)
13	Ctl (Output cycle)	Read /Write	0.1 second(s)
14	Inp (Input)	Read /Write	See instruction manual
15	dPt (Decimal point)	Read /Write	0: 0 1: 0.0 2: 0.00 3: 0.000
16	SCL (Lower input limit)	Read /Write	Same unit as measured value
17	SCH (Upper input limit)	Read /Write	Same unit as measured value
18	ALP (Alarm Position)	Read /Write	See instruction manual
19	Sc (Input correction)	Read /Write	Same unit as measured value
20	Op1 (Output method)	Read /Write	See instruction manual
21	OPL (Output lower limit)	Read /Write	%
22	OPH (Output upper limit)	Read /Write	%

Register	Parameter	Read /Write	Description
23	AF (Advanced Function)	Read /Write	See instruction manual
24	Mode characteristics	Read only	
25	Address	Read /Write	See instruction manual
26	Filt (Input filter)	Read /Write	
27	AMAn (Auto/manual)	Read /Write	0: MAN 1: Auto 2: FMAAn 3: FAut
28	LOC (Parameter lock)	Read /Write	
29	MV (Manual output Value)	Read /Write	%
30	SRUN (Run/Stop)	Read /Write	0: run 1: StoP 2: HoLd
31	CHYS (control return diff.)	Read /Write	Same unit as measured value
32	At (Auto tune)	Read /Write	0: OFF 1: on 2: FoFF
33	SPL (SV lower limit)	Read /Write	Same unit as measured value
34	SPH (SV upper limit)	Read /Write	Same unit as measured value
35	Fru (Frequency)	Read /Write	See instruction manual
36	OHEF (OPH Effective Range)	Read /Write	See instruction manual
37	ACT (Positive/Negative action selection)	Read /Write	0: rE 1: dr 2: rEbA 3: drbA
38	ADIS (alarm indication)	Read /Write	0: OFF 1: on
39	Aut (Output type)	Read /Write	0: SSR 1: rELy 2: 0-20 3: 4-20
40	P2 (Proportional band)	Read /Write	Same unit as measured value
41	I2 (Integration band)	Read /Write	second(s)
42	D2 (Differentiation band)	Read /Write	0.1 second(s)

43	CTI2 (Output cycle)	Read /Write	0.1 second(s)
44	Et (Event input type)	Read /Write	0: nonE 1: ruSt 2: SP1.2 3: PId2
45	SPr (Heating rate limit)	Read /Write	Measurement value unit/(minute)
46	Pno (No. of blocks)	Read /Write	1~30/50
47	Ponp (Power selection)	Read /Write	0: Cont 1: StoP 2: run 3: dASt 4: HoLd
48	PAF (Program parameter)	Read /Write	See instruction manual
49	STEP (Block no.)	Read /Write	1~30/50
50	Program/current segment/elapsed time	Read /Write	0.1 minute or 0.1 hour, 1.6 minutes for AI-5 series programmable controller
51	Event output status	Read /Write	0: No event output 1: Event 1(AL1) activated 2: AL2 activated 3: AL1 and AL2 activated

Register	Parameter	Read/Write	Description
52	Oprt (Soft start time)	Read /Write	second(s)
53	Strt (Valve turning time)	Read /Write	
54	SPSL (Given lower limit)	Read /Write	Same unit as measured value
55	SPSH (Given upper limit)	Read /Write	Same unit as measured value
56	Ero (Fault output value)	Read /Write	%
57	AF2	Read /Write	
58~66	Reserved	Read only	
67~74	EP1-EP8	Read /Write	
75	Valve Position	Read only	
76~82	Reserved	Read only	
83	SP1	Read /Write	Same unit as measured value
84	T1	Read /Write	0.1 Minute/0.1 hour
85	SP2	Read /Write	Same unit as measured value
86	T2	Read /Write	0.1 Minute/0.1 hour
87~182	SP3~T50	Read /Write	
183~189	Reserved	Read only	

3.2 Parameter list of AI-7028/7038/7048/702M/703M/704M/706M

Register	AI-7028	AI-7038	AI-7048	AI-702M	AI-703M	AI-704M	AI-706M
0	MV1	MV1	MV1	MV1	MV1	MV1	MV1
1	MV2	MV2	MV2	MV2	MV2	MV2	MV2
2	ALM1	MV3	MV3	ALM1	MV3	MV3	MV3
3	ALM2	ALM1	MV4	ALM2	ALM1	MV4	MV4
4	PV1	ALM2	ALM1	PV1	ALM2	ALM1	MV5
5	PV2	ALM3	ALM2	PV2	ALM3	ALM2	MV6
6	SV1	PV1	ALM3	Reserved	PV1	ALM3	ALM1
7	SV2	PV2	ALM4		PV2	ALM4	ALM2
8	HIAL1	PV3	PV1	HIAL1	PV3	PV1	ALM3
9	HIAL2	SV1	PV2	HIAL2	Reserved	PV2	ALM4
10	LOAL1	SV2	PV3	LOAL1		PV3	ALM5

Register	AI-7028	AI-7038	AI-7048	AI-702M	AI-703M	AI-704M	AI-706M		
11	LOAL2	SV3	PV4	LOAL2	Reserved	PV4	ALM6		
12	Reserved	HIAL1	SV1	Reserved	HIAL1	Reserved	PV1		
13		HIAL2	SV2		HIAL2		PV2		
14		HIAL3	SV3		HIAL3		PV3		
15		LOAL1	SV4		LOAL1		PV4		
16	CHYS1	LOAL2	HIAL1	DF1	LOAL2	HIAL1	PV5		
17	CHYS2	LOAL3	HIAL2	DF2	LOAL3	HIAL2	PV6		
18	AT1	Reserved	HIAL3	Reserved	Reserved	HIAL3	Reserved		
19	AT2		HIAL4			HIAL4			
20	P1		LOAL1			LOAL1			
21	P2		LOAL2			LOAL2			
22	I1		LOAL3			LOAL3			
23	I2		LOAL4			LOAL4			
24	D1		CHYS1			Reserved		DF1	Reserved
25	D2	CHYS2	DF2	HIAL2					
26	CTI	CHYS3	CN	DF3	HIAL3				
27		AT1		HIAL4					
28	INP1	AT2	INP1	HIAL5					
29	INP2	AT3	INP2	HIAL6					
30	DIP1	P1	DIP1	LOAL1					
31	DIP2	P2	DIP2	LOAL2					
32	SCL1	P3	CHYS1	SCL1	Reserved		DF1	LOAL3	
33	SCL2	I1	CHYS2	SCL2			DF2	LOAL4	
34	SCH1	I2	CHYS3	SCH1		DF3	LOAL5		
35	SCH2	I3	CHYS4	SCH2		DF4	LOAL6		
36	AOP1	D1	AT1	AOP1		Reserved	Reserved		
37	AOP2	D2	AT2	AOP2					

Register	AI-7028	AI-7038	AI-7048	AI-702M	AI-703M	AI-704M	AI-706M	
38	SCB1	D3	AT3	SCB1	Reserved	Reserved	Reserved	
39	SCB2	CN	AT4	SCB2	CN			
40	Reserved		P1	OPN				
41			P2					
42			INP1	P3				OPL
43	INP2	P4	INP2					
44	OPH1	INP3	I1	OPH	INP3			
45	OPH2	DIP1	I2		DIP1			
46	AF	DIP2	I3	AF	DIP2			
47		DIP3	I4		DIP3			
48	Model	SCL1	D1	Model	SCL1			DF1
49	Characteristics	SCL2	D2	Characteristics	SCL2			DF2
50	Address	SCL3	D3	Address	SCL3			DF3
51		SCH1	D4		SCH1			DF4
52	FILT1	SCH2	CTI	FILT1	SCH2	CN	DF5	
53	FILT2	SCH3		FILT2	SCH3		DF6	
54	NONC	AOP1		NONC	AOP1	AOP2		
55		AOP2						
56	LOC	AOP3	INP1	LOC	AOP3	INP1		
57		SCB1	INP2		SCB1	INP2		
58	CN	SCB2	INP3	CN	SCB2	INP3		
59		SCB3	INP4		SCB3	INP4		
60	Reserved	Reserved	DIP1	Reserved	OPN	DIP1	Reserved	
61			DIP2			DIP2		
62			DIP3			DIP3		
63			DIP4		OPL	DIP4		
64			SCL1			SCL1		
65			SCL2			SCL2		

Register	AI-7028	AI-7038	AI-7048	AI-702M	AI-703M	AI-704M	AI-706M	
66		OPH1	SCL3			SCL3	Reserved	
67		OPH2	SCL4		OPH	SCL4		
68		OPH3	SCH1			SCH1		
69		AF	SCH2		AF	SCH2		
70			SCH3			SCH3		
71			SCH4			SCH4		
72		Model Characteristics	AOP1		Model Characteristics	AOP1		
73			AOP2			AOP2		
74			AOP3			AOP3		
75		Address	AOP4		Address	AOP4		
76			SCB1			SCB1		
77			SCB2			SCB2		
78		FILT1	SCB3		FILT1	SCB3	CN	
79		FILT2	SCB4	Reserved	FILT2	SCB4		
80		FILT3	Reserved		FILT3	OPN		
81		NONC						NONC
82								
83								
84		CN	Reserved		CN	INP1		
85						CN		INP2
86								INP3
87			INP4					
88		Reserved	OPH1		Reserved	OPH	INP5	
89			OPH2				INP6	
90			OPH3			DIP1		
91			OPH4			DIP2		
92		AF	AF		AF	DIP3		
93				DIP4				

Register	AI-7028	AI-7038	AI-7048	AI-702M	AI-703M	AI-704M	AI-706M	
94		Reserved	AF	Reserved	Reserved	AF	DIP5	
95							DIP6	
96			Model Characteristics				Model Characteristics	SCL1
97								SCL2
98								SCL3
99								SCL4
100			Address				Address	SCL5
101								SCL6
102								SCH1
103								SCH2
104			FILT1				FILT1	SCH3
105			FILT2				FILT2	SCH4
106			FILT3				FILT3	SCH5
107			FILT4				FILT4	SCH6
108			NONC				NONC	AOP1
109								AOP2
110								AOP3
111								AOP4
112			LOC				LOC	AOP5
113	AOP6							
114	SCB1							
115	SCB2							
116	CN		CN	SCB3				
117				SCB4				
118				SCB5				
119				SCB6				
120	Address						OPN	
121								

Register	AI-7028	AI-7038	AI-7048	AI-702M	AI-703M	AI-704M
122	Address					OPN
123						
124						
125						
126						OPL
127						
128						
129						
130						
131						
132						OPH
133						
134						
135						
136						
137						AF
138						
139						
140						
141						
142						Model Characteristics
143						
144						
145						
146						
147						
148						
149						

Register	AI-7028	AI-7038	AI-7048	AI-702M	AI-703M	AI-704M					
150						ADDR					
151											
152											
153											
154											
155											
156						FILT1					
157						FILT2					
158						FILT3					
159						FILT4					
160						FILT5					
161						FILT6					
162						Reserved					NONC
163											
164											
165											
166											
167											
168	LOC										
169											
170											
171											
172	CN										
173											
174											
175											
176											
177											

Register	AI-7028	AI-7038	AI-7048	AI-702M	AI-703M	AI-704M
178	Reserved					CN
179						
180~189	Reserved					

Description:

The multi-channel devices have set number of measurement channels, and the parameters are not static. For example, if in 706M Cn is set as 5 channels, then address 05 is the first channel's alarm status ALM, and 10 is the first channel's measurement value, i.e. each parameter code will move forward. It is recommended not to modify the number of channels. Parameters [MV], [ALM], [PV], and [Model Characteristics] attributes are Read only, and other parameters can be read and written.

3.3 AI-518/518P/708/708P/808/808P/601/301M/708H/808H

Parameter list of AI-518/518P/708/708P/808/808PV7.x /AI601/AI301M/AI708H/AI808H:

Register	AI518P AI708P AI808P	AI518 AI708 AI808	AI708H AI808H	AI501 AI701	AI601	AI301M
0	MV	MV	Instantaneous Flow	MV	MV	MV
1	ALM	ALM	Cumulative flow low	ALM	ALM	ALM
2	PV	PV	Cumulative flow high	PV	PV defined according to INP main input	PV
3	SV	SV	Temperature	SV	I Current	SV
4	STEP	HIAL	Pressure	HIAL	U Voltage	HIAL
5	HIAL	LOAL	Flow before compensation	LOAL	HIAL	LOAL
6	LOAL	HDAL	Batch control SV	HDAL	LOAL	HDAL
7	HDAL	LDAL	FHIAL	LDAL	HDAL	LDAL
8	LDAL	DF	FLOAL	AHYS	LDAL	AHYS
9	DF	CTRL	SPE	CTRL	AHYS	Reserved
10	CTRL	M5	ACT	Reserved	Reserved	
11	M5	P	SN			
12	P	T	FSc			
13	T	CTI	PdIH			
14	CTI	INP	CSc	INP	INP	

Register	AI518P AI708P AI808P	AI518 AI708 AI808	AI708H AI808H	AI501 AI701	AI601	AI301M
15	INP	DIP	CdIH	DIP	INP	DIP
16	DIP	SCL	Cut	SCL	DIP	SCL
17	SCL	SCH	FdIH	SCH	SCL	SCH
18	SCH	ALP	FdIP	ALP	SCH	ALP
19	ALP	SC	PA	Scb	ALP	I/O status
20	SC	OPT	Po	OPT	SC	OPT
21	OPT	OPL	Co	Reserved	OPT	Reserved
22	OPL	OPH	Frd		Reserved	
23	OPH	CF	CF			
24	CF	Model Characteristics	bC	Model Characteristics		Model Characteristics
25	Program Control	ADDR	Reserved	ADDR	Model Characteristics	ADDR
26	ADDR	FILT	FoH	FILT	ADDR	FILT
27	FILT	RUN	Model Characteristics	SPL	FILT	NULL
28	RUN	LOC	ADDR	SPH	NULL	LOC
29	LOC	Reserved	IoH	Reserved	LOC	Reserved
30	C01		FdL			
31	T01		Loc			
32	C02		Reserved			
33	T02		FdF			
34	C03		CHIA			
35	T03		CLoA			
36	C04		PHIA			
37	T04		PLoA			
38	C05		ALP			
39	T05		FSb			
40	C06		CdIP			
41	T06		PdIP			

Register	AI518P AI708P AI808P	AI518 AI708 AI808	AI708H AI808H	AI501 AI701	AI601	AI301M
42	C07	Reserved	PSc	Reserved		
43	T07		CLn			
44	C08		FLJH			
45	T08		FLJL			
46	C09		EJH			
47	T09		EJL			
48	C10		Cumulative clear bit			
49	T10	Reserved				
50	C11					
51	T11					
52	C12					
53	T12					
54	C13					
55	T13					
56	C14					
57	T14					
58	C15					
59	T15					
60	C16					
61	T16					
62	C17					
63	T17					
64	C18					
65	T18					
66	C19					

Register	AI518P AI708P AI808P	AI518 AI708 AI808	AI708H AI808H	AI501 AI701	AI601	AI301M
67	T19	Reserved				
68	C20					
69	T20					
70	C21					
71	T21					
72	C22					
73	T22					
74	C23					
75	T23					
76	C24					
77	T24					
78	C25					
79	T25					
80	C26					
81	T26					
82	C27					
83	T27					
84	C28					
85	T28					
86	C29					
87	T29					
88	C30					
89	T30					
90	Elapsed time					
91	(Manual MV in AI808 only)					
92~189	Reserved					

Description

Parameters [MV], [ALM], [PV], and [Model Characteristics] attributes are only Read only. [SV] and [Elapsed time] attributes of AI518P, AI708P and AI808P are Read only. For AI601, [U voltage] and those parameters listed above it are all Read only and all other parameters can be Read/Write.

Note 1: Instrument alarm status

ALM	Description
Status 0	High alarm (HIAL) Off 0, Active 1
Status 1	Low alarm (LoAL) Off 0, Active 1
Status 2	High deviation alarm (dHAL) Off 0, Active 1
Status 3	Low deviation alarm (dLAL) Off 0, Active 1
Status 4	High input alarm (orAL) Off 0, Active 1
Status 5	AL1 Status, Off 1, Active 0
Status 6	AL2 Status, Off 1, Active 0
Status 7	Empty