Technical Information

FLXA402T
Liquid Analyzer for Turbidity and Chlorine
MODBUS Communication

TI 12A01G01-62EN

CONTENTS

This document describes MODBUS communication by the FLXA402T Liquid Analyzer for Turbidity and Chlorine.

Before communicating using the MODBUS protocol, refer to the User's Manual of the FLXA402T Liquid Analyzer for Turbidity and Chlorine (IM 12A01G01-03EN Operation of Converter) for details of the parameters.

For the latest User's Manual, download it from our website or scan the QR code.

http://www.yokogawa.com/an/flxa402t/download/
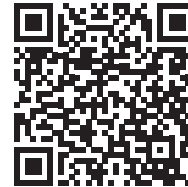
1.   General

FLXA402T configures or obtains process data by using MODBUS/TCP protocol on physical application: Ethernet, RS485.

MODBUS RTU is supported but not ASCII.

1.1   MODBUS setup

● **Ethernet**

FLXA402T uses Modbus/TCP, connection port 502.

For MODBUS/TCP, IP address, subnet mask, default gateway or DHCP should be set in advance from HMI device.

The Ethernet configuration is reflected onto the system, after FLXA402T reboots.

● **RS485**

FLXA402T communicates via RS485 MODBUS.

The following list shows the required setting by HMI to establish communication between a master device and FLXA402T via RS485 MODBUS.

Converter address:	1 to 247 (initial value 1)
Transmission speed:	9600[bps], 38400[bps], 115200[bps]
Parity :	Even, Odd, None

When Parity is Even or Odd, Stop bit is 1bit, when None, Stop bit is 2 bit.
Even or Odd is recommended for Parity.

Stop bit:	1 bit
Parity:	Even
Mode:	RTU

1.2   MODBUS master

● **Data memory**

YOKOGAWA GX series with RS485 MODBUS are recommended for process data saving. MODBUS communication enables to store larger amount of process data than FLXA402T mA output.

1.3   Function code/Exception code

MODBUS Function code used for FLXA402T

Function	Function Code (hex)
Read Coils	01
Write Single Coil	05
Write Multiple Coils	0F
Read Input Register	04
Read Holding Registers	03
Write Single Register	06
Write Multiple Registers	10
Read Device Identification	2B

Exception responses

Exception Code	Name	Meaning
0x01	Illegal Function	The Function Code received in the query is not an allowable action for the server or slave.
0x02	Illegal Data Address	The data address received in the query is not an allowable address for the server or slave.
0x03	Illegal Data Values	The value contained in the query data field is not an allowable value for the server or slave.

If parameter setting fails because the setting is out of the range, Exception code 0x03 is replied indicating a fail setting. When multiple parameters are to be set, even a single forbidden setting makes all the other parameter setting fail.

1.4   MODBUS communication

The following must be cared when master devices are used.

● MODBUS response timing

IR (Input Register) response to IR Read request within 50 ms after FLXA402T receives the message. To the other request, FLXA402T replies within 100 ms after it receives the request.

Another request must be sent at least 100 ms after the last response was received from FLXA402T.
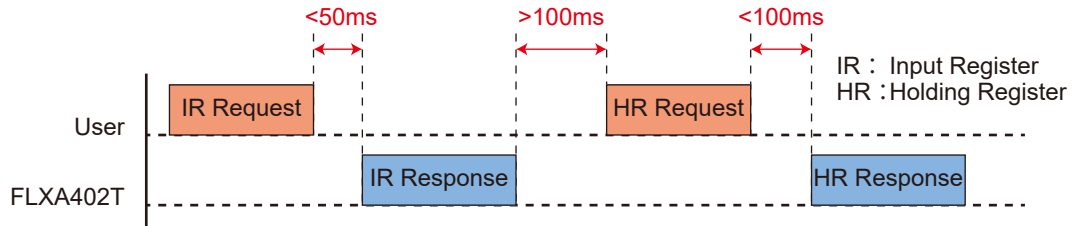
● Input Register renewal cycle

Process value sent in Input Register is renewed every 500 ms. It is better to Read the process value every 500 ms.

● Cautions for changing settings

Exit HMI before changing the parameter settings.

1.5   MODBUS password

Entering password on "MODBUS password" protects parameter setting and prohibits data input except for "cancel MODBUS password."

To be allowed to input data when password is available, enter the password you created to "cancel MODBUS password."

NOTE

- When creating a MODBUS password is allowed and no data-input signal is received from MODBUS master for 10 minutes while data input is being allowed, the parameter setting becomes prohibited automatically.
- The three parameters in the MODBUS password area are accessed by aligning Quantity to the area.
- When entering data be sure to use Write Multiple Register (Function Code 0x10).

1.6   How to change sensor address

Sensor* address are all 1 at the time of purchase. If you try to connect multiple sensor before you change the address, the communication fails. When you change sensor for the first time after the purchase, you have to connect the sensor one by one and change the address.

*:   "Sensor" refers to TB8x0D, FC800D, RC800D.

1.7   Connection

● **Ethernet**

On the FLXA402T network, Ethernet MODBUS allows 2 sessions.

First session provides communication to Read process value periodically by connecting constantly.

Second session is for maintenance only when maintenance is required.
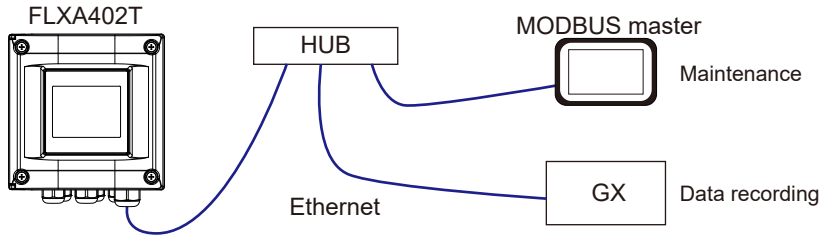
● **RS485**

FLXA402T communicates with one MODBUS master via RS485 MODBUS. RS485 is connected constantly and provides communication for reading process value.
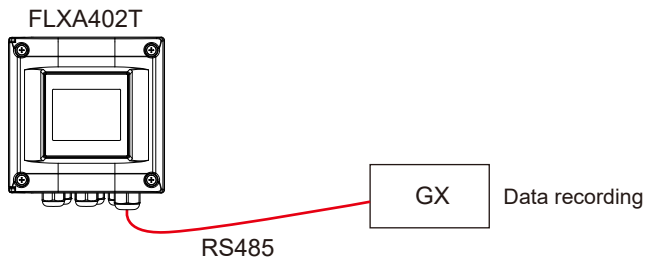
NOTE

Although connections other than these mentioned above are available, they might disable obtaining process value, if Read and setting change are implemented in a single session/communication.

2.   MODBUS map

Data type for FLXA402T MODBUS map

Data type	Definition
float	floating point (4byte) IEEE754 NaN: 0x7FFFFFFF
int16	16 bit signed integer
uint16	16 bit unsigned integer
uint32	32 bit unsigned integer
ASCII	character set (using one byte per character), multiple registration possible
bit fields	data assigning information on bit

Access (load/import) to multiple registration such as float, uint32, ASCII etc. must be implemented at once.

The available Function Codes are shown in the table below.

		Function	Function Code (hex)
Data Access	Bit	Read Coils	01
		Write Single Coil	05
		Write Multiple Coils	0F
	16 bits	Read Input Register	04
		Read Holding Registers	03
		Write Single Register	06
		Write Multiple Registers	10
Diagnostics		Read Device Identification	2B

2.1 COIL: Coil register

address	item name	Value/description
0	Reserved	all 0 Do not change.
1		
2		
3		
4		
5		
6		
7		
30	write permission status	Read only Shows access authority.
31	password status	Pass word is locked. (Read only) On: Password is locked. Off: Password is unlocked.
50	converter restart	Restarts the converter

51	squawk	Starts backlight flashing.
		On: Flash Once: After lighting on for 5 sec,
		                        automatically lights off.
		                    Endless: Light On until cancelling the flash
		Off: Stop the flash

52	mA1 HOLD	mA output manual Hold status On: Hold Off: Hold off
53	mA2 HOLD	
54	mA3 HOLD	
55	mA4 HOLD	
56	release Wash/Cal. box error	Wash/Cal. box error is released. After turning On (theerror is released), it turns Off automatically.
57	release Auto Zero cal. result error alarm /Auto Cal. Unstable alarm	Auto Zero cal. result error alarm /Auto Cal. Unstable alarm is released. After turning On (the error is released), it turns Off automatically.

58	auto wash start	Starts auto wash.
		On: After auto wash starts and it ends (the wash time
		        elapses), it turns Off automatically.
		Off: After auto wash starts, when it is canceled, it shifts
		        to a wash recovery state automatically.

59	auto calibration start	On: After auto wash/calib. starts, and it ends (the wash/
		        calib. time elapses), it turns Off automatically.
		Off: After wash/calib. starts, when it is canceled, it shifts
		        to a wash/calib. recovery state automatically.

60	recovery after wash / calibration	When auto wash state, auto wash/calib. state is canceled, it shifts to the recovery state automatically.
		On: when it turns to the recovery state, it becomes
		        On automatically. Manual switching from Off to
		        On is disabled. After the recovery state ends (the
		        recovery time elapses), it automatically turns Off.
		Off: It releases the recovery state.

61	maintenance mode in address CH1-1	This turns sensors into a maintenance mode. On: maintenance mode Off: maintenance mode is released.
62	maintenance mode in address CH2-1	
63	maintenance mode in address CH2-2	
64	start plateau data acquisition in address CH1-1	It starts acquiring plateau data. After turning On and starting the plateau data acquisition, it becomes Off automatically. (Abort in the midway is not allowed.)
65	start plateau data acquisition in address CH2-1	
66	start plateau data acquisition in address CH2-2	
67	ad touch screen flag	HMI of the converter switches to Touch panel adjusting.

2.2   INPUT_REGISTER: Input Register

MODBUS address are assigned to parameters of the converter status including AO. Address from 1000 to 1999 are for the measured value obtained from sensors.

Address	Name	Comment
0 to 999	Converter	Status on Converter, AO. See 2.2.1 through 2.2.3.
1000 to 1063	Sensor 1-1 measured value	Input Register for each sensor connection number. For IR of each sensor type, see 2.2.4.
1100 to 1163	Sensor 2-1 measured value	
1200 to 1263	Sensor 2-2 measured value	
52017 to 52056	Reserved	
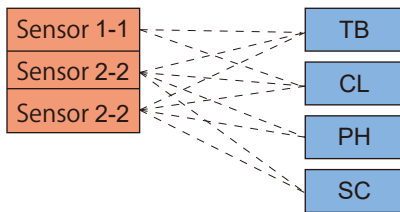
Image of sensor connection

MODBUS address are assigned to designated sensor connection number to input sensor measured value. Other address, which are not assigned to the sensor connection, shows "0".

<Example>

When:

Sensor1: CL detector, Sensor2: TB detector

Sensor connection number 1-1 is CL, Sensor connection number 2-1 is TB.

This time,

MODBUS address 1000 to 1035 are assigned to input of measured value from Sensor1 CL detector.
MODBUS address 1100 to 1139 are assigned to input of measured value from Sensor2 TB detector.

"0" is read on other address : 1036-1039, 1200-1239.

2.2.1   Status

address	item name	Type	Value/description
0,1	converter status	uint32 (bit fields)	MODBUS status of the converter **bit** 0-3 changes at Housing HR setting 4-7 changes at Housing IR renewed 8-29 Reserved 30 Ethernet link up. ON at cable connection 31 Bluetooth link up, "ON" when Bluetooth is connected.
2,3	converter alarm	uint32 (bit fields)	Integrated information on alarms of the converter or connected sensors. See the table of alarms to know the bit assignment. **bit** **Integrated information on alarms of the converter** 0 SSA1-1 Process error(Low) 1 SSA1-1 Process error(High) 8 SSA2-1/Analog sensor module2 Process error(Low) 9 SSA2-1/Analog sensor module2 Process error(High) 10 SSA2-2 Process error(Low) 11 SSA2-2 Process error(High) 16 Converter setting Alarm on 17 Converter maintenance status on 24 Err on: mA1 fails on the converter 25 Err on: mA2 fails on the converter 26 Err on: mA3 fails on the converter 27 Err on: mA4 fails on the converter 28 Err on: AI fails on the converter 29 one of the following sensors is failure.: SSA1-1~2-2 / Analog sensor (module) 30 Converter (Housing) failure 31 when any problem happens on Housing/Sensor
4	Sensor connection status	uint16 (bit fields)	Sensor connection status of each Address CH 00: unconnected, 01: being connected,10: connect **bit** 0, 1 Address CH1-1 2, 3 Reserved 4, 5 Reserved 6, 7 Reserved 8, 9 Address CH2-1 10, 11 Address CH2-2 12, 13 Reserved 14, 15 Reserved
5,6	Sensor type	uint32 (bit fields)	Connected sensor of each Address CH. 0000: none, 0001: PH, 0010: SC, 0011: TB, 0100: CL **bit** 0-3 Address CH1-1 4-7 Reserved 8-11 Reserved 12-15 Reserved 16-19 Address CH2-1 20-23 Address CH2-2 24-27 Reserved 28-31 Reserved
7	Wash Calibration/HOLD status	uint16 (bit fields)	Wash Calibration/HOLD status HOLD: ON: HOLD Wash Calibration: bit8 ON: Recovering, bit9 ON: being washed, bit10 ON: Calibrating **bit** 0-3 Reserved 4 mA1_HOLD 5 mA2_HOLD 6 mA3_HOLD 7 mA4_HOLD 8, 9, 10 Auto wash /Cal status 11-15 Reserved

2.2.2 mA Output, mA Input, Contact Output, Contact Input

address	item name	Type	Value/description
8,9	AO_Process_Parameter1	float	analog output: process parameter
10,11	AO_Process_Parameter2		The measured value of process parameter assigned to
12,13	AO_Process_Parameter3		mA1 to mA4.
14,15	AO_Process_Parameter4		
16,17	AO_mA1	float	analog output: current (2.2-22mA)
18,19	AO_mA2		Output value of mA1 to mA4
20,21	AO_mA3		
22,23	AO_mA4		
24,25	AI_Current	float	analog input [mA]
26,27	AI_Temperature		mA input information, confirmable by unit
28,29	AI_PH		
30,31	AI_Conductivity		
32	Contact input/output	uint16 (bit fields)	Contact output, Contact input bit0: S1 bit1: S2 bit2: S3 bit3: S4 bit4-7: Reserved bit8: DI1 bit9: DI2 bit10-15: Reserved
33	AO_mA1_Range	uint16	0: Range1, 1: Range2, 2: Range3
34	AO_mA2_Range		0: Range1, 1: Range2
35	AO_mA3_Range		
36	AO_mA4_Range		

2.2.3 Converter Alarm

For bit assignment, see "3.1   Alarm list (Converter)"

address	item name	Type	Value/description
500,501	Converter Measurement alarm	uint32 (bit fields)	See the table of alarms for bit assignment.
502,503	Converter I/O alarm		
504,505	Converter Maintenance Status		
506,507	Converter Setting alarm		

2.2.4   Sensor measured value

● **TB**

address	item name	Type	Value/description
0	device failure	bit fields	See the table of alarms for bit assignment.
1	sensor status	bit fields	
2	measurement warning	bit fields	
3	device status	bit fields	
4,5	Turbidity	float	
6	Turbidity unit	uint16	mg/L(0), TU(1), NTU(2), FTU(3),FNU(4), user-defined unit(5)
7	Reserved		
8,9	Transmitted light current	float	
10,11	Scattered light current	float	
12,13	Light source current	float	
14,15	Lighting IF	float	
16,17	Last calibrated date	uint32	the number of seconds since 2000-01-01 00:00:00
18,19	Desiccant changed date	uint32	the number of seconds since 2000-01-01 00:00:00
20	Light source diagnosis	uint16	bad(0), quarter(1), half(2), 3quarters(3), fine(4), no meaning(5)
21	Dried condition	uint16	
22	Light source operating time	uint16	
23	Wiper operating time	uint16	
24-35	Reserved		

● **CL**

address	item name	Type	Value/description
0	device failure	bit fields	See the table of alarms for bit assignment.
1	sensor status	bit fields	
2	measurement warning	bit fields	
3	device status	bit fields	
4,5	Temperature	float	
6,7	Chlorine	float	
8	Temperature unit	uint16	degC(1), degF(2)
9	Chlorine unit	uint16	
10,11	Measurement current	float	
12,13	Applied voltage	float	
14,15	Input pH	float	
16-19	Reserved		
20,21	Last calibrated date	uint32	the number of seconds since 2000-01-01 00:00:00
22,23	R-contact installed date	uint32	the number of seconds since 2000-01-01 00:00:00
24	Signal status	uint16	
25	ME operating time	uint16	
26	Beads operating time	uint16	
27	Motor operating time	uint16	
28	Coupling operating time	uint16	
29	Shaft assy operating time	uint16	
30-39	Reserved		

● **PH**

address	item name	Type	Value/description
0	device_failure	uint16 (bit fields)	See the table of alarms for bit assignment.
1	sensor_failure	uint16 (bit fields)	
2	meas_warning	uint16 (bit fields)	
3	device_status	uint16 (bit fields)	
4,5	temp_measure	float	
6,7	pH_measure	float	
8-13	Reserved		
14,15	Voltage_pH	float	E.M.F (PH: glass electrode - reference electrode)
16-19	Reserved		
20,21	impedance1	float	When Impedance is set low, Impedance is shown with Ω, when it is set high, NaN is shown. If it is set high, alarm information tells the error presence.
22,23	impedance2	float	

● **SC**

address	item name	Type	Value/description
0	device_failure	uint16 (bit fields)	See table of alarms for bit assignment.
1	sensor_failure	uint16 (bit fields)	
2	meas_warning	uint16 (bit fields)	
3	device_status	uint16 (bit fields)	
4,5	temp_measure	float	Temperature
6,7	SC1_measure	float	Conductivity 1
8-13	Reserved		
14	temp_unit	uint16	degC(1), degF(2)
15	SC1_unit	uint16	Conductivity Unit 1:S/cm, 2:S/m
16-19	Reserved		
20,21	sensor_ohm	float	Resistivity between electrodes of sensors (Ω)
22,23	polarization	float	
24,25	Reserved		

2.3　HOLD_REGISTER

2.3.1　Error setting (0-)

For further information, see section 4.7 "Error settings" in the User's Manual IM 12A01G03-01EN Operation of Converter.

■ Error settings

See Chapter 3 for bit assignment.

Register (by bit) 4 alarm types :
　　　　Measurement alarm, I/O alarm, Maintenance status, Setting error,

according to NE107 :
　　　　Failure (F), Function check (S), Out of specification (C), Maintenance required (M), and (Off), (N).

If you assign bit "0" to an alarm , the alarm reads "Off".

If you assign a bit number to multiple alarms simultaneously, priority in the validity goes F>S>C>M.

CAUTION

When you want to revise an alarm priority from high to low, first provide bit "0" with the lower one, then give "1" to the higher one.

● **Error settings- Converter**

address	NE107	item name	Type
0,1	F	Measurement alarm	uint32 (bit fields)
2,3		I/O alarm	
4,5		Maintenance Status	
6,7		Setting alarm	
8,9	C	Measurement alarm	
10,11		I/O alarm	
12,13		Maintenance Status	
14,15		Setting alarm	
16,17	S	Measurement alarm	
18,19		I/O alarm	
20,21		Maintenance Status	
22,23		Setting alarm	
24,25	M	Measurement alarm	
26,27		I/O alarm	
28,29		Maintenance Status	
30,31		Setting alarm	

● **Error settings-sensor**

Address	NE107	Address	NE107	Address	NE107	Address	NE107		Name	Type
32	F	48	C	64	S	80	M	PH	Device fail	uint16 (bit fields)
33		49		65		81			Sensor status	
34		50		66		82			Measure alarm	
35		51		67		83			Device status	
36		52		68		84		SC	Device fail	
37		53		69		85			Sensor status	
38		54		70		86			Measure alarm	
39		55		71		87			Device status	
40		56		72		88		TB	Device fail	
41		57		73		89			Sensor status	
42		58		74		90			Measure alarm	
43		59		75		91			Device status	
44		60		76		92		CL	Device fail	
45		61		77		93			Sensor status	
46		62		78		94			Measure alarm	
47		63		79		95			Device status	

■ Error simulation

Simulate the following 4 alarms and output (Error simulate) by the bit.

> Measure alarm
> I/O alarm
> Maintenance status
> Setting alarm

ERROR: Provide the alarms with simulated alarm status by bit. (1: Error on, 0: Error off)

MODE: Define alarms to simulate by bit. (1: Error simulate ON, 0: Error simulate OFF)

● **Converter error simulation**

Address	Name		Type
100, 101	MODE	Measurement alarm	uint32 (bit fields)
102, 103		I/O alarm	
104, 105		Maintenance Status	
106, 107		Setting alarm	
108, 109	ALARM	Measurement alarm	
110, 111		I/O alarm	
112, 113		Maintenance Status	
114, 115		Setting alarm	

● **Sensor error simulation (mode)**

Address	Connection number	Address	Connection number	Address	Connection number		Name	Type
200	1-1	216	2-1	232	2-2	PH	Device fail	uint16 (bit fields)
201		217		233			Sensor status	
202		218		234			Measure alarm	
203		219		235			Device status	
204		220		236		SC	Device fail	
205		221		237			Sensor status	
206		222		238			Measure alarm	
207		223		239			Device status	
208		224		240		TB	Device fail	
209		225		241			Sensor status	
210		226		242			Measure alarm	
211		227		243			Device status	
212		228		244		CL	Device fail	
213		229		245			Sensor status	
214		230		246			Measure alarm	
215		231		247			Device status	

● **Sensor error simulation (error)**

Address	Connection number	Address	Connection number	Address	Connection number		Name	Type
400	1-1	416	2-1	432	2-2	PH	Device fail	uint16 (bit fields)
401		417		433			Sensor status	
402		418		434			Measure alarm	
403		419		435			Device status	
404		420		436		SC	Device fail	
405		421		437			Sensor status	
406		422		438			Measure alarm	
407		423		439			Device status	
408		424		440		TB	Device fail	
409		425		441			Sensor status	
410		426		442			Measure alarm	
411		427		443			Device status	
412		428		444		CL	Device fail	
413		429		445			Sensor status	
414		430		446			Measure alarm	
415		431		447			Device status	

2.3.2 mA input settings (1700-)

Address	Parameter		Type	Value/description
1700	Type		uint16	None(0), Current(1), Temperature(2), pH(3), Conductivity(4)
1701, 1702	PH	4mA	float	-2~16
1703, 1704		20mA	float	-2~16
1705, 1706	Conductivity	4mA	float	0~1
1707, 1708		20mA	float	0~1
1709, 1710	Temperature	4mA	float	-40~260
1711, 1712		20mA	float	-40~260
1713, 1714	Damping time		float	0~3600
1715, 1716	AI upper limit		float	3.8~20.5 (Upper limit > Lower limit)
1717, 1718	AI lower limit		float	3.8~20.5 (Upper limit > Lower limit)

2.3.3 Contact input settings (1800-)

Address	Parameter		Type	Value/description
1800	Contact input1	Contact input Type	uint16	Disabled(0), Contact input Wash(1), Contact input Calibration(2), mA output range2 select(3), mA output range3 select(4)
1801		DI1 contact input Range2 select	uint16	mA1(1), mA2(2), mA3 (Ad)(3), mA4 (Ad)(4)
1802	Contact input2 (Ad)	Contact input Type	uint16	Disabled(0), Contact input Wash(1), Contact input Calibration(2), mA output range2 select(3), mA output range3 select(4)
1803		DI2 contact input Range2 select	uint16	mA1(1), mA2(2), mA3(3), mA4(4)

2.3.4   mA output settings (1000-)

Address				Parameter	Type	Value/description
mA1	**mA2**	**mA3(Ad)**	**mA4(Ad)**			
1000	1100	1200	1300	output mode	uint16	Output(0), Simulate(1), Off(2)
1001	—	—	—	Process parameter	uint16	Turbidity(1), Chlorine(2)
—	1101	1201	1301			Turbidity(1), Chlorine(2), temperature(3), pH(4), conductivity(5), AI(6)
1002	—	—	—	Process parameter slot	uint16	1-1(0), 2-1(4), 2-2(5)
—	1102	1202	1302			1-1(0), 2-1(4), 2-2(5), Converter(8)
1003	1103	1203	1303	Output line form	uint16	Linear(0), Polygonal line(1)
1004	—	—	—	range select setting	uint16	Manual range select(0), contact input select(1), auto 2 ranges select(2), auto 3 ranges select(3)
—	1104	1204	1304			Manual range select(0), contact input select(1)
1005	—	—	—	manual range select	uint16	range1(1), range2(2), range3(3)
—	1105	1205	1305			range1(1), range2(2)
1006,1007	1106,1107	1206,1207	1306,1307	range1 0%	float	arbitrary
1008,1009	1108,1109	1208,1209	1308,1309	range1 100%	float	arbitrary
1010,1011	1110,1111	1210,1211	1310,1311	range2 0%	float	arbitrary
1012,1013	1112,1113	1212,1213	1312,1313	range2 100%	float	arbitrary
1014,1015	—	—	—	range3 0%	float	
1016,1017	—	—	—	range3 100%	float	
1018,1019	1114,1115	1214,1215	1314,1315	range1 changeover %	float	
1020,1021	1116,1117	1216,1217	1316,1317	range1 changeover point value	float	
1022,1023	—	—	—	changeover point of auto range	float	
—	1118,1119	1218,1219	1318,1319	Reserved		
1024	1120	1220	1320	Burn	uint16	Off(0), Low(1), High(2)
1025,1026	1121,1122	1221,1222	1321,1322	damping time	float	0~3600
1027,1028	1123,1124	1223,1224	1323,1324	simulaion %	float	-11.25~112.5
1029	1125	1225	1325	last or fixed	uint16	Last(0), Fixed(1)
1030, 1031	1126, 1127	1226, 1227	1326, 1327	fixed value mA	float	2.2~22.0
1032	1128	1228	1328	Reserved		
1033	1129	1229	1329	auto hold during maintenance	uint16	Disabled(0), Enabled(1)

2.3.5 Contact output settings (1500-)

Address				Parameter	Type	Value/description
S1 (R)	**S2 (R)**	**S3 (R)**	**S4 (R)**			
1500	1550	—	—	function	uint16	off(0), alarm(1), maintenance(2), auto wash/cal status(4), mA range1(5), mA range2(6), mArange3(7), fail(8), simulate(9)
—	—	1600	—			off(0), alarm(1), maintenance(2), wash(3), auto wash/cal status(4), mA range1(5), mA range2(6), mA range3(7), fail(8), simulate(9)
—	—	—	1650			alarm(1), fail(8), simulate(9), Fail safe(10)
1501	1551	1601	1651	alarm process parameter	uint16	turbidity(1), chlorine(2), temperature(3), pH(4), conductivity(5)
1502	1552	1602	1652	alarm process parameter slot	uint16	1-1(0), 2-1(4), 2-2(5)
1503	1553	1603	1653	Reserved		
1504, 1505	1554, 1555	1604, 1605	1654, 1655	alarm setpoint	float	arbitrary
1506	1556	1606	1656	alarm direction	uint16	Low(0), High(1)
1507	1557	1607	1657	Reserved		
1508, 1509	1558, 1559	1608, 1609	1658, 1659	alarm hysteresys	float	arbitrary
1510, 1511	1560, 1561	1610, 1611	1660, 1661	alarm delay time	float	0~1800
1512	1562	1612	1662	fail process parameter	uint16	Hard + Soft Fail(0), Hard Fail only(1)
1513	1563	1613	1663	fail process parameter slot	uint16	1-1(0), 2-1(4), 2-2(5)
1514	1564	1614	1664	maintenance mA output corresponded to	uint16	mA1(0), mA2(1), mA3(2), mA4(3)
1515	1565	1615	1665	simulate	uint16	Off(0), On(1)

2.3.6 Display settings (3000-)

Address				Parameter	Type	Value/description
Display 1	**Display 2**	**Display 3**	**Display 4**			
3000	—	—	—	Process parameter slot	uint16	1-1(1), 2-1(5), 2-2(6), Converter(9)
—	3023	3046	3069			None(0), 1-1(1), 2-1(5), 2-2(6), Converter(9)
3001	—	—	—	1st line	uint16	turbidity(1), chlorine(2), temperature(3), pH(4), conductivity(5), AI(6)
—	3024	3047	3070			empty(0), turbidity(1), chlorine(2), temperature(3), pH(4), conductivity(5), AI(6)
3002	3025	3048	3071	2nd line	uint16	empty(0), turbidity(1), chlorine(2), temperature(3), pH(4), conductivity(5), AI(6)
3003	3026	3049	3072	TB/CL decimals on screen	uint16	no decimal place(0), 1 declmal place(1), 2 declmal place(2), 3 declmal place(3)
3004	3027	3050	3073	conductivity unit	uint16	Auto(0), nS(1), µS(2), mS(3), S(4), kS(5)
3005-3010	3028-3033	3051-3056	3074-3079	display name	ASCII	
3011-3016	3034-3039	3057-3062	3080-3085	add text 1	ASCII	
3017-3022	3040-3045	3063-3068	3086-3091	add text 2	ASCII	

2.3.7 Display settings Trend (3300-)

Address				Parameter	Type	Value/description
Trend 1	**Trend 2**	**Trend 3**	**Trend 4**			
3300	—	—	—	Process parameter	uint16	turbidity(1), chlorine(2), temperature(3), pH(4), conductivity(5), AI(6)
—	3306	3312	3318			empty(0), turbidity(1), chlorine(2), temperature(3), pH(4), conductivity(5), AI(6)
3301	—	—	—	Process parameter slot	uint16	sensor1-1(1), sensor2-1(5), sensor2-2(6), converter(9)
—	3307	3313	3319			none(0), sensor1-1(1), sensor2-1(5), sensor2-2(6), converter(9)
3302, 3303	3308, 3309	3314, 3315	3320, 3321	low limit	float	arbitrary
3304, 3305	3310, 3311	3316, 3317	3322, 3323	high limit	float	arbitrary
3348				X-axis timing	uint16	15 min.(0), 30 min.(1), 1 hour(2), 2 hours(3), 4 hours(4), 8 hours(5), 24 hours(6), 7 days(7), 14 days(8)

2.3.8 Display settings Others (3400-)

Address	Parameter		Type	Value/description
3400	auto return		uint16	Disable(0), 10 min.(1), 60 min.(2)
3401	brightness		uint16	10%(0), 20%(1), 30%(2), 40%(3), 50%(4), 60%(5), 70%(6), 80%(7), 90%(8), 100%(9)
3402	backlight saver		uint16	Disable(0), 10 min.(1), 30 min.(2), 60 min.(3)
3403	monitor display		uint16	Off(0), On(1)
3404	backlight flash	backlight flash	uint16	Off(0), On(1)
3405		backlight flash behavior	uint16	Once (5sec)(0), Continue forever(1)
3406	alarm notification screen flash		uint16	Off(0), On(1)
3407	measurement value during auto wash/cal		uint16	non-hold(0), hold(1)

2.3.9 Advanced settings MODBUS setting (2100-)

Address	Parameter		Type	Value/description
2100	RS485 setting (RS)	MODBUS address	uint16	1~247
2101		Baud rate	uint16	9600(0), 38400(1), 115200(2)
2102		Parity	uint16	Even(0), Odd(1), None(2)
2103	Sensor Address setting (S)	Address CH1-1	uint16	1~247
2104		Address CH2-1		1~248
2105		Address CH2-2		

2.3.10 Advanced settings Ethernet setting (2200-)

Address	Parameter	Type	Value/description
2200	DHCP enable	uint16	Off(0), On(1)
2201, 2202	IP Address	uint32	
2203, 2204	Subnet mask	uint32	
2205, 2206	Default gateway	uint32	

CAUTION

Ethernet setting is reflected onto the system, after FLXA402T reboots.

2.3.11 Advanced settings Others setting (4000-)

Address	Parameter	Type	Value/description
4000	Temperature	uint16	°C(0), °F(1)
4001	Date format	uint16	YYYY/MM/DD(0), MM/DD/YYYY(1), DD/MM/YYYY(2)

2.3.12 MODBUS native (4200-)

Address	Parameter	Type	Value/description
4200-4205	cancel MODBUS password	ASCII	MODBUS password function " " (space x12)
4300-4305	set MODBUS password	ASCII	MODBUS password function "************" (*×12)
5000-5199	User note	ASCII	free space
10000, 10001	mA1 simulate	float	Simulate of mA output mA1 to mA4 from MODBUS master, normally 0.0
10002, 10003	mA2 simulate	float	When entering value at 2.2-22.0[mA] , the value switches to simulate ouput as below.
10004, 10005	mA3 simulate	float	0: mA1, 1: mA2, 2: mA3, 4: mA4 This register returns to "0" when the power turns off.
10006, 10007	mA4 simulate	float	
10008	Contact output simulate (MODE)	uint16 (bit fields)	MODE: set contact output to simulate by the bit 1: Simulate ON, 0: Simulate Off VALUE: set contact status to simulate by the bit 1: ON, 0: OFF bit0: S1, bit1: S2, bit2: S3, bit3: S4, bit4-7: Reserved This register returns to "0" when the power turns off.
10009	Contact output simulate		

2.3.13 Sensor operation (4500-)

Address	Parameter	Type	Value/description
4500	wash box control	bit fields	TB: SV1(bit0), SV2(bit1), SV3(bit2), SV4(bit3), wiper(bit4) RC: Liquid flow pump(bit0), SV1(bit1), SV3(bit2), SV4(bit3), SV5(bit4), SV6(bit5), SV7(bit6), air pump(bit7) FC: S3(bit0)
4501	ME rotating1-1	uint16	Off(0), On(1)
4502	ME rotating2-1	uint16	Off(0), On(1)
4503	ME rotating2-2	uint16	Off(0), On(1)
4504	ultrasonic wash 1-1	uint16	Off(0), On(1)
4505	ultrasonic wash 2-1	uint16	Off(0), On(1)
4506	ultrasonic wash 2-2	uint16	Off(0), On(1)
4507	light source 1-1	uint16	Off(0), On(1)
4508	light source 2-1	uint16	Off(0), On(1)
4509	light source 2-2	uint16	Off(0), On(1)

2.3.14   Auto wash/calibration setting (1900-)

Address	Parameter		Type	Value/description
1900	Auto sequence for wash/cal		uint16	Disable(0), Enable(1)
1901	First start year		uint16	the number of years since 2000
1902	First start month		uint16	the number of month(1 - 12)
1903	First start day		uint16	the number of days(1 - 31)
1904	First start hour		uint16	the number of hours(0 - 23)
1905	First start minute		uint16	the number of minutes(0 - 59)
1906	Auto update of start date		uint16	Disable(0), Enable(1)
1907	TB setting	Auto wash function	uint16	Disable(0), Enable(1)
1908		Wash type	uint16	Water flow(0), Water flow and wiper(1)
1909		Auto calibration function	uint16	Disable(0), Enable(1)
1910,1911		Washing interval	float	(hours)
1912		Repeat count of wash	uint16	(times)
1913		Calibration frequency	uint16	(times)
1914		Drainage time	uint16	(seconds)
1915		Washing time	uint16	(seconds)
1916		Wiper driving time	uint16	(seconds)
1917		Flow waiting time	uint16	(seconds)
1918		Recovery time	uint16	(seconds)
1919	CL setting	Auto detector wash function	uint16	Disable(0), Enable(1)
1920		Auto sand filter wash function	uint16	Disable(0), Enable(1)
1921		Auto calibration function	uint16	Disable(0), Enable(1)
1922,1923		Washing interval	float	(hours)
1924,1925		Calibration interval	float	(days)
1926,1927		Washing time for detector	float	(minutes)
1928,1929		Washing time for sand filter	float	(minutes)
1930,1931		Recovery time after wash	float	(minutes)
1932,1933		Washing interval for double sand filter	float	(hours)
1934,1935		Replacing time for double sand filter	float	(minutes)
1936,1937		Cross time for double sand filter	float	(minutes)
1938		Waiting time for calibration	uint16	(minutes)
1939		Recovery time after calibration	uint16	(minutes)

2.4   Identification

object id	object name	Type	Value/description
0x00	vendor_name	ASCII	YOKOGAWA
0x01	product_code		FLXA402T
0x02	major_minor_version		create from software revision (e.g. 01-01.01)

object id	object name	Type	Value/description
0x03	vendor_url	ASCII	space(64)
0x04	product_name		space(16)
0x05	model_name		space(8)
0x06	user_app_name		space(16)

object id	object name	Type	Value/description
0x80	SERIAL_NUMBER	ASCII[12]	Serial No.
0x81	INTERNAL_SERIAL_NO_HOUSING	ASCII[16]	Internal Serial No. (Housing)
0x82	INTERNAL_SERIAL_NO_AO_MODULE	ASCII[12]	Internal Serial No. (I/O module)
0x83	INTERNAL_SERIAL_NO_COMM_E	ASCII[12]	Internal Serial No. (Communication module)
0x84	MS_CODE	ASCII[128]	Model code
0x85	SENSOR_INTERNAL_SERIAL_NO_CH1_1	ASCII[12]	Sensor Serial No.(Internal Serial No.)
0x86	SENSOR_INTERNAL_SERIAL_NO_CH2_1	ASCII[12]	
0x87	SENSOR_INTERNAL_SERIAL_NO_CH2_2	ASCII[12]	
0x88	HARDWARE_DEVICES	word	2byte, bit assign (AIO_MODULE to MAINT_BOARD_ETHERNET)
0x89	SOFTWARE_REVISION	ASCII[12]	Software revision
0x8A	SERIAL_PROFILE_RS485	ASCII[32]	9600 even 1 stop
0x8B	SERIAL_PROFILE_BLUETOOTH	ASCII[32]	115200 even 1 stop
0x8C	SERIAL_PROFILE_SLOT1	ASCII[32]	9600 even 1 stop
0x8D	SERIAL_PROFILE_SLOT2	ASCII[32]	9600 even 1 stop
0x8E	INPUT_REG_UPDATE_CYCLE	UINT32	500
0x8F	INPUT_REG_RES_TIME	UINT32	10
0x90	HOLD_REG_RES_TIME	UINT32	100
0x91	NEXT_REQ_WAIT_TIME	UINT32	30
0x92	MODBUS_ADDR	UINT16	MODBUS address
0x93	DHCP_ENABLE	ENUM	Ethernet setting
0x94	IP_ADDR	ASCII[16]	
0x95	SUBNET_MASK	ASCII[16]	
0x96	DEFAULT_GATEWAY	ASCII[16]	
0x97	MAC_ADDR	ASCII[32]	
0x98	BLUETOOTH_DEVICE_NAME_FULL	ASCII[32]	Bluetooth device name

Hardware structure

bit	Name	Description
0	Bluetooth yes/no	0b: yes, 1b: no
1, 2	digital network type	00b: none, 01b: Modbus RTU(RS485), 10b: Modbus TCP/IP
3-5	sensor type of Sensor1	000b: none, 001b: SENCOM SA, 010b: digital sensor, 011b: analog sensor
6-8	sensor type of Sensor2	000b: none, 001b: SENCOM SA, 010b: digital sensor, 011b: analog sensor
9	relay board yes/no	0b: no, 1b: yes
10, 11	mA output/input	01b: -A2, 10b: -A4
15	country	0b: other than Japan, 1b: Japan

3.   Alarm

For further information on "Error settings" see 4.7 in the User's Manual IM 12A01G03-01EN.
Alarm numbers start with XY as shown below.

X		Y	
1	Address CH1-1	0	Housing
5	Address CH2-1	1	PH
6	Address CH2-2	2	SC
		5	TB
		6	CL

3.1   Alarm list (Converter)

Alarm	bit	Alarm name	Alarm Number	default*1	Note
Measurement alarm	31	Hardware failure	0001	(F)	
	30	Internal com. erro	0002	(F)	
	29	IO mod. param. read error	0003	(F)	
	28	Com. mod. param. read err	0004	(F)	
	27	CPU param. read error	0005	(F)	
	26	System configuration failure	0006	(F)	
I/O alarm	31	mA output burn low 1	0030	(N)	*2
	30	mA output burn low 2	0031	(N)	*2
	29	mA output burn low 3	0032	(N)	*2
	28	mA output burn low 4	0033	(N)	*2
	27	mA output burn high 1	0034	(N)	*2
	26	mA output burn high 2	0035	(N)	*2
	25	mA output burn high 3	0036	(N)	*2
	24	mA output burn high 4	0037	(N)	*2
	23	mA output saturation 1	0038	(S)	
	22	mA output saturation 2	0039	(S)	
	21	mA output saturation 3	003A	(S)	
	20	mA output saturation 4	003B	(S)	
	15	AI exceed upper limit	0040	(S)	
	14	AI exceed lower limit	0041	(S)	
	13	AI out of range	0042	(F)	
	7	Fail safe occur	0047	F	

Alarm	bit	Alarm name	Alarm Number	default*1	Note
Maintenance Status	31	Simulated mA value 1	0070	(C)	
	30	Simulated mA value 2	0071	(C)	
	29	Simulated mA value 3	0072	(C)	
	28	Simulated mA value 4	0073	(C)	
	27	Outputs in HOLD 1	0074	N	
	26	Outputs in HOLD 2	0075	N	
	25	Outputs in HOLD 3	0076	N	
	24	Outputs in HOLD 4	0077	N	
	23	mA1 Output Maintenance status	0080	N	
	22	mA2 Output Maintenance status	0081	N	
	21	mA3 Output Maintenance status	0082	N	
	20	mA4 Output Maintenance status	0083	N	
	15	Simulated contact value 1	007C	C	
	14	Simulated contact value 2	007D	C	
	13	Simulated contact value 3	007E	C	
	12	Simulated contact value 4	007F	C	
	7	Detector/Sensor 1-1 Maintenance mode	0084	(N)	*2
	5	Detector/Sensor 2-1 Maintenance mode	0086	(N)	*2
	4	Detector/Sensor 2-2 Maintenance mode	0087	(N)	*2
Setting alarm	31	mA configuration error 1	0090	F	
	30	mA configuration error 2	0091	F	
	29	mA configuration error 3	0092	F	
	28	mA configuration error 4	0093	F	
	19	Display1 setting error	00A0	C	
	18	Display2 setting error	00A1	C	
	17	Display3 setting error	00A2	C	
	16	Display4 setting error	00A3	C	
	7	Auto wash/cal. setting error	009E	C	
	6	Auto start date error	009F	C	
	5	Contact config. error 1	0098	F	
	4	Contact config. error 2	0099	F	
	3	Contact config. error 3	009A	F	
	2	Contact config. error 4	009B	F	
	1	AI configuration error	009C	(C)	
	0	DI configuration error	009D	(C)	

*1:   F: Failure, C: Function Check, S: Out of Specification, M: Maintenance required, N: Off
        The default in ( ) (parentheses) are fixed, not settable.
*2:   These errors are not displayed on the converter HMI.

3.2 Alarm list (TB)

Alarm	bit	Alarm name	Alarm Number	default*1	Note
Device fail	15	EEPROM error	X500	(F)	
	14	User param. read error	X501	(F)	
	13	Factory param. read error	X502	(F)	
	12	AD converter failure	X503	(F)	
	11	RAM failure	X504	(F)	
	10	Flash Memory failure	X505	(F)	
Sensor status	15	Wash/Calibration box error	X520	(S)	
	14	Humidity sensor failure	X521	S	
	13	Heater failure	X522	(S)	
Measure alarm	15	Turbidity High	X540	S	
	14	Turbidity Low	X541	S	
	13	Light detection error	X542	S	
	12	Light source failure	X543	S	
	1	Auto Zero calibration result error	X54E	S	
	0	Auto Calibration Unstable	X54F	S	
Device status	10	SENCOM comm. error	X50A	F	

*1: F: Failure, C: Function Check, S: Out of Specification, M: Maintenance required, N: Off
The numbers in ( ) (parentheses) are fixed, not settable.

3.3 Alarm list (CL)

Alarm	bit	Alarm name	Alarm Number	default*1	Note
Device fail	15	EEPROM error	X600	(F)	
	14	User param. read error	X601	(F)	
	13	Factory param. read error	X602	(F)	
	12	AD converter failure	X603	(F)	
	11	RAM failure	X604	(F)	
	10	Flash Memory failure	X605	(F)	
	7	Temperature sensor failure	X608	(F)	
	6	Motor driver failure	X609	(F)	
Sensor status	15	Wash/Calibration box error	X620	(S)	
Measure alarm	15	Chlorine High	X640	S	
	14	Chlorine Low	X641	S	
	13	Temperature too high	X642	S	
	12	Temperature too low	X643	S	
	11	Temperature compensation range over	X644	S	
	10	pH compensation range over	X645	S	
	8	Measured current range over	X647	(S)	
	7	Applied voltage error	X648	(S)	
	6	Empty cell detection	X649	S	
	5	Motor driver high temp	X64A	(S)	
	4	ME rotating stop	X64B	S	
	1	Auto Zero calibration result error	X64E	S	
	0	Auto Calibration Unstable	X64F	S	
Device status	10	Sensor communication error	X60A	F	

*1: F: Failure, C: Function Check, S: Out of Specification, M: Maintenance required, N: Off
The numbers in ( ) (parentheses) are fixed, not settable.

3.4 Alarm list (PH)

Alarm	bit	Alarm name	Alarm Number	default*1	Note
Device fail	15	EEPROM error	XY00	(F)	
	14	User param. read error	XY01	(F)	
	13	Err on: Factory param. Error	XY02	(F)	
	12	Sensor mod. not working	XY03	(F)	
	10	ID chip data param. read err	XY05	(F)	*2
	9	Temp. resistance too high	XY4F	(F)	
	8	Temp. resistance too low	XY50	(F)	
	7	Input voltage pH too high	XY51	(F)	
	6	Input voltage pH too low	XY52	(F)	
	5	Input volt. ORP1 too high	XY53	(F)	
	4	Input volt. ORP1 too Low	XY54	(F)	
	3	Input volt. ORP2 too high	XY55	(F)	
	2	Input volt. ORP2 too Low	XY56	(F)	
	0	SSA temp out. Design spec	XY06	(F)	*2 *3
Sensor status	15	Sensor not detect	XY0B	F	*2
	14	Temp element not detect	XY0C	F	*2
	13	ID chip failure	XY08	F	*2*4
	12	LE not detect	XY58	F	*2
	11	Calib. time exceeded	XY09	N	
	9	imp1 glasbreak detect	XY59	F	*2
	8	imp2 glasbreak detect	XY5A	F	*2
Measure alarm	15	Temperature too high	XY40	S	
	14	Temperature too low	XY41	S	
	13	pH too high	XY42	S	
	12	pH too low	XY43	S	
	6	Impedance 1 too high	XY49	M	
	5	Impedance 1 too low	XY4A	M	
	3	Impedance 2 too high	XY4B	M	
	2	Impedance 2 too low	XY4C	N	
	0	SSA temp outside spec	XY07	S	*2
Device status	10	SENCOM comm. error	XY0A	F	*2

*1:   F: Failure, C: Function Check, S: Out of Specification, M: Maintenance required, N: Off
       The numbers in ( ) (parentheses) are fixed, not settable.
*2:   This alarm occurs only when SENCOM SA is used.
*3:   This alarm occurs when temperature measurements exceed specification limit.
*4   When sensor is not connected to SENCOM SA tightly enough, "ID chip failure" may occur.

3.5   Alarm list (SC)

Alarm	bit	Alarm name	Alarm Number	default*1	Note
Device fail	15	EEPROM error	XY00	(F)	
	14	User param. read error	XY01	(F)	
	13	Err on: Factory param. Error	XY02	(F)	
	12	Sensor mod. not working	XY03	(F)	
	10	ID chip data param. read err	XY05	(F)	*2
	9	Temp. resistance too high	XY4F	(F)	
	8	Temp. resistance too low	XY50	(F)	
	7	Input resistance too high	XY51	(F)	
	6	Input resistance too low	XY52	(F)	
	0	SSA temp out. Design spec	XY06	(F)	*2 *3
Sensor status	15	Sensor not detect	XY0B	F	*2
	14	Temp element not detect	XY0C	F	*2
	13	ID chip failure	XY08	F	*2 *5
	11	Calib. time exceeded	XY09	N	
Measure alarm	15	Temperature too high	XY40	S	
	14	Temperature too low	XY41	S	
	13	Conductivity too high	XY42	S	
	12	Conductivity too low	XY43	S	
	11	Temp comp1 warning	XY44	S	
	7	Measurement unstable	XY49	(F)	*4
	6	Polarization detect	XY4A	N	
	0	SSA temp outside spec	XY07	S	*2
Device status	10	SENCOM comm. error	XY0A	F	*2

*1:   F: Failure, C: Function Check, S: Out of Specification, M: Maintenance required, N: Off
       The numbers in ( ) (parentheses) are fixed, not settable.
*2:   This alarm occurs only when SENCOM SA is used.
*3:   This alarm occurs when temperature measurements exceed specification limit.
*4:   This alarm occurs in the failure but only when analog sensor module is installed.
*5:   When sensor is not connected to SENCOM SA tightly enough, "ID chip failure" may occur.

Revision Information