1SFC170017M0201 EN, REV C

Arc Guard System™ – TVOC-2-COM

Modbus configuration manual

Read this first
Warning and safety

Thank you for selecting this ABB TVOC-2 Arc Guard System™. Carefully read and make sure that you understand all instructions before you mount, connect, configure the Arc Guard System.

This manual is intended for configuration of the TVOC-2-COM Modbus interface.

The manual is available on:

http://new.abb.com/low-voltage/products/arc-guard

- Only authorized and appropriately trained personnel are allowed to install and make the electrical connection of the Arc Guard System in accordance with existing laws and regulations.
- Only authorized personnel are allowed to do service and repair on the Arc Guard System.
- Unauthorized repair will effect the warranty.
- This manual is a part of the TVOC-2 Arc Guard System. Always keep this manual available when working with the TVOC-2 Arc Guard System.
- Examine the Arc Guard System and the package when you unpack your new product. If there are damages, please contact the transportation company or the ABB reseller/office immediately.

Safety notes

In this user manual, these symbols are used:

WARNING

General warning symbol indicates the presence of a hazard which could result in personal injury and damage to equipment or property.

WARNING

Warning symbol indicates the presence of hazardous voltage which could result in personal injury.

INFORMATION

Information sign alerts the reader to relevant facts and conditions.

Modifications to data in this manual can be applied without notice.

General safety information

WARNING

Only authorized and appropriately trained personnel are allowed to install and make the electrical connection of the Arc Guard System in accordance with existing laws and regulations.

WARNING

Examine the Arc Guard System and the package when you unpack your new product. If there are damages, please contact the transportation company or the ABB reseller/office immediately.

WARNING

Only authorized and appropriately trained service personnel are allowed to do service and repair on the Arc Guard System. Note: unauthorized repair will effect the warranty.

Personal

Service and repair should be performed by authorized personnel only. Note that unauthorized repair affects safety and warranty.

Arc Guard System™ TVOC-2-COM Modbus

Configuration manual

1 General information

1.1 Introduction

This manual covers the Modbus interface, which offers a direct connection to Modbus-RTU for the Arc Guard System™ TVOC-2.

TVOC-2-COM will behave as a slave. This means all communication will be performed by a master device on the same Modbus system. Mostly this will be a PLC. This manual explains how to install the Arc Guard System™ TVOC-2-COM to your Modbus system.

1.2 References

[1] http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf (2012)

[2] http://www.modbus.org/docs/Modbus_over_serial_line_V1_02.pdf (2006)

[3] https://www.modbusdriver.com/modpoll.html

1.3 Quick start-up

❶ Make sure your Modbus master has been installed to the system.

❷ The TVOC-2-COM will be delivered with the following configuration:

- baud rate 19200
- parity even
- stop bits 1
- Modbus ID 248*

*Modbus ID 248 is not a valid id for a Modbus system but is used to indicate that the communication is disabled.

❸ Physically connect the system to the Modbus network.

❹ Test communication between your master and the TVOC-2 system. For example see chapter 5 Troubleshooting.

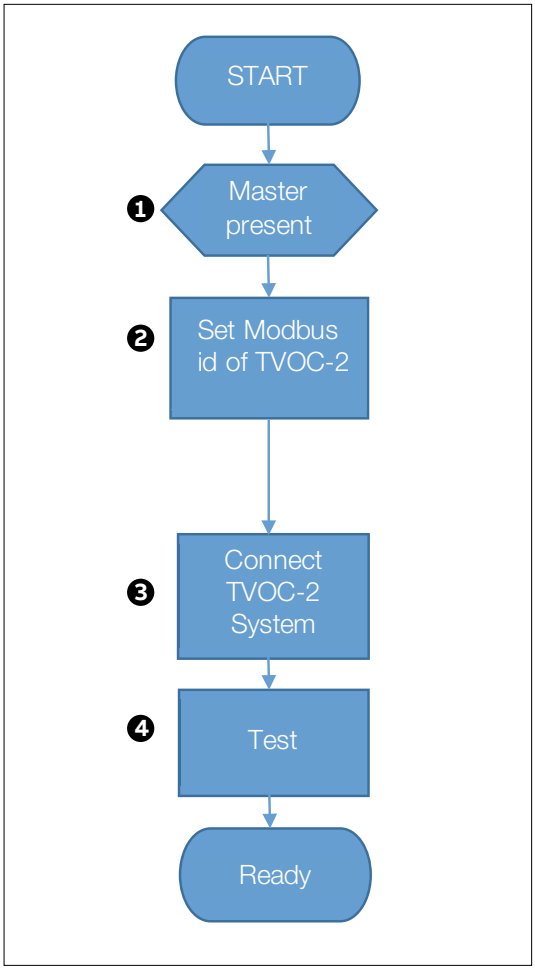

Figure 1
Quick start-up

2 Modbus installation

2.1 General

Modbus/RTU is a 2-wire, RS485-based field bus communication system for parameter value exchange.

INFORMATION

The implementation of the Modbus interface is based on standards [1] and [2].

2.2 Modbus connector

The supplied Modbus connector has the following pin configuration:

Table 1 Modbus Connector

Terminal	EIA/TIA-485 name	ITr/IDv	Description
+(B)	B/B'	D1	Transceiver terminal 1 Terminator 1 input*
-(A)	A/A'	D0	Transceiver terminal 0 Terminator 2 input*
DGND	C/C'	Common	Signal common

* If the device is connected as first or last device in a multi-drop system, a 120Ω terminator resistor should be installed between terminator inputs (A) and (B).

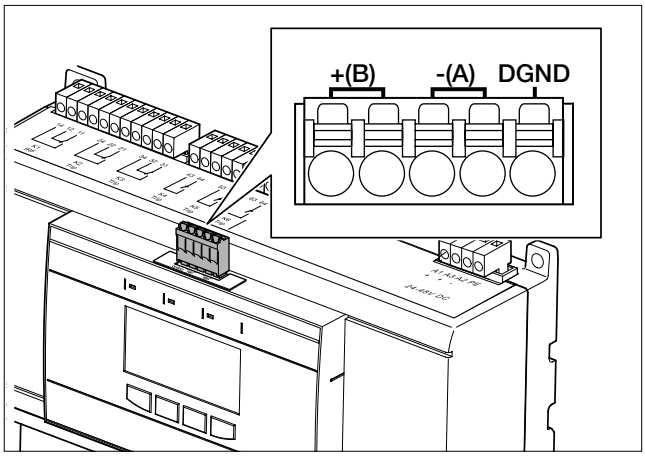

Figure 2
Modbus connector

2.3 Modbus cables

Recommended cable: Belden 3105A (AWG22).

2.4 Termination

For best quality of data transfer, Modbus should be terminated correctly.

The following figure shows Modbus installation according to [3].

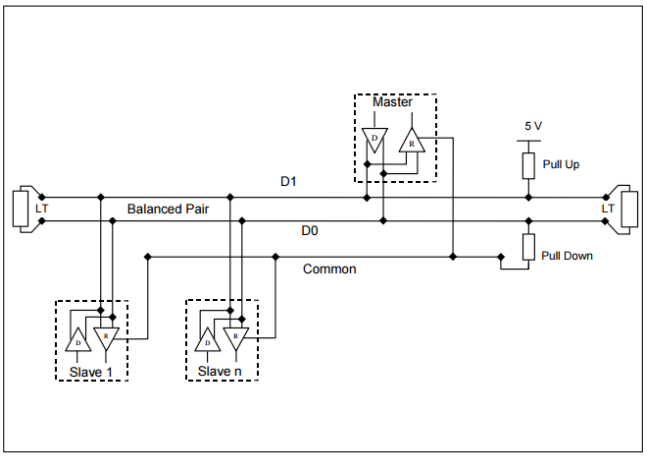

Figure 3
General 2-Wire Topology

2.4.1 Termination resistors

A 120Ω resistor is added in parallel with TVOC-2 System connection if it is installed as first or last device on the network. For this purpose there are double terminals for +(B) and -(A) connections.

2.4.2 Pull-up / pull-down resistors

When the Modbus network is not being actively driven by a device, the bus line is in an undefined state. Bias resistors should then be used to obtain a defined voltage potential on the data lines. The bias resistors act for data line B (D1) as pull-up resistors against 5V and for data line A (D0) as pull-down resistors against GND. This is illustrated in Figure 20 in [2].

The following devices usually have built-in bias resistors:

- Modbus masters
- Gateways
- Repeaters

3 Changing Modbus ID and communication parameters

3.1 Changing Modbus ID and communication parameters

On delivery the default parameters are:

- Modbus ID 248
- Baud rate 19200
- Parity even
- Data bits 8
- Stop bits 1

The parameters should be changed to fit the existing network.

3.2 Configuration via HMI

Use the HMI to navigate to menu 3.4 Modbus

Select appropriate submenu to change configuration.

Note: The Modbus ID must be changed to enable communication. The default ID of 248 only indicates that the Modbus communication is disabled. It is not a valid ID in a Modbus network. Valid ID range is 1-247.

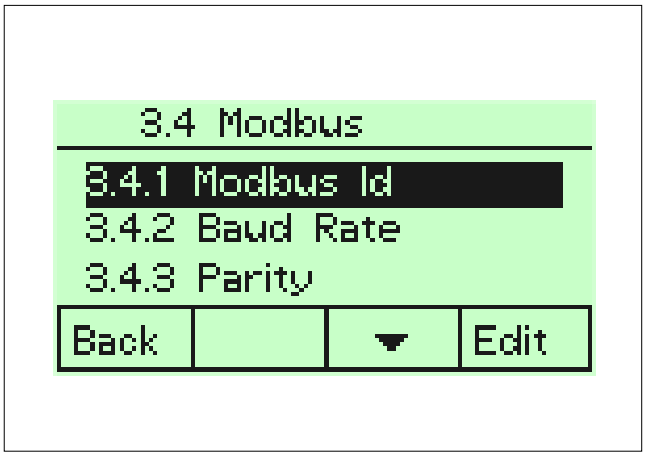

Figure 4
Menu 3.4 Modbus

4 Functional description

4.1 Functional description

The information found here is the basic information needed for the installation of a Modbus system.

4.2 Implementation class

The physical and data link layer are implemented conforming to the “basic slave” implementation class as described in document [2] “MODBUS over Serial Line specification and implementation guide V1.02”.

The following options have been implemented:

Table 2 Modbus Parameters

General settings		
Parameter	**Options**	**Remarks**
Addressing	address configurable 1-248 (default 248)	When set to 248, the communication is disabled.
Baud rate	9600 19200 (default) 38400 57600	
Parity	none even (default) odd	
Data bits	8	Not configurable.
Stop bits	1 (default) 1.5 2	The use of no parity requires 2 stop bits.
Electrical interface	RS485 2W cabling	

4.3 Supported Modbus functions

This section describes the supported Modbus function codes.

4.3.1 Read Registers (03, 04)

Both function 03, Read Holding Registers and function 04, Read Input Registers, can be used. The addresses are the same.

Table 3 Read Exceptions

Possible exception responses		
Code	**Name**	**Meaning**
02	ILLEGAL_DATA_ADDRESS	Address refers to a register that is not available or not readable.

4.3.2 Write Registers (06, 16)

Functions 06, Write Single Register and function 16, Write Multiple Registers, are supported.

Table 4 Write Exceptions

Possible exception responses		
Code	**Name**	**Meaning**
02	ILLEGAL_DATA_ADDRESS	Address refers to a register that is not available or not readable.
03	ILLEGAL_DATA_VALUE	The value written is not permitted for this register.

4.3.3 Available registers

Modbus registers are numbered from 1 to 65536.
In a Modbus PDU (Protocol Data Unit) these registers are addressed from 0 to 65535.

The following table lists the available parameters. More details about the data format can be found in 4.4 Register data format below.

Modbus registers

Parameter name	**Access**	**PDU Address**		**Register Number**		**Remark**
		Hex	**Dec**	**Hex**	**Dec**	
Trip 1 detector, low	R	0x0064	100	0x0065	101	X1:1 – X2:5
Trip 1 detector, low	R	0x0064	100	0x0065	101	X1:1 – X2:5
Trip 1 detector, high	R	0x0065	101	0x0066	102	X2:6 – X3:10
Trip 1 relay	R	0x0066	102	0x0067	103	K4 (LSb), K5, K6
Trip 1 date	R	0x0067	103	0x0068	104	Days since January 1, 1970
Trip 1 time HHMM	R	0x0068	104	0x0069	105	MSB = hours, LSB = minutes
Trip 1 time SS	R	0x0069	105	0x006A	106	
Trip 2 detector, low	R	0x006B	107	0x006C	108	X1:1 – X2:5
Trip 2 detector, high	R	0x006C	108	0x006D	109	X2:6 – X3:10
Trip 2 relay	R	0x006D	109	0x006E	110	K4 (LSb), K5, K6
Trip 2 date	R	0x006E	110	0x006F	111	Days since January 1, 1970
Trip 2 time HHMM	R	0x006F	111	0x0070	112	MSB = hours, LSB = minutes
Trip 2 time SS	R	0x0070	112	0x0071	113	
Trip 3 detector, low	R	0x0072	114	0x0073	115	X1:1 – X2:5
Trip 3 detector, high	R	0x0073	115	0x0074	116	X2:6 – X3:10
Trip 3 relay	R	0x0074	116	0x0075	117	K4 (LSb), K5, K6
Trip 3 date	R	0x0075	117	0x0076	118	Days since January 1, 1970
Trip 3 time HHMM	R	0x0076	118	0x0077	119	MSB = hours, LSB = minutes
Trip 3 time SS	R	0x0077	119	0x0078	120	
Trip 4 detector, low	R	0x0079	121	0x007A	122	X1:1 – X2:5
Trip 4 detector, high	R	0x007A	122	0x007B	123	X2:6 – X3:10
Trip 4 relay	R	0x007B	123	0x007C	124	K4 (LSb), K5, K6
Trip 4 date	R	0x007C	124	0x007D	125	Days since January 1, 1970
Trip 4 time HHMM	R	0x007D	125	0x007E	126	MSB = hours, LSB = minutes
Trip 4 time SS	R	0x007E	126	0x007F	127	
Trip 5 detector, low	R	0x0080	128	0x0081	129	X1:1 – X2:5
Trip 5 detector, high	R	0x0081	129	0x0082	130	X2:6 – X3:10
Trip 5 relay	R	0x0082	130	0x0083	131	K4 (LSb), K5, K6
Trip 5 date	R	0x0083	131	0x0084	132	Days since January 1, 1970
Trip 5 time HHMM	R	0x0084	132	0x0085	133	MSB = hours, LSB = minutes
Trip 5 time SS	R	0x0085	133	0x0086	134	
Trip 6 detector, low	R	0x0087	135	0x0088	136	X1:1 – X2:5
Trip 6 detector, high	R	0x0088	136	0x0089	137	X2:6 – X3:10

Modbus registers

Parameter name	Access	PDU Address		Register Number		Remark
		Hex	Dec	Hex	Dec	
Trip 6 relay	R	0x0089	137	0x008A	138	K4 (LSb), K5, K6
Trip 6 date	R	0x008A	138	0x008B	139	Days since January 1, 1970
Trip 6 time HHMM	R	0x008B	139	0x008C	140	MSB = hours, LSB = minutes
Trip 6 time SS	R	0x008C	140	0x008D	141	
Trip 7 detector, low	R	0x008E	142	0x008F	143	X1:1 – X2:5
Trip 7 detector, high	R	0x008F	143	0x0090	144	X2:6 – X3:10
Trip 7 relay	R	0x0090	144	0x0091	145	K4 (LSb), K5, K6
Trip 7 date	R	0x0091	145	0x0092	146	Days since January 1, 1970
Trip 7 time HHMM	R	0x0092	146	0x0093	147	MSB = hours, LSB = minutes
Trip 7 time SS	R	0x0093	147	0x0094	148	
Number of trips	R	0x0095	149	0x0096	150	Number of trips in trip log
Diagnostics error date	R	0x00C8	200	0x00C9	201	Days since January 1, 1970
Diagnostics error time HHMM	R	0x00C9	201	0x00CA	202	MSB = hours, LSB = minutes
Diagnostics error time SS	R	0x00CA	202	0x00CB	203	
Diagnostics error DTC,						
number 2 and 1	R	0x00CB	203	0x00CC	204	
Diagnostics error DTC,						
number 4 and 3	R	0x00CC	204	0x00CD	205	
Diagnostics error DTC,						
number 6 and 5	R	0x00CD	205	0x00CE	206	
Diagnostics trip	R	0x00CE	206	0x00CF	207	
Diagnostics trip date	R	0x00CF	207	0x00D0	208	
Diagnostics trip time HHMM	R	0x00D0	208	0x00D1	209	MSB = hours, LSB = minutes
Diagnostics trip time SS	R	0x00D1	209	0x00D2	210	
Diagnostics trip detector low	R	0x00D2	210	0x00D3	211	X1:1 – X2:5
Diagnostics trip detector high	R	0x00D3	211	0x00D4	212	X2:6 – X3:10
Diagnostics trip relay	R	0x00D4	212	0x00D5	213	
Perform diagnostics	W	0x00D5	213	0x00D6	214	1 = perform diagnostics,
0 = no-operation						
Last performed diagnostics date	R	0x00DC	220	0x00DD	221	
Last performed diagnostics time	R	0x00DD	221	0x00DE	222	
Error 1 date	R	0x012C	300	0x012D	301	Days since January 1, 1970
Error 1 time HHMM	R	0x012D	301	0x012E	302	
Error 1 time SS	R	0x012E	302	0x012F	303	
Error 1 DTC, number 2 and 1	R	0x012F	303	0x0130	304	
Error 1 DTC, number 4 and 3	R	0x0130	304	0x0131	305	
Error 1 DTC, number 6 and 5	R	0x0131	305	0x0132	306	
Error 2 date	R	0x0133	307	0x0134	308	Days since January 1, 1970
Error 2 time HHMM	R	0x0134	308	0x0135	309	
Error 2 time SS	R	0x0135	309	0x0136	310	
Error 2 DTC, number 2 and 1	R	0x0136	310	0x0137	311	
Error 2 DTC, number 4 and 3	R	0x0137	311	0x0138	312	
Error 2 DTC, number 6 and 5	R	0x0138	312	0x0139	313	
Error 3 date	R	0x013A	314	0x013B	315	Days since January 1, 1970
Error 3 time HHMM	R	0x013B	315	0x013C	316	
Error 3 time SS	R	0x013C	316	0x013D	317	
Error 3 DTC, number 2 and 1	R	0x013D	317	0x013E	318	
Error 3 DTC, number 4 and 3	R	0x013E	318	0x013F	319	
Error 3 DTC, number 6 and 5	R	0x013F	319	0x0140	320	
Error 4 date	R	0x0141	321	0x0142	322	Days since January 1, 1970
Error 4 time HHMM	R	0x0142	322	0x0143	323	
Error 4 time SS	R	0x0143	323	0x0144	324	

Modbus registers

Parameter name	Access	PDU Address		Register Number		Remark
		Hex	Dec	Hex	Dec	
Error 4 DTC, number 2 and 1	R	0x0144	324	0x0145	325	
Error 4 DTC, number 4 and 3	R	0x0145	325	0x0146	326	
Error 4 DTC, number 6 and 5	R	0x0146	326	0x0147	327	
Error 5 date	R	0x0148	328	0x0149	329	Days since January 1, 1970
Error 5 time HHMM	R	0x0149	329	0x014A	330	
Error 5 time SS	R	0x014A	330	0x014B	331	
Error 5 DTC, number 2 and 1	R	0x014B	331	0x014C	332	
Error 5 DTC, number 4 and 3	R	0x014C	332	0x014D	333	
Error 5 DTC, number 6 and 5	R	0x014D	333	0x014E	334	
Error 6 date	R	0x014F	335	0x0150	336	Days since January 1, 1970
Error 6 time HHMM	R	0x0150	336	0x0151	337	
Error 6 time SS	R	0x0151	337	0x0152	338	
Error 6 DTC, number 2 and 1	R	0x0152	338	0x0153	339	
Error 6 DTC, number 4 and 3	R	0x0153	339	0x0154	340	
Error 6 DTC, number 6 and 5	R	0x0154	340	0x0155	341	
Error 7 date	R	0x0156	342	0x0157	343	Days since January 1, 1970
Error 7 time HHMM	R	0x0157	343	0x0158	344	
Error 7 time SS	R	0x0158	344	0x0159	345	
Error 7 DTC, number 2 and 1	R	0x0159	345	0x015A	346	
Error 7 DTC, number 4 and 3	R	0x015A	346	0x015B	347	
Error 7 DTC, number 6 and 5	R	0x015B	347	0x015C	348	
Error 8 date	R	0x015D	349	0x015E	350	Days since January 1, 1970
Error 8 time HHMM	R	0x015E	350	0x015F	351	
Error 8 time SS	R	0x015F	351	0x0160	352	
Error 8 DTC, number 2 and 1	R	0x0160	352	0x0161	353	
Error 8 DTC, number 4 and 3	R	0x0161	353	0x0162	354	
Error 8 DTC, number 6 and 5	R	0x0162	354	0x0163	355	
Error 9 date	R	0x0164	356	0x0165	357	Days since January 1, 1970
Error 9 time HHMM	R	0x0165	357	0x0166	358	
Error 9 time SS	R	0x0166	358	0x0167	359	
Error 9 DTC, number 2 and 1	R	0x0167	359	0x0168	360	
Error 9 DTC, number 4 and 3	R	0x0168	360	0x0169	361	
Error 9 DTC, number 6 and 5	R	0x0169	361	0x016A	362	
Custom name, letter 1 and 2	RW	0x0190	400	0x0191	401	
Custom name, letter 3 and 4	RW	0x0191	401	0x0192	402	
Custom name, letter 5 and 6	RW	0x0192	402	0x0193	403	
Custom name, letter 7 and 8	RW	0x0193	403	0x0194	404	
Custom name, letter 9 and 10	RW	0x0194	404	0x0195	405	
Custom name, letter 11 and 12	RW	0x0195	405	0x0196	406	
Custom name, letter 13 and 14	RW	0x0196	406	0x0197	407	
Custom name, letter 15 and 16	RW	0x0197	407	0x0198	408	
Installed modules	R	0x01F4	500	0x01F5	501	
Dip Switches	R	0x0258	600	0x0259	601	
Arc Monitor SW version XXYY	R	0x0320	800	0x0321	801	
Arc Monitor SW version ZZ	R	0x0321	801	0x0322	802	
Arc Monitor HW version	R	0x0322	802	0x0323	803	
Arc Monitor CPLD version XXYY	R	0x0323	803	0x0324	804	
Arc Monitor CPLD version ZZ	R	0x0324	804	0x0325	805	
Arc Monitor ID, byte 0	R	0x032B	811	0x032C	812	
Arc Monitor ID, byte 1	R	0x032C	812	0x032D	813	
Arc Monitor ID, byte 2	R	0x032D	813	0x032E	814	
Arc Monitor ID, byte 3	R	0x032E	814	0x032F	815	

Modbus registers

Parameter name	Access	PDU Address		Register Number		Remark
		Hex	Dec	Hex	Dec	
Arc Monitor ID, byte 4	R	0x032F	815	0x0330	816	
HMI SW version XXYY	R	0x0334	820	0x0335	821	
HMI SW version ZZ	R	0x0335	821	0x0336	822	
HMI HW version	R	0x0336	822	0x0337	823	
HMI ID, byte 0	R	0x033D	829	0x033E	830	
HMI ID, byte 1	R	0x033E	830	0x033F	831	
HMI ID, byte 2	R	0x033F	831	0x0340	832	
HMI ID, byte 3	R	0x0340	832	0x0341	833	
HMI ID, byte 4	R	0x0341	833	0x0342	834	
Other HMI SW version XXYY	R	0x0348	840	0x0349	841	
Other HMI SW version ZZ	R	0x0349	841	0x034A	842	
Other HMI HW version	R	0x034A	842	0x034B	843	
Other HMI ID, byte 0	R	0x0351	849	0x0352	850	
Other HMI ID, byte 1	R	0x0352	850	0x0353	851	
Other HMI ID, byte 2	R	0x0353	851	0x0354	852	
Other HMI ID, byte 3	R	0x0354	852	0x0355	853	
Other HMI ID, byte 4	R	0x0355	853	0x0356	854	
X2 HW version	R	0x035C	860	0x035D	861	
X2 CPLD version XXYY	R	0x035D	861	0x035E	862	
X2 CPLD version ZZ	R	0x035E	862	0x035F	863	
X2 ID, byte 0	R	0x0364	868	0x0365	869	
X2 ID, byte 1	R	0x0365	869	0x0366	870	
X2 ID, byte 2	R	0x0366	870	0x0367	871	
X2 ID, byte 3	R	0x0367	871	0x0368	872	
X2 ID, byte 4	R	0x0368	872	0x0369	873	
X3 HW version	R	0x0370	880	0x0371	881	
X3 CPLD version XXYY	R	0x0371	881	0x0372	882	
X3 CPLD version ZZ	R	0x0372	882	0x0373	883	
X3 ID, byte 0	R	0x0378	888	0x0379	889	
X3 ID, byte 1	R	0x0379	889	0x037A	890	
X3 ID, byte 2	R	0x037A	890	0x037B	891	
X3 ID, byte 3	R	0x037B	891	0x037C	892	
X3 ID, byte 4	R	0x037C	892	0x037D	893	
Reset trip	W	0x03E8	1000	0x03E9	1001	1 = reset, 0 = no-operation
System date	RW	0x044C	1100	0x044D	1101	
System time HHMM	RW	0x044D	1101	0x044E	1102	
Modbus failure register	R	0x04B0	1200	0x04B1	1201	
System state	R	0x0514	1300	0x0515	1301	
Active DTC, number 1	R	0x0515	1301	0x0516	1302	
Active DTC, number 2	R	0x0516	1302	0x0517	1303	
Active DTC, number 3	R	0x0517	1303	0x0518	1304	
Active DTC, number 4	R	0x0518	1304	0x0519	1305	
Active DTC, number 5	R	0x0519	1305	0x051A	1306	
Active DTC, number 6	R	0x051A	1306	0x051B	1307	

4.4 Register data format

This section describes details about the data format for selected registers.

4.4.1 Trip information

The trip registers contain information about the last 7 trips that has occurred. If less than 7 trips has occurred, which can be checked by reading register Number of trips, the register values will be 0xFFFF.

4.4.1.1 Trip x detector, low

This register contains a bit field that contains which detectors triggered the trip.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	X2:5	X2:4	X2:3	X2:2	X2:1	X1:10	X1:9	X1:8	X1:7	X1:6	X1:5	X1:4	X1:3	X1:2	X1:1

4.4.1.2 Trip x detector, high

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	X3:10	X3:9	X3:8	X3:7	X3:6	X3:5	X3:4	X3:3	X3:2	X3:1	X2:10	X2:9	X2:8	X2:7	X2:6

4.4.1.3 Trip x relay (IGBT)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	-	-	-	-	-	-	-	-	-	-	-	-	K6	K5	K4

4.4.1.4 Trip x date

The date the trip occurred. The date is expressed as number of days since January 1, 1970.

Example: the value 0x42B6 (17078) corresponds to October 4, 2016.

4.4.1.5 Trip x time HHMM

The hours and minutes of time the trip occurred. The time is expressed in 24h format as a 16 bit value where the most significant byte contains the hours and the least significant the minutes.

Example: the value 0x0922 (2338) corresponds to 09:34.

4.4.1.6 Trip x time SS

The seconds of the time the trip occurred.

4.4.1.7 Number of trips

The number of trips that has occurred.

4.4.2 Diagnostics information

The following registers contain the same information as menu 2. Diagnostics on the HMI.

Diagnostics error registers contain information about the current active error. If there is no active error they contain 0x0000. The format of the registers are as described in 4.4.3 Error information below.

Diagnostics trip registers contain information about the current active trip. If there is no active trip they contain 0x0000. The format of the registers are as described in 4.4.1 Trip information above.

Register System state can be read to see if there is an active error/trip.

4.4.2.1 Perform diagnostics

Write value 1 to this register to perform diagnostic test.

4.4.2.2 Last performed diagnostics date

Date of last performed diagnostics. Format as described in 4.4.1.4 Trip x date above.

4.4.2.3 Last performed diagnostics time HHMM

Time of last performed diagnostics. Format as described in 4.4.1.5 Trip x time HHMM above.

4.4.3 Error information

The error registers contain information about the last 9 errors that has occurred. If less than 9 errors has occurred, which can be checked by reading register Number of errors, the register values will be 0xFFFF.

4.4.3.1 Error x date

The date the error occurred. The date is expressed as number of days since January 1, 1970.

Example: the value 0x42B6 (17078) corresponds to October 4, 2016.

4.4.3.2 Error x time HHMM

The hours and minutes of time the trip occurred. The time is expressed in 24h format as a 16 bit value where the most significant byte contains the hours and the least significant the minutes.

Example: the value 0x0922 (2338) corresponds to 09:34.

4.4.3.3 Error x time SS

The seconds of the time the trip occurred.

4.4.3.4 Error x DTC, number y and z

A diagnostic trouble code (DTC) consist of 6 numbers. When displayed on the HMI it has the following format: n6-n5-n4-n3-n2-n1, where n<n> denotes number n.

Example: With DTC 64-0-0-2-0-0, number 3 has value 2 and number 6 has value 64.

Two numbers are stored in each register, the first number (y) in the most significant byte and the second (z) in the least significant.

4.4.3.5 Number of errors

The number of errors that has occurred.

4.4.4 Custom name registers

The custom name registers contains the letters in the custom name that can be programmed to the HMI.

Allowed characters are the alphanumeric characters plus “-“, “_” and “ “ (space). This means ASCII character 32, 45, 48-57, 65-90, 95, 97-122. If not all 16 characters are needed, the trailing characters should be set to value 32 (space) to keep the layout of the name center aligned.

In each register, two characters are stored. One in the most significant byte and one in the least significant.

Example: To set the custom name to “Example” the registers should be set as follows

Custom name, letter 1 and 2	0x4578 (Ex)
Custom name, letter 3 and 4	0x616D (am)
Custom name, letter 5 and 6	0x706C (pl)
Custom name, letter 7 and 8	0x6520 (e)
Custom name, letter 9 and 10	0x2020 ( )
Custom name, letter 11 and 12	0x2020 ( )
Custom name, letter 13 and 14	0x2020 ( )
Custom name, letter 15 and 16	0x2020 ( )

Using modpoll (see 5.2 Example of reading with modpoll below) the command is:

```
modpoll -m rtu -a 247 -0 -r 400 COM1 0x4578 0x616D 0x706C 0x6520 0x2020 0x2020 0x2020 0x2020
```

4.4.4.1 Custom name, letter x and y

Letter x is stored in the most significant byte, letter y in the least significant byte.

4.4.5 Installed modules

This register contains a bit field that reflects which modules are installed and detected on the Arc Guard System™ TVOC-2.

A high bit signals an installed module.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	-	-	-	-	-	-	-	-	-	CSU22	CSU21	X3	X2	External HMI	Internal HMI

Example: the value 0x000E shows a system that contains an internal HMI and extension modules X2 and X3.

4.4.6 Dip switches

This registers contains the status of the dip switches on the Arc Monitor in its least significant byte.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Dip switch	-	-	-	-	-	-	-	-	-	-	CSU22	CSU21	X3	X2	External HMI	Internal HMI

Example: the value 0x0004 indicates that dip switch 3, TripMatrix 4, is On and all others are Off.

4.4.7 Version information

Software (SW) and CPLD versions are specified with three numbers XX.YY.ZZ. Each version is presented using two Modbus registers, one for the first two numbers and one for the last.

4.4.7.1 Arc Monitor SW version XXYY

This registers contains the first number of the version in the most significant byte and the second number of the version in the least significant byte.

Example: If the Arc Monitor software version is 00.03.43 this register has value 0x0003.

4.4.7.2 Arc Monitor SW version ZZ

This registers contains the third number of the version in the least significant byte.

Example: If the Arc Monitor software version is 00.03.43 this register has value 0x002B.

4.4.7.3 Arc Monitor HW version

This register contains the Arc Monitor hardware version in the least significant byte.

4.4.7.4 Arc Monitor CPLD version XXYY

This registers contains the first number of the version in the most significant byte and the second number of the version in the least significant byte.

Example: If the Arc Monitor CPLD version is 00.02.01 this register has value 0x0002.

4.4.7.5 Arc Monitor CPLD version ZZ

This registers contains the third number of the version in the least significant byte.

Example: If the Arc Monitor software version is 00.02.01 this register has value 0x0001.

4.4.7.6 Arc Monitor ID, byte x

The ID number is presented using 5 bytes.

Each register contains one byte in the least significant byte.

The first part of the ID number is static, it is always “1S16010”.

Then byte 4, 3 and 2 follows in decimal format with 2 digits for each number.

Finally a 16-bit word constructed from byte 1 as most significant and byte 0 as least significant is added as a 4 digit decimal number (byte 1 << 8 | byte 0).

Example: If the Arc Monitor ID registers contains the following values:

Arc Monitor ID, byte 0	0x00D9	
Arc Monitor ID, byte 1	0x0007	**This corresponds to ID**
Arc Monitor ID, byte 2	0x0012 (18)	**1S16010 72 14 18 2009**
Arc Monitor ID, byte 3	0x000E (14)	**0x48 0x0E 0x12 0x07D9**
Arc Monitor ID, byte 4	0x0048 (72)	

HMI SW version XXYY

The HMI is the HMI that is queried on the Modbus network.

See 4.4.7.1 Arc Monitor SW version XXYY above.

4.4.7.7 HMI SW version ZZ

See 4.4.7.2 Arc Monitor SW version ZZ above.

4.4.7.8 HMI HW version

See 4.4.7.3 Arc Monitor HW version above.

4.4.7.9 HMI ID, byte x

See 4.4.7.6 Arc Monitor ID, byte x above.

4.4.7.10 Other HMI SW version XXYY

Other HMI is the HMI that is not queried on the Modbus network.

See 4.4.7.1 Arc Monitor SW version XXYY above.

4.4.7.11 Other HMI SW version ZZ

See 4.4.7.2 Arc Monitor SW version ZZ above.

4.4.7.12 Other HMI HW version

See 4.4.7.3 Arc Monitor HW version above.

4.4.7.13 Other HMI ID, byte x

See 4.4.7.6 Arc Monitor ID, byte x above.

4.4.7.14 X2 HW version

See 4.4.7.3 Arc Monitor HW version above.

4.4.7.15 X2 CPLD version XXYY

See 4.4.7.4 Arc Monitor CPLD version XXYY above.

4.4.7.16 X2 CPLD version ZZ

See 4.4.7.5 Arc Monitor CPLD version ZZ above.

4.4.7.17 X2 ID, byte x

See 4.4.7.6 Arc Monitor ID, byte x above.

4.4.7.18 X3 HW version

See 4.4.7.3 Arc Monitor HW version above.

4.4.7.19 X3 CPLD version XXYY

See 4.4.7.4 Arc Monitor CPLD version XXYY above.

4.4.7.20 X3 CPLD version ZZ

See 4.4.7.5 Arc Monitor CPLD version ZZ above.

4.4.7.21 X3 ID, byte x

See 4.4.7.6 Arc Monitor ID, byte x above.

4.4.8 Reset

Write value 1 to this register to reset currently active trip, if any.

4.4.9 System date

Read or update the system date. The date is stored in the Arc Monitor so if updated it will take up to 2 seconds for the change to reflect in the HMI.

The date is expressed as number of days since January 1, 1970.

Example: the value 0x42B6 (17078) corresponds to October 4, 2016.

4.4.10 System time HHMM

Read or update the system time. The time is stored in the Arc Monitor so if updated it will take up to 2 seconds for the change to reflect in the HMI.

The time is expressed in 24h format as a 16 bit value where the most significant byte contains the hours and the least significant the minutes.

Example: the value 0x0922 (2338) corresponds to 09:34.

4.4.11 Modbus failure register

This register contains the PDU Address of the Modbus register that was involved in the last Modbus exception.

Example: if one attempts to read System date and System time HHMM (PDU addresses 1100, 1101) but accidently specifies 3 registers instead of 2, one will get an Illegal Data Address exception as response since also address 1102 will be queried. The Modbus failure register will contain value 0x044E (1102).

4.4.12 System state

This register contains a 4-bit bit field that reflects the system state.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	-	-	-	-	-	-	-	-	-	-	-	Diagnostics running	System start sequence	There is an active error	There is an active trip

4.4.13 Diagnostic Trouble Code, number x

These registers contain the same data as Diagnostics error DTC number x and y but with only one byte per register. It might be easier to retrieve the information this way.

See 4.4.3.4 Error x DTC, number y and z above for more information.

5 Troubleshooting

5.1 Visual diagnostics

The yellow Com LED flashes when a Modbus request is received.

5.2 Example of reading with modpoll

Using the application modpoll [3] from a windows environment, it is easy to query the Arc Guard System™ TVOC-2.

The following command is an example of how the TVOC-2 status can be read:

```
C:\Windows\System32>REM This connects to a slave with Modbus id 247 on COM1

C:\Windows\System32>modpoll -m rtu -0 -a 247 -r 1300 COM1

RTU protocol, pdu addressing, Modbus id, register, com_port


modpoll 3.4 - FieldTalk(tm) Modbus(R) Master Simulator

Copyright (c) 2002-2013 proconX Pty Ltd

Visit http://www.modbusdriver.com for Modbus libraries and tools.


Protocol configuration: Modbus RTU

Slave configuration...: address = 247, start reference = 1300 (PDU), count = 1

Communication.........: COM35, 19200, 8, 1, even, t/o 1.00 s, poll rate 1000 ms

Data type.............: 16-bit register, output (holding) register table


-- Polling slave... (Ctrl-C to stop)

[1300]: 0

-- Polling slave... (Ctrl-C to stop)

[1300]: 0
```

6 Index

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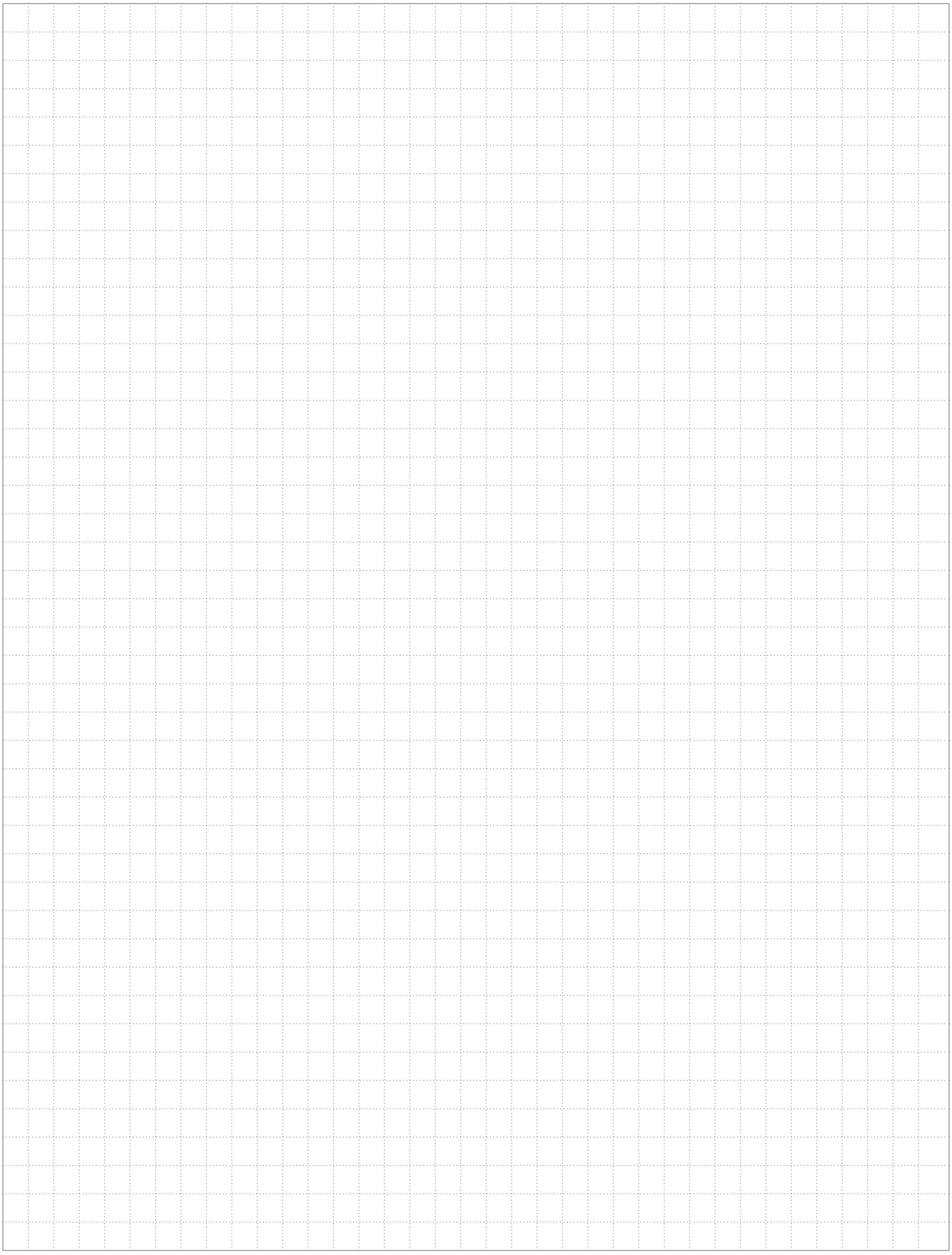

Notes

ABB AB
Electrification Products Division
Low Voltage Products and Systems
Protection & Connection
Motorgränd 20
SE-721 61 Västerås / Sweden

You can find the address of your local sales organisation on the ABB home page.

http://new.abb.com/low-voltage/products/arc-guard

http://www.abb.com/lowvoltage

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