ATEQ

G6 Series – EtherCAT

Manual

Table of Contents

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We continuously work on improving our products. This is why inforamtion contained in this manual, the device and the technical specifications may be modified without prior notification.

Pictures and figures in this manual are non contractual

Safety advisory / Warranty

GOOD PRACTICES AND SAFETY INSTRUCTIONS

Safety recommendations

If the device is supplied with 100 / 240 V AC, it is mandatory to connect it to the ground with a good link to the ground, to protect against electric hazard or electrocution.

It is dangerous to change the status of the outputs.
They can control power actuators or other equipment (mechanical, pneumatic, hydraulic, electrical or other) which can cause serious personal injury and damage to surrounding material.

For safety and quality measurement reasons, it is important, before powering on the device, to ensure that it is air supplied with a minimum operating pressure (0.6 MPa ± 15%).

Recommendations for the test environment

Keep the test area as clean as possible.

Recommendations for operators

ATEQ recommends that the operators who use the devices have training and a level of qualification that correspond to the job to perform.

General recommendations

— Read the user manual before using the device.
— All electrical connections to the device must be equipped with safety systems (fuses, circuit breakers, etc.) adapted to the needs and in accordance with the applicable standards and rules.
— To avoid electromagnetic interference, electrical connections to the device must be shorter than 2 meters.
— Power supply plug must be grounded.
— Disconnect the device from the mains before performing any maintenance work.
— Shut off the compressed air supply when working on the pneumatic assembly.
— Do not open a connected device.
— Avoid splashing water on the device.

ATEQ is at your disposal for any information concerning the use of the device under maximum safety conditions.
We draw your attention to the fact that ATEQ cannot be held responsible for any accident related to a misuse of the measuring instrument, the workstation or non-compliance of the installation with safety rules.
In addition, ATEQ declines any responsibility for the calibration or the fitting of their instruments that is not done by ATEQ.
ATEQ also declines any responsibility for any modification (program, mechanical or electrical) of the device done without their written consent.

Preamble

INTRODUCTION

This manual intends to help you for the configuration and the use of your ATEQ G6 device on the EtherCAT network.

For more information on your ATEQ equipment, refer to the Quick Start Manual.

The numerical values used in the ATEQ device are coded on a **Long** format.

ATEQ devices are configured in **Little Endian format**. It means that the **Least Significant Byte** is **sent first** on the network.

Word

A word is a 16-bit data. It is coded with two bytes (8bits):

- The first byte is the Least Significant Byte (**LSB**)
- The second byte is the Most Significant Byte (**MSB**)

Example of a word:

Reminder: "**h**" indicates a hexadecimal code, "**(d)**" indicates a decimal code.

On network: 98 28

Byte 0 *Byte 1*

- Word = 2898h
- LSB = 98h
- MSB = 28h

Long format (Signed Double word)

A **Long** format data is coded with two words (of 16 bits).
In the memory range of the ATEQ device or when they are transmitted, both words are coming in the following order:

- The first word is the least significant word
- The second word is the most significant word
- Example of a **Long** format:

On network: 98 28 03 00

Byte 0 *Byte 1* *Byte 2* *Byte 3*

- Word 1 = 2898h (least significant word)
- Word 2 = 0003h (most significant word)
- Long value = 00032898h = 207000(d)

Address value

All address values are treated with the **Long** format.
Example – address of the "millibar" unit in the Unit table (see Unit table):

On network: B0 36 00 00

Byte 0 *Byte 1* *Byte 2* *Byte 3*

- Word 1 = 36B0h
- Word 2 = 0000h
- Address value = 000036B0h

Numerical value

All the numerical values are treated with the **Long** format with fixed comma (10^{-3}).
Thus, their value is expressed in thousandths of unit. So, this value must be multiplied by 1000 to get the value in units.
For example, a value of 207055 represents 207.055. So, any numerical value must be divided by 1000 to get the real value:

— 207.055 = 207055 ÷ 1000

Example – Pressure:

On network: E3 28 03 00

Byte 0 Byte 1 Byte 2 Byte 3

- Word 1 = 28E3h
- Word 2 = 0003h
- Value = 000328E3h = 207 055(d) = 207 055 of thousandths of unit
- Real value = 207 055 ÷ 1000 = 207.055 expressed in units

Negative numerical value

All the negative numerical values are treated with **Signed long** format with fixed comma (10^{-3}).
Thus, they must be multiplied by 1000 to get the value in units.
Example – Leak value (signed long):

On network: 94 FF FF FF

Byte 0 Byte 1 Byte 2 Byte 3

- Word 1 = FF94h
- Word 2 = FFFFh
- Value = FFFFFF94h = - 108(d) = - 108 of thousandths of unit
- Real value = - 108 ÷ 1000 = - 0.108 expressed in units

Hardware installation

HARDWARE CONFIGURATION

Connect your ATEQ equipment to the EtherCAT fieldbus using its EtherCAT connectors and compatible cables.
Your device has an EtherCAT internal board and two EtherCAT connectors.
The EtherCAT internal board is located inside your device. Only one version is available:

- **COMX 51**

> You can see the version installed using your user interface (see Identification of the version of the EtherCAT module).

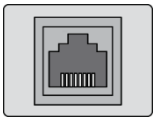
Your device has two RJ45 type connectors.

> For more information on your ATEQ equipment, refer to the Quick Start Manual.

EtherCAT connector

Standard connection Ethernet TCP / IP protocol.

RJ45 connector



Wiring instructions

General notes on wiring in EtherCAT

- Use shielded Ethernet cables that meet the requirements of at least category 5 (Cat 5) according to EN 50173 or ISO/IEC 11801.
- Do not use hubs in an EtherCAT network.
- Use switches only between EtherCAT master and first EtherCAT slave device (100 MBit/s, Full Duplex).
- The cable length between two EtherCAT devices must not exceed 100 meters.

Standard wiring (without redundancy)

Standard wiring in EtherCAT connects channel 0 (also known as Port 0 or Main Port) of the master device to the IN Port of the first slave device. The OUT Port of the first slave device is connected to the IN Port of the next slave device, and so forth. The OUT Port of the last slave device and channel 1 of the master device remain unused.

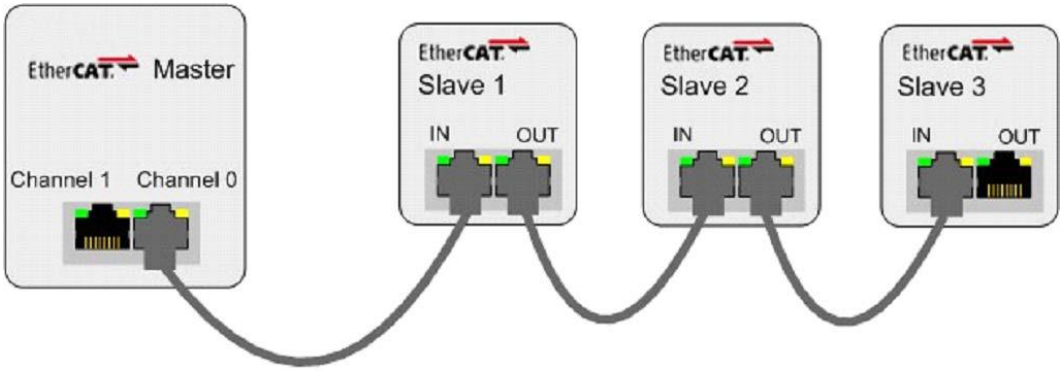


Figure 1: Standard Wiring in EtherCAT Network

Redundant wiring

EtherCAT master firmware version ≥ 2.5.x.x supports redundant wiring. In redundant wiring, the OUT Port of the last slave device is connected to channel 1 (Port 1) of the master device in addition to the standard wiring, thus creating a “ring topology” with the master channel 1 serving as "redundancy port".

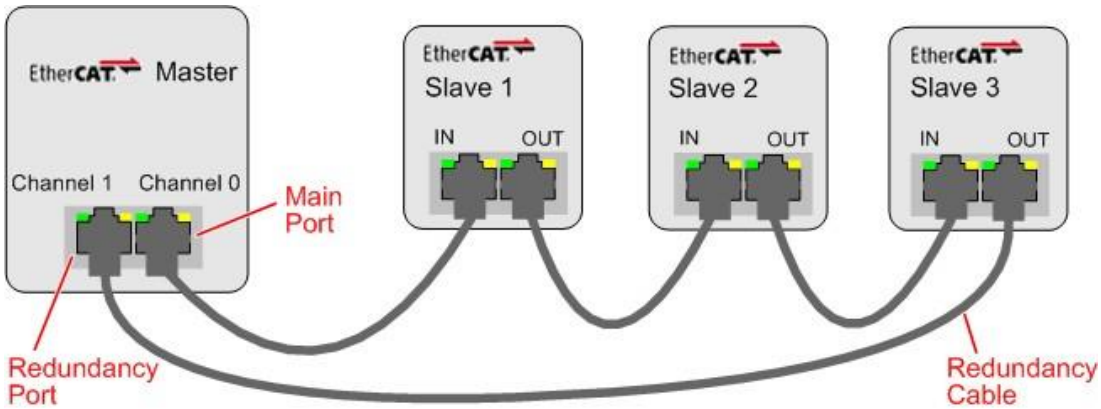


Figure 2: Redundant Wiring in EtherCAT Network

In case of an interrupted cable connection between two EtherCAT slaves or in case of a defective slave device, the redundant cable maintains the communication between the master and the other slaves, which otherwise would be cut-off from the bus.

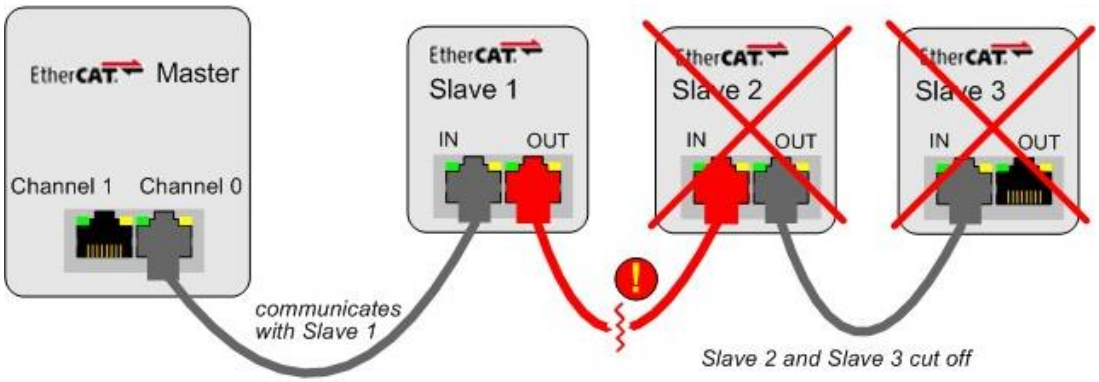


Figure 3: Cable Interrupt in Standard Wiring in EtherCAT Network

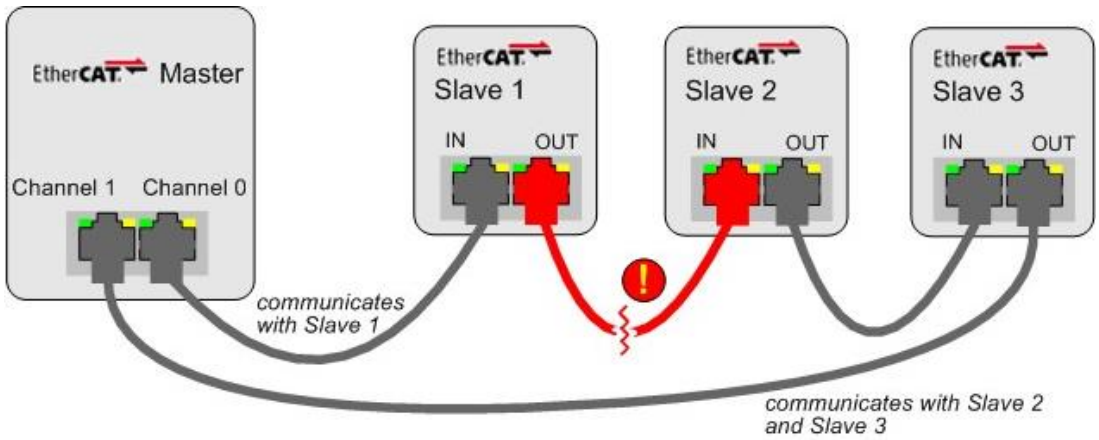


Figure 4: Cable Interrupt in Redundant Wiring in EtherCAT Network

Prerequisites for using redundant wiring in EtherCAT: Redundancy function has been enabled in configuration of master.

Redundancy function and Distributed Clocks function cannot be used at the same time.

Firmware version 2.5.x.x does not support Distributed Clocks.
Firmware version 3.0.x supports either Redundancy or Distributed Clocks, but never both functions at once.

Configuration of the ATEQ device (slave)

Use this procedure to configure your device.

This configuration can be done with the front panel of your ATEQ device or with the ATEQ Fieldbus Configurator software.

SETUP OF THE ETHERCAT CONFIGURATION MODE

Five configuration modes are available according to the bytes number available:

Mode number	Configuration mode	Use
5	**Standard mode (normal)**	For the inputs/outputs, real time measurements, the live cycle results and parameters management
4	**Standard less mode**	For the inputs/outputs, real time measurements, the live cycle results and parameters management
3	**Medium more mode**	For the inputs/outputs, the real time measurements, the live cycle results and parameters management
2	**Medium mode**	For the inputs/outputs and the real time measurements
1	**Light mode**	For the digital inputs/outputs

Configuration modes according to bytes number available

Memory range	Mode number and bytes available					Functions available
	(5) 200 bytes	(4) 96 bytes	(3) 64 bytes	(2) 32 bytes	(1) 16 bytes	
00h-0Fh	X	X	X	X	X	Inputs/outputs
10h-1Fh	X	X	X	X		Real time measurements
20h-3Fh	X	X	X			Exchange zone: cycle result reading or 5 parameters management
40h-5Fh	X	X				Exchange zone: cycle result reading or 10 parameters management
60h-C8h	X					Exchange zone: cycle result reading or 20 parameters management

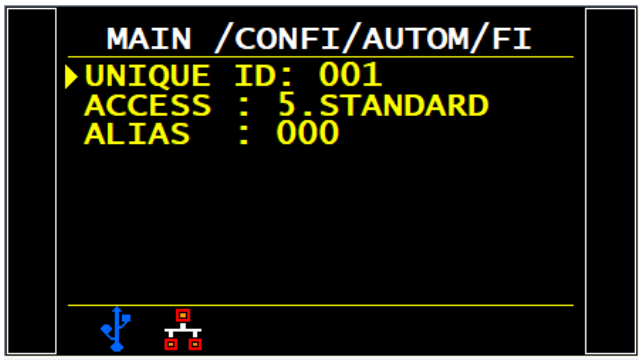
From the **MAIN MENU** screen of your ATEQ device:

- **CONFIGURATION**
- **AUTOMATISM**
- **FIELDBUS**
- **ACCESS**

SETUP OF THE UNIQUE ID

The **Unique ID** must be the different for each device on the EtherCAT network.

From the ATEQ device

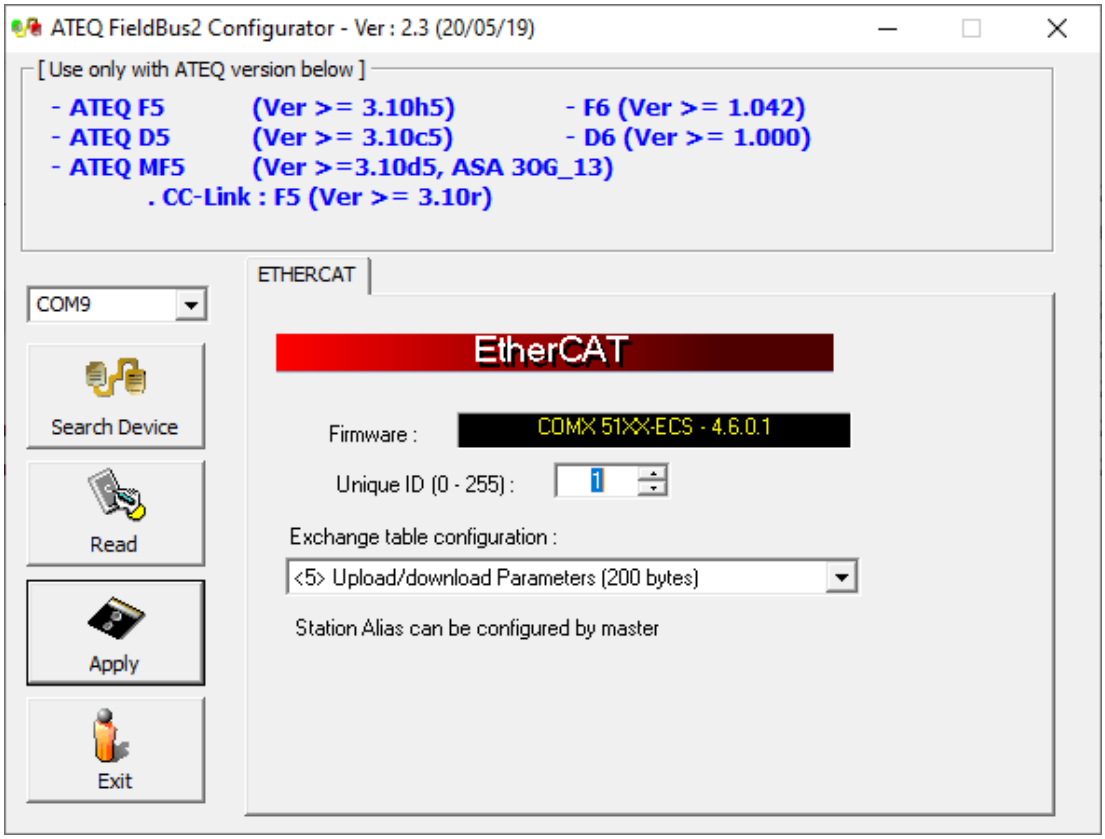


From the **MAIN MENU** screen of your ATEQ device:

- **CONFIGURATION**
- **AUTOMATISM**
- **FIELDBUS**
- **UNIQUE ID**

From the ATEQ Fieldbus Configurator software

Connect your PC to the RS232 connector of your ATEQ device.
Run the ATEQ Fieldbus Configurator software:



The **Alias** is set only by the master (no access by the slave).

Configuration of the master

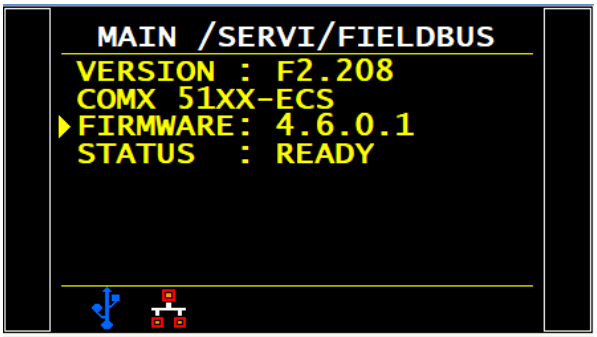
INSTALLATION OF THE ETHERCAT MODULE

Identification of the version of the EtherCAT module

You can identify the hardware configuration using your ATEQ device or using a fieldbus configuration software.

For the installation and configuration of the EtherCAT module, you have to select the component that corresponds to the firmware (see Configuration files).

From the ATEQ device



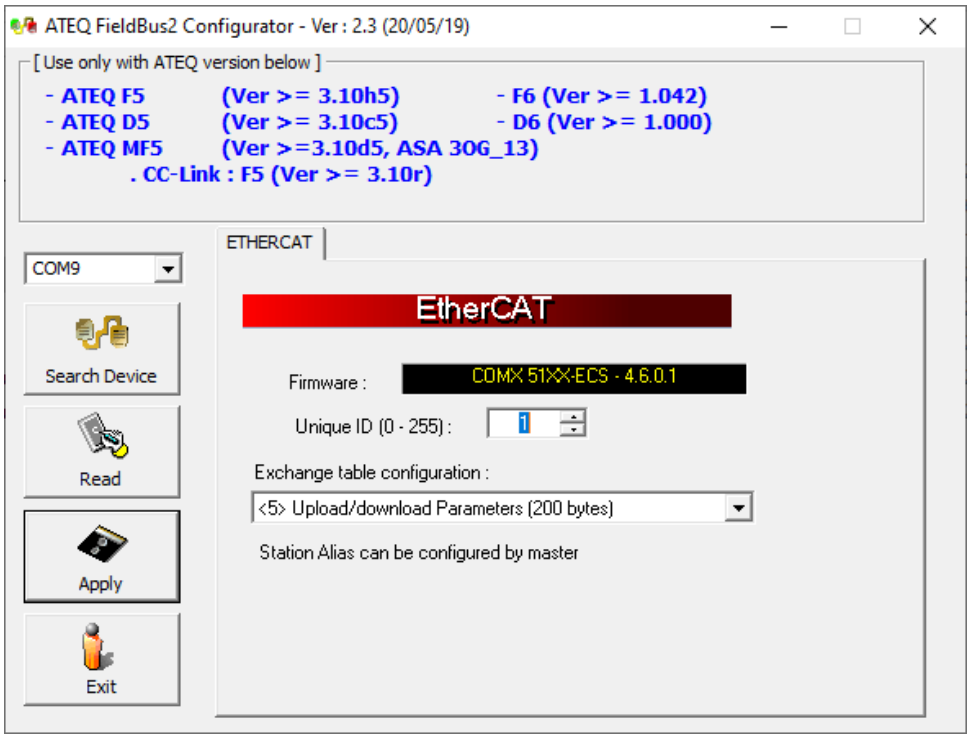
From the **MAIN MENU** screen of your ATEQ device:

- **SERVICE**
- **FIELDBUS**

The Hilscher firmware version is displayed in the **FIRMWARE** parameter.

From the ATEQ Fieldbus Configurator software

Connect your PC to the RS232 connector of your ATEQ device.
Run the ATEQ Fieldbus Configurator software:



The Hilscher firmware version is displayed in the **FIRMWARE** parameter.

CONFIGURATION FILES

Configuration files to use for the configuration of the master instrument.

EtherCAT hardware and software compatibilities

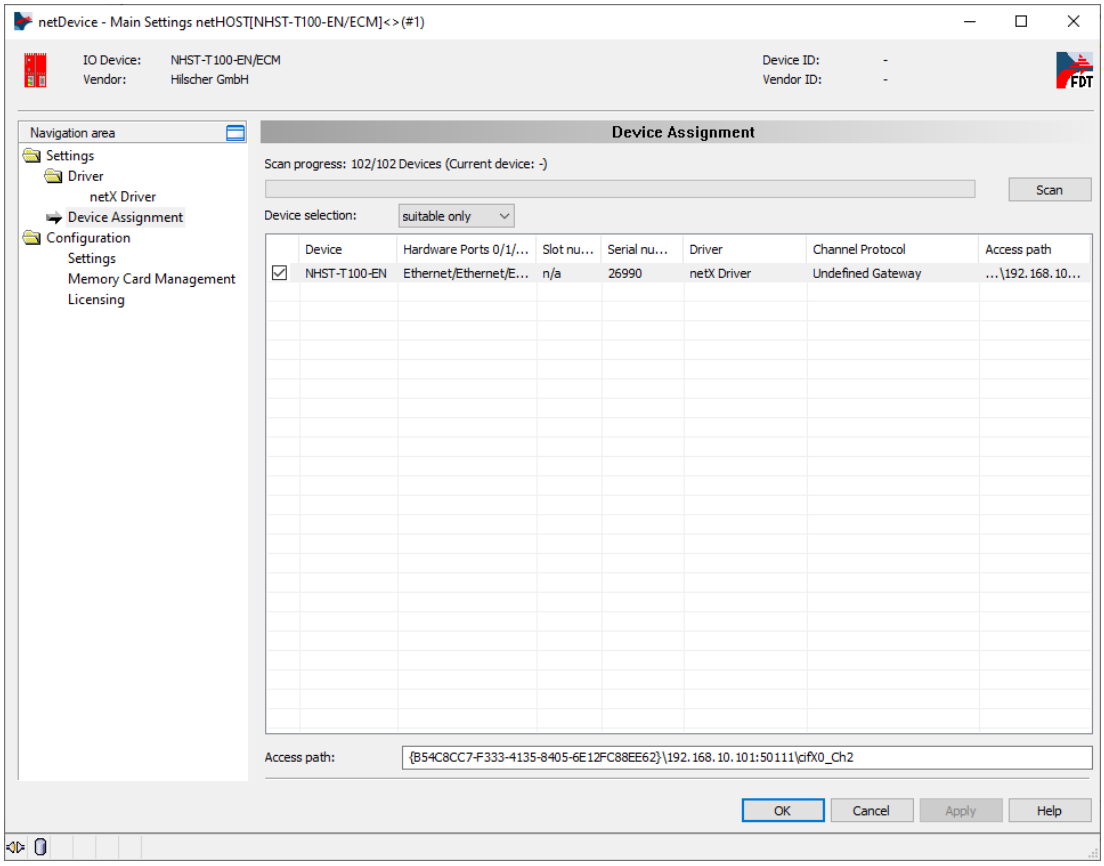
The table below gives the configuration file to use according to the hardware reference of the EtherCAT internal board of your ATEQ device (Hilscher hardware reference).

EtherCAT Specs	Device software	Fieldbus Software	Hilscher Firmware	Config Files	Hilscher Hardware Ref
V4.6	F6: ≥ 1.322 Others: ≥ 1.000	> 2.104	4.6.0.1	**HILSCHER COMX 51XX RE ECS V4.6.X.xml (15/06/2018)**	**COMX 51**

SELECTION OF THE MASTER BOARD

The screenshot used in this section correspond to the Sycon.net from Hilscher software. Nevertheless, you may use your own software to configure the master.

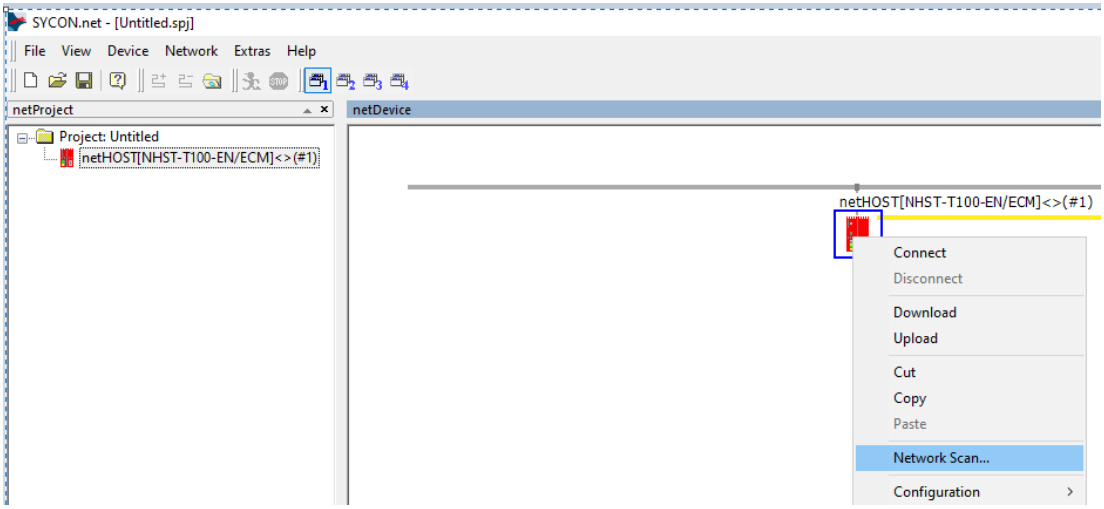
From the **Device Assignment** screen, select the master card:



The screenshot used in this section correspond to the Sycon.net from Hilscher software. Nevertheless, you may use your own software to configure the master.

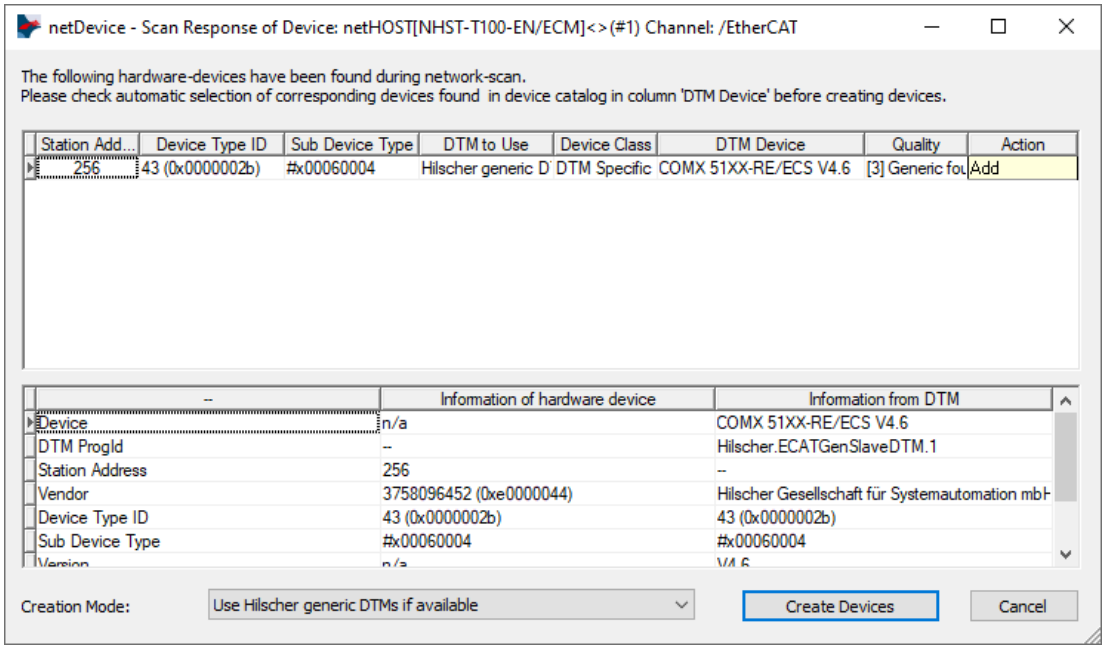
Scan the devices

To have connection and communication with EtherCAT, you must follow the instruction displayed in the examples below.
Right click on the master and select **Network Scan…** to detect slaves on the network:



Devices configuration

Once devices are detected, a window containing the information of these devices appears.
You can click on the **Create Devices** button and the software will create the corresponding slaves.



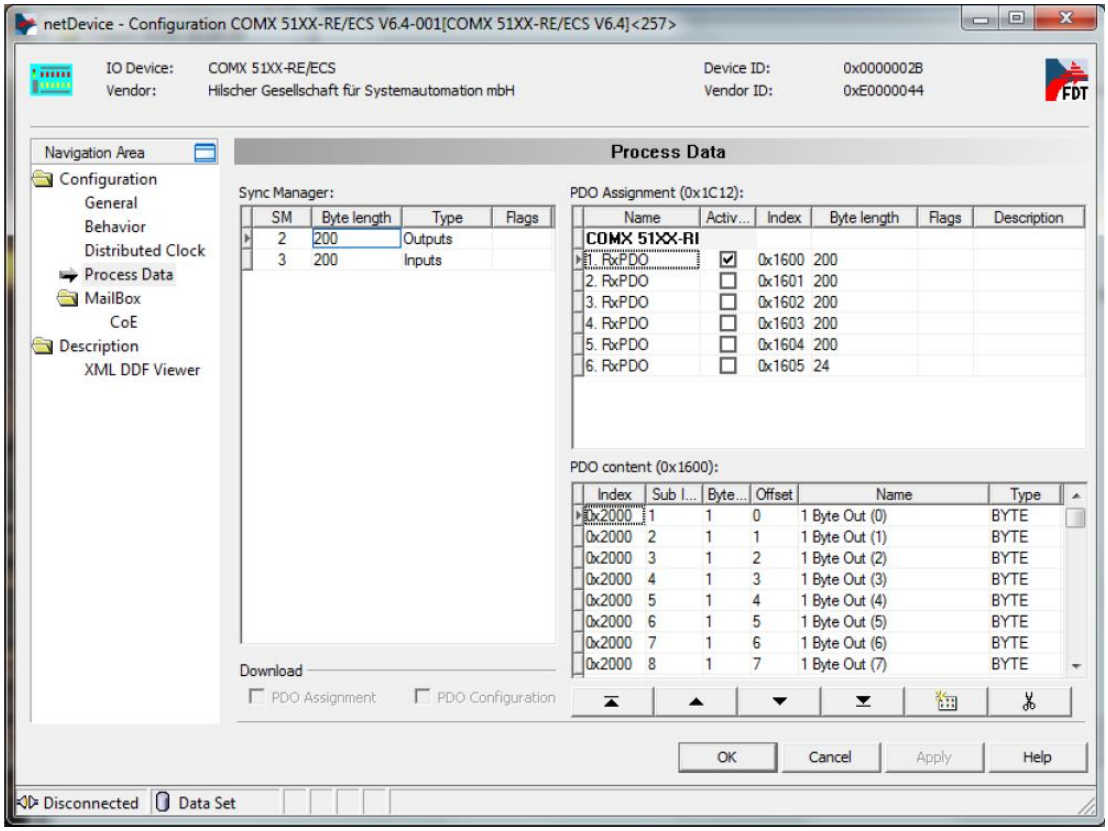
Five configuration modes are available according to the bytes number available (see Configuration of the ATEQ device (slave)).

As you can see with the Sycon example below, the outputs must be at the 0x1A00 index (TxPDO) and the inputs must be at the 0x1600 index (RxPDO).

Setup of the Standard mode (normal)

The parameters configuration must be like the following ones:

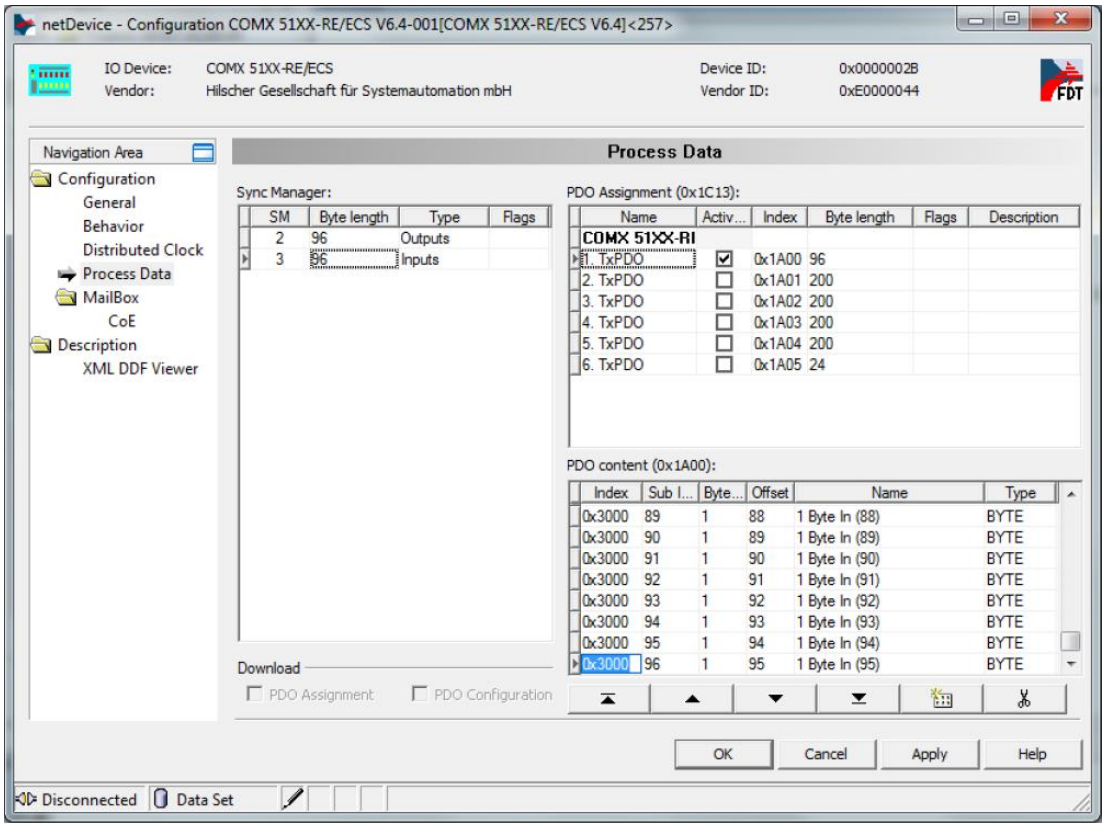
- Input_Data: IB = 200 bytes
- Output_Data: QB = 200 bytes



Setup of the Standard less mode

The parameters configuration must be like the following ones:

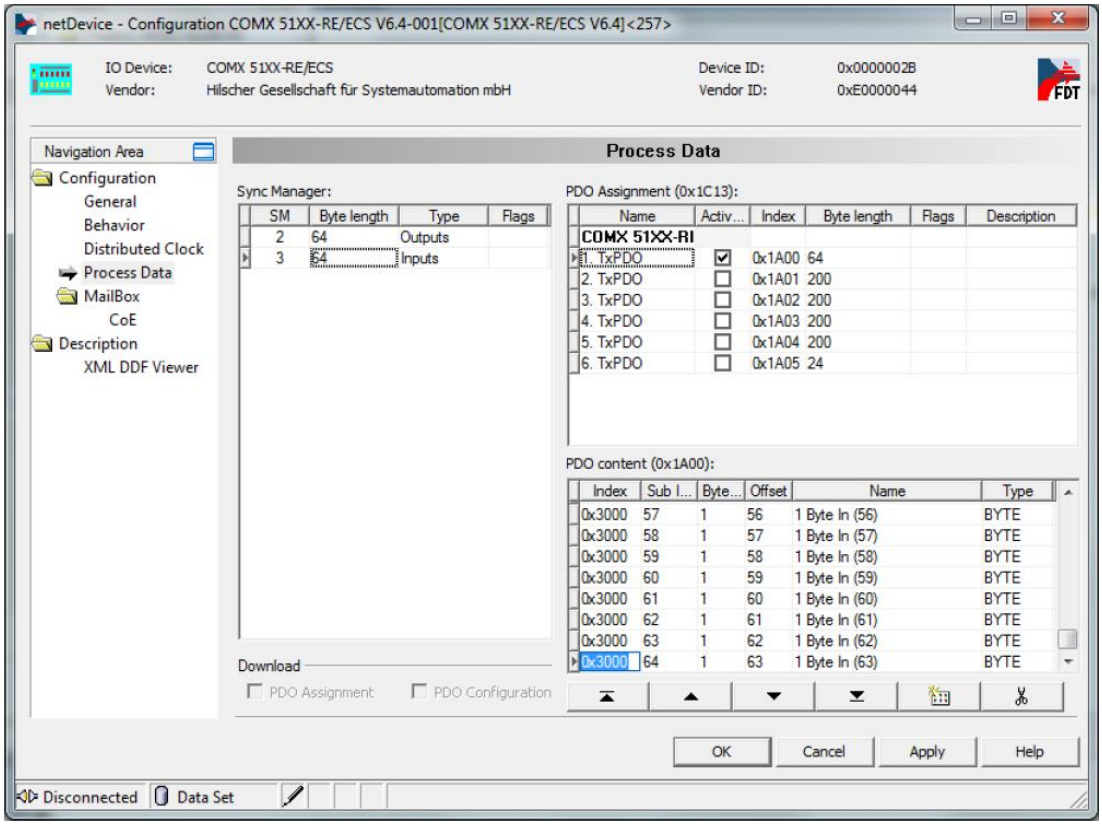
- Input_Data: IB = 96 bytes
- Output_Data: QB = 96 bytes



Setup of the Medium more mode

The parameters configuration must be like the following ones:

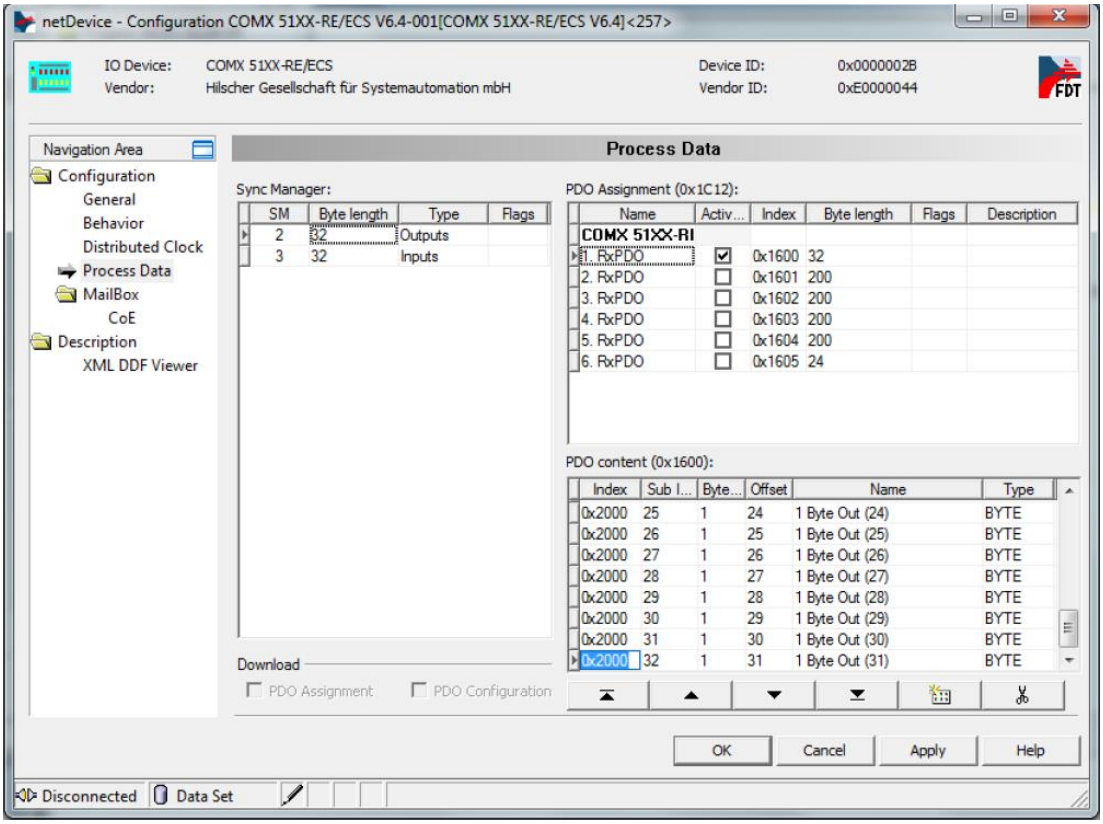
- Input_Data: IB = 64 bytes
- Output_Data: QB = 64 bytes



Setup of the Medium mode

The parameters configuration must be like the following ones:

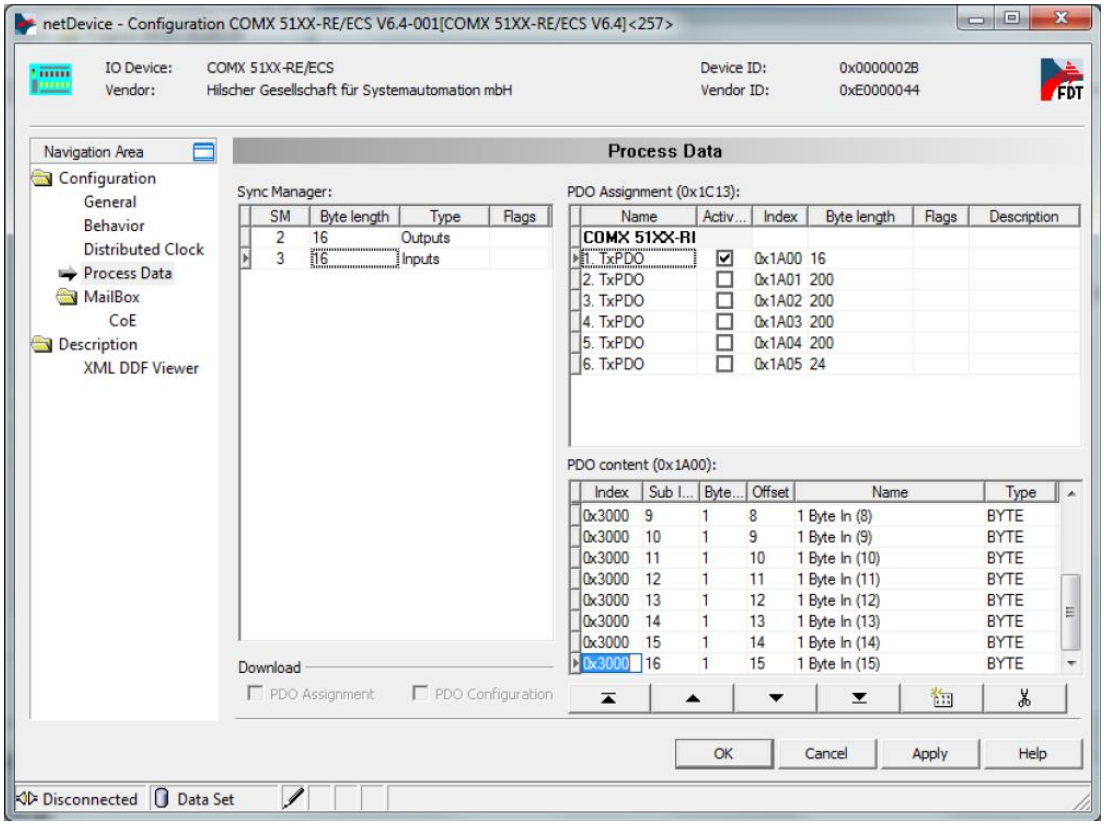
- Input_Data: IB = 32 bytes
- Output_Data: QB = 32 bytes



Setup of the Light mode

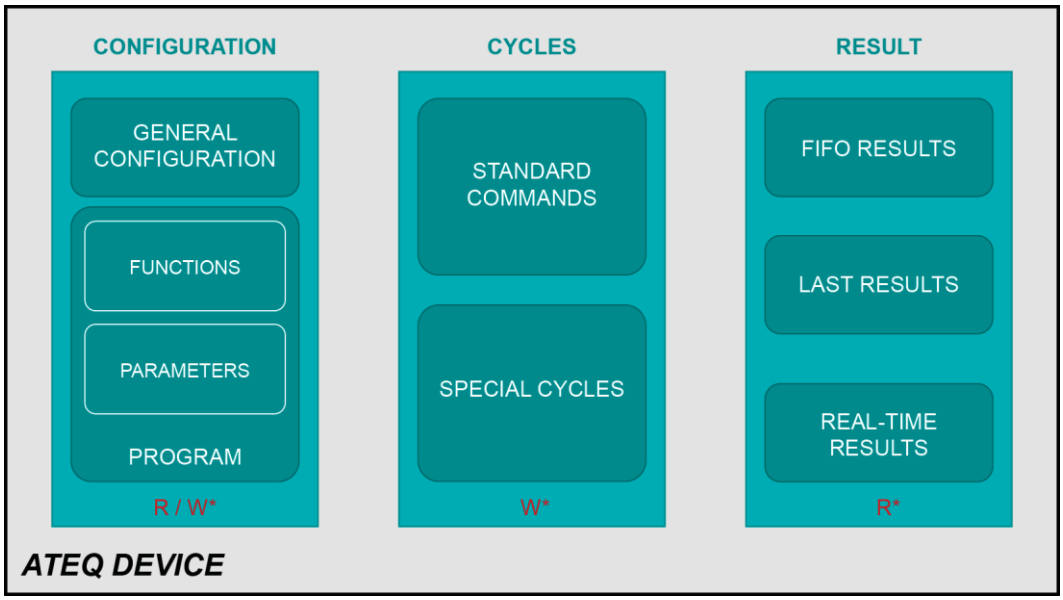
The parameters configuration must be like the following ones:

- Input_Data: IB = 16 bytes
- Output_Data: QB = 16 bytes



Functional description of an ATEQ device

INTRODUCTION



- R/W*: reading and writing
- W*: writing only
- R*: reading only

Write table

Writing table structure

0x00 0x01		Commands
0x02 0x04		Reserved
0x06 0x09		The program number (Running and Edit) Special cycle
0x0A 0x1F		Reserved
0x20		Exchange table: Config Bits or Functions Bits or Parameters

Details writing table structure

Address (bytes)	Description
00h Commands	Bit 0 = 1 > Reset (stop the current cycle).
	Bit 1 = 1 > Start (starting a test cycle).
	Bit 2 = 1 > Special cycle (start a special cycle, example: regulator adjust).
	Bit 3 = 1 > Program selection.
	Bit 4 = 1 > Read the FIFO cycles results (the FIFO contains the 8 lasts results, standard mode only).
	Bit 5 = 1 > Read of the parameters.
	Bit 6 = 1 > Write of the parameters.
	Bit 7 = 1 > Reset of the results FIFO (reset all available results in the FIFO).
01h Commands	Bit 0 = 1 > Read of the instrument configuration.
	Bit 1 = 1 > Read of the configuration / extended menu bits.
	Bit 2 = 1 > Read of the function bits.
	Bit 3 = 1 > Write of the configuration / extended menu bits.
	Bit 4 = 1 > Write of the function bits.
	Bit 5 = 1 > Read of the program name.
	Bit 6 = 1 > Write of the program name.
	Bit 7 = 1 > Read last result.
02h – 05h	*Reserved*.
06h – 07h	Address 06h: Number of the program to be selected. Address 07h = 0.
08h – 09h	Address 08h: Special cycle. Address 09h=0.
0Ah – 0Fh	*Reserved*.

Read table

Reading table structure

0x00 0x0F		State of the unit: Echo / Error code command Status Current program Number of results available Program step
0x10 0x1F		Real time measurements.
0x20		Exchange table: FIFO Results or Last Result or Parameters

Results status: (@: 00h – 0Fh)

Echo: Acknowledgement of delivery of the master command allowing to determinate in which state is the slave (current command or command realised).
Error code: In case of command execution error, the corresponding command error bit is activated.

Address (bytes)	Description
00h Echo	Bit 0 = 1 > Echo reset.
	Bit 1 = 1 > Echo start.
	Bit 2 = 1 > Echo special cycle.
	Bit 3 = 1 > Echo program selection.
	Bit 4 = 1 > Echo reading of the results FIFO.
	Bit 5 = 1 > Echo reading of the parameters.
	Bit 6 = 1 > Echo writing of the parameters.
	Bit 7 = 1 > Echo reset of the results FIFO.
01h Echo	Bit 0 = 1 > Echo reading of the instrument configuration.
	Bit 1 = 1 > Echo reading of the configuration / extended menu bits.
	Bit 2 = 1 > Echo reading of the function bits.
	Bit 3 = 1 > Echo writing of the configuration / extended menu bits.
	Bit 4 = 1 > Echo writing of the function bits.
	Bit 5 = 1 > Echo reading of the program name.
	Bit 6 = 1 > Echo writing of the program name.
	Bit 7 = 1 > Echo reading last result.
02h Error code (≠ FFh)	Bit 0 = 1 > Reset error.
	Bit 1 = 1 > Start error.
	Bit 2 = 1 > Special cycle error.
	Bit 3 = 1 > Program selection error.
	Bit 4 = 1 > Reading of the results FIFO error.
	Bit 5 = 1 > Reading of the parameters error.
	Bit 6 = 1 > Writing of the parameters error.
	Bit 7 = 1 > Reset of the results FIFO error.
03h Error code (≠ FFh)	Bit 0 = 1 > Reading of the instrument configuration error.
	Bit 1 = 1 > Reading of the configuration bits error.
	Bit 2 = 1 > Reading of the function bits error.
	Bit 3 = 1 > Writing of the configuration bits error.
	Bit 4 = 1 > Writing of the function bits error.
	Bit 5 = 1 > Reading of the program name error.
	Bit 6 = 1 > Writing of the program name error.
	Bit 7 = 1 > Reading last result error.
04h – 05h	*Reserved*.
06h – 07h	Current program in use.
08h – 09h	Number of results in FIFO (quantity of available results recorded in the FIFO).
0Ah – 0Bh	Type of test in progress.

Address (bytes)	Description
0Ch – 0Dh Real time test results	Bit 0 = 1 > Pass part. (OK)
	Bit 1 = 1 > Fail test part. (NOK)
	Bit 2 = 1 > Fail reference part. (NOK)
	Bit 3 = 1 > Alarm.
	Bit 4 = 1 > Pressure error.
	Bit 5 = 1 > Cycle end (system ready).
	Bit 6 = 1 > Part recoverable.
	Bit 7 = 1 > Calibration error.
	Bit 0 = 1 > *Not used*.
	Bit 1 = 1 > ATR fault.
	Bit 2 to 7 > *Not used, all always at 0*.
0Eh – 0Fh	Program step in progress.

Real time measurements: (@: 10h – 1Fh)

Address (bytes)	Description
10h – 13h	Pressure current value Example: reading of 524000 (7FEE0h) = 524 x 1000, thus the real value is 524.
14h – 17h	Pressure unit code Example: reading 6000 (1770h) = 6 x 1000, thus the value is 6 which corresponds to Pa (see Unit table).
18h – 1Bh	Flow current value Examples: reading 20000 (4E20h) = 20 x 1000, thus the real value is 20 reading - 108 (FFFFFF94h) = - 0.108 x 1000, thus the real value is - 0.108 (see Basic notions)
1Ch – 1Fh	Flow unit code Example: reading 8000 (1F40h) = 8 x 1000 thus the value is 8, which corresponds to the Pa/s unity.

Exchange zone: (@: 20h – 9Fh)

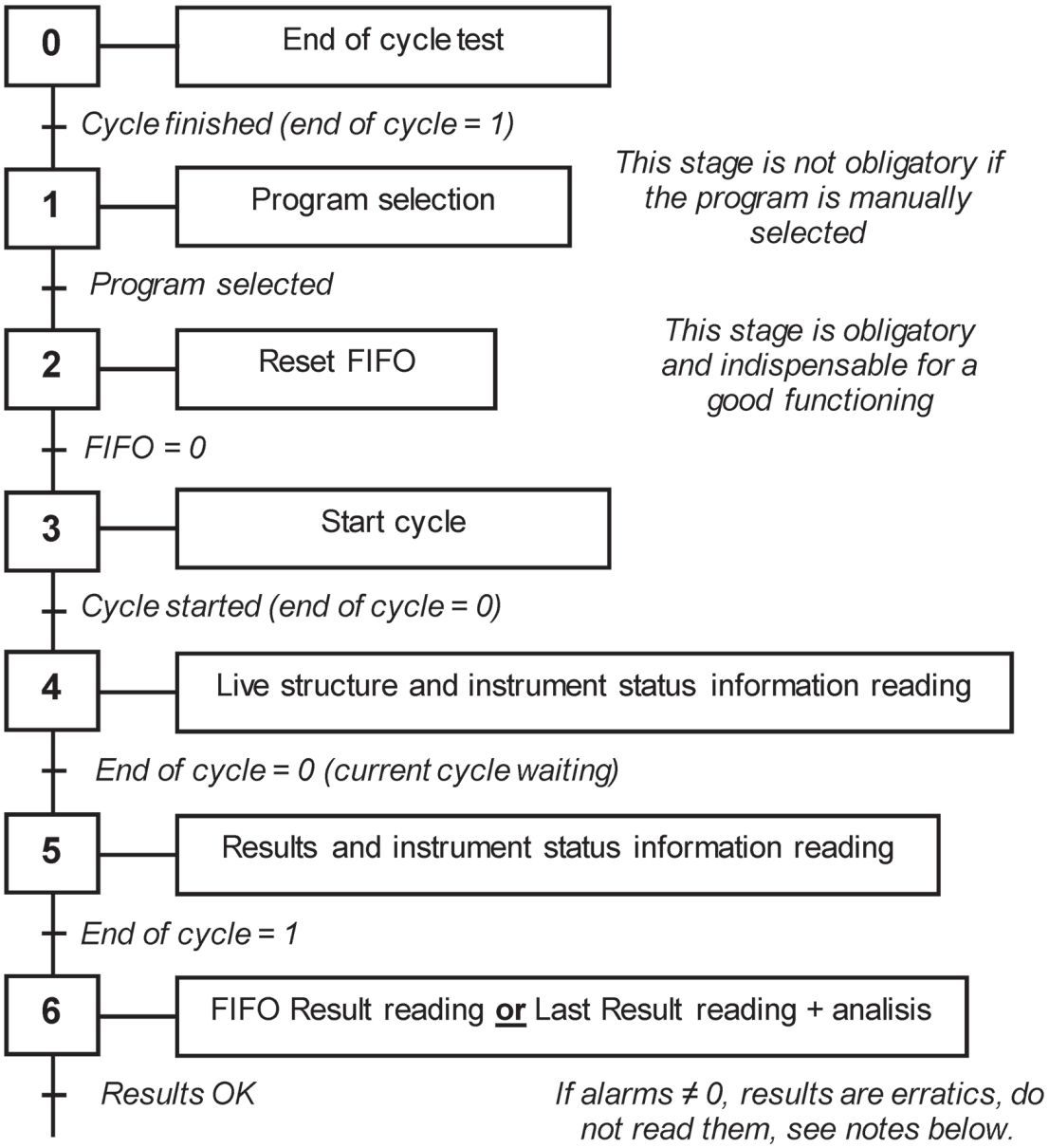
Address (bytes)	Description
20h – 9Fh	Cycle results exchange zone. Parameters reading and writing exchange zone.

Treatment of the commands

Reminder: "h" indicates a hexadecimal code, "(d)" indicates a decimal code.

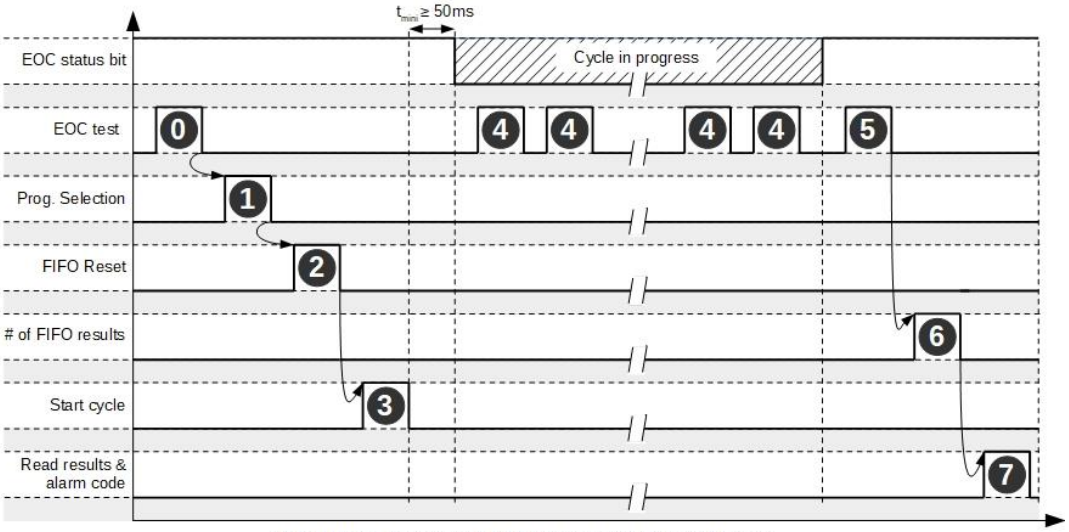
ATEQ device using

Base procedure for using an ATEQ instrument.



If the number of results in the FIFO = 0, the results are erratic, **do not read them.**
If there's an alarm bit, read the alarm code and **do not use the measurements results (erratic results).**

Fieldbus progress chart



WARNING : The status bits update rate is about 50ms

0 : Read @0Ch – 0Dh : Status bit 5 = 1 (EOC status bit)

1 : Write @06h : 1 word = n° prog (0001h = prog 2)
Write @00h : bit 3 = 1 (command « Prog. Selection »)

2 : **ALWAYS RESET THE FIFO**
Write @00h : bit 7 = 1 (command « Reset FIFO »)

3 : Write @00h : bit 1 = 1 (command « Start »)
t_{mini} ≥ 50ms

4 : Read @0Ch – 0Dh : Status bit 5 = 0 (EOC status bit)

5 : Read @0Ch – 0Dh : Status bit 5 = 1 (EOC status bit)

Use of FIFO Results

6 : Read the number of results in FIFO :
Read @08h – 09h : **if > 0** go to step 7, **else** END

7 : Write @00h : bit 4 = 1 (command « Read FIFO results »)
Read @20h : 12 words (size of standard results)
if Alarm Code = 0 go to step 8, **else** END

8 : Use the results recovered at step 7 (if Alarm code was equal to 0)

Use of Last Results

6 : *Read the number of results in FIFO :*
Read @08h – 09h : **if ≥ 1** go to step 7, **else** END

7 : Write @01h : bit 7 = 1 (command « Read Last results »)
Read @20h : 12 words (size of standard results)
if Alarm Code = 0 go to step 8, **else** END

8 : Use the results recovered at step 7 (if Alarm code was equal to 0)

General configuration

Table of the configuration / extended menus bits

Reminder: "h" indicates a hexadecimal code, "(d)" indicates a decimal code.

The bits below are mostly present in the **CONFIGURATION** or **More functions...** menus.
They are only used to allow the access to other parameters according to the configuration, depending on the configuration, these are active or not.

Acronyms used in the "Menu" column:

- Conf: CONFIGURATION
- +Func: FUNCTIONS > More functions...
- RS232: CONFIGURATION > RS232

Word	Bit n°	Mask		Meaning	Menu
		Hexa	Dec		
1	0	0001	1	Fill type.	+Func
	1	0002	2	Pre-fill type.	+Func
	2	0004	4	Recovery thresholds.	+Func
	3	0008	8	Volume calculation	+Func
	4	0010	16	Personalization of the program name.	+Func
	5	0020	32	Chaining.	+Func
	6	0040	64	Automatic connector.	+Func
	7	0080	128	Valves codes (outputs codes)	+Func
	8	0100	256	Stamping.	+Func
	9	0200	512	Sending conditions: pass part	RS232
	10	0400	1024	Sending conditions: fail part maximum flow	RS232
	11	0800	2048	Sending conditions: presence of an alarm	RS232
	12	1000	4096	Sending conditions: pressure defect	RS232
	13	2000	8192	Sending conditions: end of cycle	RS232
	14	4000	16384	Sending conditions: recoverable	RS232
	15	8000	32768	Content of the frame: time	RS232

Word	Bit n°	Mask		Meaning	Menu
		Hexa	Dec		
2	16	0001	1	Content of the frame: personalization	RS232
	17	0002	2	Content of the frame: pressure	RS232
	18	0004	4	Security	Conf
	19	0008	8	External dump	Conf
	20	0010	16	Exportation	RS232
	21	0020	32	Automatic reset	Conf
	22	0040	64	*Reserved*	
	23	0080	128	*Reserved*	
	24	0100	256	*Reserved*	
	25	0200	512	Automatic start	+Funct
	26	0400	1024	Cut valve	Conf
	27	0800	2048	Filtering	+Funct
	28	1000	4096	*Reserved*	
	29	2000	8192	Pressure compensation	+Funct
	30	4000	16384	*Reserved*	
	31	8000	32768	Line feed (label)	RS232
3	32	0001	1	End of cycle	+Funct
	33	0002	2	Unit type	+Funct
	34	0004	4	Bar graph display	Conf
	35	0008	8	Negative rejects level	Conf
	36	0010	16	*Reserved*	
	37	0020	32	Bar code	RS232
	38	0040	64	Program selection bar code	
	39	0080	128	Bar code reset on end of cycle	
	40	0100	256	Auxiliary code activation	+Funct
	41	0200	512	Standard conditions	+Funct
	42	0400	1024	*Reserved*	
	43	0800	2048	Service cycle activation	
	44	1000	4096	Sign change activation	+Funct
	45	2000	8192	Peak hold	+Funct
	46	4000	16384	Negative flow display	+Funct
	47	8000	32768	*Reserved*	

Word	Bit n°	Mask		Meaning	Menu
		Hexa	Dec		
4	48	0001	1	Buzzer	+Funct
	49	0002	2	Display mode activation	+Funct
	50	0004	4	Sending conditions: fail part minimum flow	RS232
	51	0008	8	Offset	+Funct
	52	0010	16	Minimum flow activation	+Funct

Example: bit number 13 (automatic mode) activated to 1, will place to "2000h" the value in the first word.
2000h is equivalent to 8192 in decimal and 0010000000000000 in binary.
In the Modbus frame, the words will follow each other: word 1 + word 2 + ... + word n.

Reading of the configuration / extended menu bits

Master	Slave
— Activate the “Read extended menu bits” command: Write at the address 00(h), the value **0200(h)** Byte 0 = 00(h) Byte 1 = 02(h) (Bit 1 = 1)	
	Acknowledgement Command echo: — Byte 0 = 00(h) — Byte 1 = 02(h) (Bit 1 = 1) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Read extended menu bits” command
	Command finished Command echo: — Byte 0 = 00(h) — Byte 1 = 02(h) (Bit 1 = 1) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 00(h) — Byte 3 = 02(h) (Bit 1 = 1)
— Wait the end of the command: command echo = 0200(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Read extended menu bits” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) Byte 1 = 00(h) (Bit 1 = 0)	
— Read the configuration bits at the address 20h of X Words or read the function bits at the address 20h of X Words.	

The configuration / extended menu bits are defined in the table above for the “Extended menus” of each specific chapter for the instruments.

The configuration / extended menu bits are independents of the program number.

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Writing of the configuration / extended menu bits

Master	Slave
— Write the extended menu bits at the address 20(h) — Activate the “Write extended menu bits” command: Write at the address 00(h), the value **0800(h)** Byte 0 = 00(h) Byte 1 = 08(h) (Bit 3 = 1)	
	<u>Acknowledgement</u> Command echo: — Byte 0 = 00(h) — Byte 1 = 08(h) (Bit 3 = 1) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Write extended menu bits” command
	<u>Command finished</u> Command echo: — Byte 0 = 00(h) — Byte 1 = 08(h) (Bit 3 = 1) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 00(h) — Byte 3 = 08(h) (Bit 3 = 1)
— Wait the end of the command: command echo = 0800(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Write extended menu bits” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) Byte 1 = 00(h) (Bit 3 = 0)	

The configuration / extended menu bits are defined in the table above for the “Extended menus” of each specific chapter for the instruments.

The configuration / extended menu bits are independents of the program number.

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Program

Program selection command on the ATEQ device

Master	Slave
— Write 1 word at the address 06(h) corresponding to the program number to be selected: @06(h) = 0001(h) (= program n°2) — Activate the “Program selection” command: Write at the address 00(h), the value **0008(h)** Byte 0 = 08(h) (Bit 3 = 1) Byte 1 = 00(h)	
	Acknowledgement Command echo: — Byte 0 = 08(h) (Bit 3 = 1) — Byte 1 = 00(h) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Program selection” command
	Command finished Command echo: — Byte 0 = 08(h) (Bit 3 = 1) — Byte 1 = 00(h) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 08(h) (Bit 3 = 1) — Byte 3 = 00(h)
— Wait the end of the command: command echo = 0008(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Program selection” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) (Bit 3 = 0) Byte 1 = 00(h)	

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Function

Table of the function bits

Table of the function bits per program.

Reminder: “h” indicates a hexadecimal code, “(d)” indicates a decimal code.

The bits below are present in the **FUNCTIONS** menu of each program, if these have been previously validated in the **More functions...** menu.

Word	Bit n°	Mask		Meaning	Menu
		Hexa	Dec		
1	0	0001	1	Fill type activation	Funct
	1	0002	2	Pre-fill type activation	Funct
	2	0004	4	Recovery thresholds activation	Funct
	3	0008	8	Cycle end activation	Funct
	4	0010	16	Cycle end with reset and piezo reset activation	
	5	0020	32	Cycle end with dump and reset activation	
	6	0040	64	Cycle end with fill activation	
	7	0080	128	Chaining activation	Funct
	8	0100	256	Pass part chaining activation	
	9	0200	512	Fail part maximum flow chaining activation	
	10	0400	1024	Alarm chaining activation	
	11	0800	2048	Pressure switch error chaining activation	
	12	1000	4096	Cycle end chaining activation	
	13	2000	8192	Recovery chaining activation	
	14	4000	16384	Automatic connector chaining activation	Funct
	15	8000	32768	Valve code activation	
2	16	0001	1	Valve code ext. 1 activation	
	17	0002	2	Valve code ext. 2 activation	
	18	0004	4	Valve code ext. 3 activation	
	19	0008	8	Valve code ext. 4 activation	
	20	0010	16	Valve code ext. 5 activation	
	21	0020	32	Valve code ext. 6 activation	
	22	040	64	Valve code int. 1 activation	
	23	0080	128	Valve code int. 8 activation	
	24	0100	256	Stamping activation	Funct
	25	0200	512	Pass part stamping activation	
	26	0400	1024	Fail part maximum flow stamping activation	
	27	0800	2048	Alarm stamping activation	
	28	1000	4096	Pressure switch error stamping activation	
	29	2000	8192	Cycle end stamping activation	
	30	4000	16384	Recovery stamping activation	
	31	8000	32768	External dump activation	Funct

Word	Bit n°	Mask		Meaning	Menu
		Hexa	Dec		
3	32	0001	1	Reserved	
	33	0002	2	Automatic start cycle activation	Funct
	34	0004	4	Pressure compensation activation	Funct
	35	0008	8	Filtering activation	Funct
	36	0010	16	Standard conditions activation	Funct
	37	0020	32	Bar code activation	
	38	0040	64	Start after reading bar code	
	39	0080	128	Auxiliaries code activation	
	40	0100	256	Auxiliary code 1 activation	
	41	0200	512	Auxiliary code 2 activation	
	42	0400	1024	Auxiliary code 3 activation	
	43	0800	2048	Auxiliary code 4 activation	
	44	1000	4096	Optional auxiliaries code activation	
	45	2000	8192	Optional auxiliary code 1 activation	
	46	4000	16384	Optional auxiliary code 2 activation	
	47	8000	32768	Optional auxiliary code 3 activation	
4	48	0001	1	Optional auxiliary code 4 activation	
	49	0002	2	Optional valve code activation	
	50	0004	4	Optional valve code ext. 1 activation	
	51	0008	8	Optional valve code ext. 2 activation	
	52	0010	16	Optional valve code ext. 3 activation	
	53	0020	32	Optional valve code ext. 4 activation	
	54	0040	64	Optional valve code ext. 5 activation	
	55	0080	128	Optional valve code ext. 6 activation	
	56	0100	256	Optional valve code int. 1 activation	
	57	0200	512	Optional valve code int. 2 activation	
	58	0400	1024	Sign change activation	Funct
	59	0800	2048	Peak hold activation	Funct
	60	1000	4096	Negative flow display activation	Funct
	61	2000	8192	Buzzer activation	
	62	4000	16384	Cycle end buzzer activation	
	63	8000	32768	Pass part buzzer activation	

Word	Bit n°	Mask		Meaning	Menu
		Hexa	Dec		
5	64	0001	1	Fail part maximum flow buzzer activation	
	65	0002	2	Alarm buzzer activation	Funct
	66	0004	4	Automatic mode activation	Funct
	67	0008	8	Reserved	
	68	0010	16	Reserved	
	69	0020	32	Reserved	
	70	0040	64	Offset activation	Funct
	71	0080	128	Minimum flow activation	Funct

Example: bit number 46 (Offset function) activated on 1, will put to "4000h" the value in the third word.
4000h is equivalent to 16384 in decimal and 0100000000000000 in binary.
In the Modbus frame, the words will follow as such: word 1 + word 2 + ….. + word n.

Reading of the function bits

Master	Slave
— Select the program number on which the functions bits have to be read — Activate the “Read functions bits” command: Write at the address 00(h), the value **0400(h)** Byte 0 = 00(h) Byte 1 = 04(h) (Bit 2 = 1)	
	Acknowledgement Command echo: — Byte 0 = 00(h) — Byte 1 = 04(h) (Bit 2 = 1) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Read functions bits” command
	Command finished Command echo: — Byte 0 = 00(h) — Byte 1 = 04(h) (Bit 2 = 1) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 00(h) — Byte 3 = 04(h) (Bit 2 = 1)
— Wait the end of the command: command echo = 0400(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Read functions bits” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) Byte 1 = 00(h) (Bit 2 = 0)	
— Read the functions bits at the address 20(h) of X words.	

The functions bits are dependents of the program number.
A program selection has to be realised before executing command.

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Writing of the function bits

Master	Slave
— Select the program number on which the functions bits have to be read. — Write the functions bits at the address 20(h) — Activate the “Write functions bits” command: Write at the address 00(h), the value **1000(h)** Byte 0 = 00(h) Byte 1 = 10(h) (Bit 4 = 1)	
	<u>Acknowledgement</u> Command echo: — Byte 0 = 00(h) — Byte 1 = 10(h) (Bit 4 = 1) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Write functions bits” command
	<u>Command finished</u> Command echo: — Byte 0 = 00(h) — Byte 1 = 10(h) (Bit 4 = 1) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 00(h) — Byte 3 = 10(h) (Bit 4 = 1)
— Wait the end of the command: command echo = 1000(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Write functions bits” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) Byte 1 = 00(h) (Bit 4 = 0)	

The functions bits are dependents of the program number.
A program selection has to be realised before executing command.

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Parameters

Downloading of the parameters

All the parameters values below have a tratment by the ATEQ device as **Long** format with fixed comma (10^{-3}). A **Long** is a two words set.

Identifier N°		Meaning	Value	
Dec	Hexa			
1	0001	"FILL TIME" Fill time	0 > 650 seconds	
2	0002	"STAB TIME": Stabilization time	0 > 650 seconds	
3	0003	"TEST TIME" Test time	0 > 650 seconds	
6	0006	"PRE FILL" Pre fill time	0 > 650 seconds	
9	0009	"DUMP TIME" Dump time	0 > 650 seconds	
10	000A	"COUPL. A": Coupling time 1	0 > 650 seconds	
11	000B	"COUPL. B": Coupling time 2	0 > 650 seconds	
20	0014	"VOLUME" Part volume.	0 > 9999	
21	0015	"TYPE": Test type	Invalid Direct Operator	0000 1000 2000
29	001D	"Inter-Cycle": Time between 2 chained cycles	0 > 650 seconds	
48	0030	"DURATION" Maintain time of the result during stamp	0 > 650 seconds	
50	0032	"Min FILL" Minimum pressure value	- 9999 > 9999.	
51	0033	"Max FILL" Maximum pressure value	- 9999 > 9999.	
53	0035	"Press. UNIT" Pressure unit.	Refer to Unit table.	
60	003C	"Test FAIL" Natural reject value of the test part	0 > 9999	
61	003D	"TestREWORK" Natural reject level of the test part in recovery	0 > 9999	
62	003E	"Ref. FAIL" Natural reject level of the reference part	0 > 9999	
63	003F	"Ref.REWORK" Natural reject value of the reference part in recovery:	0 > 9999	
66	0042	"Set FILL" Fill instruction value:	-9999 > 9999	

Identifier N°		Meaning	Value	
Dec	Hexa			
80	0050	“Diff A-Z” Differential auto reset time.	0 > 650 seconds	
103	0067	“FILL MODE” Type of fill.	Standard Instruction Ballistic Ramp Adjust EASY EASY Auto	0000 1000 2000 3000 4000 5000 6000
110	006E	“EXT. DUMP” Type of external dump.	Normally close Normally open	0000 1000
112	0070	‘IN7:” Function attributed to the entry of the special cycles (output 7)	Refer to the “Configure input value” table at the end of the chapter	
123	007B	“LANGUAGE” Choice of the language.	Default language 2nd language	0000 1000
126	007E	“Max PreFILL” Maximum pressure value in pre-fill.	-9999 > 9999	
127	007F	“Flow Unit” Reject unit.	Refer to Unit table.	
128	0080	“Leak Rate” Instruction value during a calibration.	0 > 9999	
148	0094	“FILTER” Filtering.	0 > 650 seconds	
149	0095	“UNITS” Unit type	SI SAE CUSTOM	0000 1000 2000
158	009E	“Max rej.” Percents of the bar graph.	70% 50% 30%	0000 1000 2000
161	00A1	“Volume UNIT” Volume unit.	Refer to Unit table.	
164	00A4	“NEXT PROG.” Number of the following program in sequencing.	1 > 128	
165	00A5	“N. OF CYCLES”(PIEZO AUTO AZ menu) Number of cycles between two automatic reset.	0 > 9999	
166	00A6	“N. OF MINUTES”(PIEZO AUTO AZ menu) Time between two automatic reset.	0 > 999 minutes	
249	00F9	“DELAY EXT1” Programmed external output 1 delay time.	0 > 650 seconds	
250	00FA	“DELAY EXT2” Programmed external output 2 delay time.	0 > 650 seconds	
251	00FB	“DELAY EXT3” Programmed external output 3 delay time.	0 > 650 seconds	
252	00FC	“DELAY EXT4” Programmed external output 4 delay time.	0 > 650 seconds	
253	00FD	“DELAY EXT5” Programmed external output 5 delay time.	0 > 650 seconds	
254	00FE	“DELAY EXT6” Programmed external output 6 delay time.	0 > 650 seconds	

Identifier N°		Meaning	Value	
Dec	Hexa			
255	00FF	“DELAY INT2” Programmed internal output 2 delay time.	0 > 650 seconds	
256	0100	“DELAY INT1” Programmed internal output 1 delay time.	0 > 650 seconds	
257	0101	“DELAY AUX1” Programmed auxiliary output 1 delay time.	0 > 650 seconds	
258	0102	“DELAY AUX2” Programmed auxiliary output 2 delay time.	0 > 650 seconds	
259	0103	“DELAY AUX3” Programmed auxiliary output 3 delay time.	0 > 650 seconds	
260	0104	“DELAY AUX4” Programmed auxiliary output 4 delay time.	0 > 650 seconds	
261	0105	“TIME EXT1” Programmed external output 1 duration time.	0 > 650 seconds	
262	0106	“TIME EXT2” Programmed external output 2 duration time.	0 > 650 seconds	
263	0107	“TIME EXT3” Programmed external output 3 duration time.	0 > 650 seconds	
264	0108	“TIME EXT4” Programmed external output 4 duration time.	0 > 650 seconds	
265	0109	“TIME EXT5” Programmed external output 5 duration time.	0 > 650 seconds	
266	010A	“TIME EXT6” Programmed external output 6 duration time.	0 > 650 seconds	
267	010B	“TIME INT2” Programmed internal output 2 duration time.	0 > 650 seconds	
268	010C	“TIME INT1” Programmed internal output 1 duration time.	0 > 650 seconds	
269	010D	“TIME AUX1” Programmed auxiliary output 1 duration time.	0 > 650 seconds	
270	010E	“TIME AUX2” Programmed auxiliary output 2 duration time.	0 > 650 seconds	
271	010F	“TIME AUX3” Programmed auxiliary output 3 duration time.	0 > 650 seconds	
272	0110	“TIME AUX4” Programmed auxiliary output 4 duration time.	0 > 650 seconds	
274	0112	“FILTER” Pressure filtering.	0 > 650 seconds	
281	0119	“RANGE” Capillary number with dual capillaries option only:	Capillary 1 Capillary 2	0000 1000
287	011F	“First Char.” Start on bar code.	0 > 40	
288	0120	“Char. Number” Number of character of bar code.	0 > 40	
289	0121	“Pr “ Program bar code.	1 > 128	
353	0161	“Press. UNIT” (configuration/pneumatique menu) General pressure unit	Refer to Unit table.	
354	0162	“LINE P. MIN” Minimum line pressure level	-9999 > 9999	

Identifier N°		Meaning	Value	
Dec	Hexa			
364	016C	“DISPLAY MODE“ Leak display management	XXXX XXX.X XX.XX X.XXX	0000 1000 2000 3000
375	0177	‘IN8:” Function attributed to the entry of the special cycles (output 8)	Refer to the “Configure input value” table at the end of the chapter	
376	0178	‘IN9:” Function attributed to the entry of the special cycles (output 9)	Refer to the “Configure input value” table at the end of the chapter	
379	017B	“USB:” USB mode (printer or supervision)	Supervision Printer Bar code Auto None	0000 1000 2000 3000 4000
412	019C	“SAVE ON” Mode of Results stocking.	None Internal USB	0000 1000 2000
413	019D	“ACCESS” Access parameters mode.	None USB Password	0000 1000 2000
414	019E	“YEAR” Year configuration.	2000 > 9999	
415	019F	“MONTH” Month configuration.	1 > 12	
416	01A0	“DAY” Day configuration.	1 > 31	
417	01A1	“HOUR” Hour configuration.	0 > 59	
418	01A2	“MINUTE” Minute configuration.	0 > 59	
419	01A3	“SECOND” Second configuration.	0 > 59	
459	01CB	“N. OF CYCLES” Number of learning cycle	2 > 9999	
460	01CC	“INTER-CYCLE” Time between 2 learning cycle	0 > 650 seconds	
461	01CD	“MAX OFFSET” Offset max for learning cycle	0 > 9999	
462	01CE	“FLOW MASTER” Value of Flow master for learning cycle	0 > 9999	
463	01CF	“PRESS MASTER” Value of Pressure master for learning cycle	-9999 > 9999	
464	01D0	“Min. Vol.” Minimum Volume for learning	0 > 9999	
465	01D1	“Max. Vol.” Maximum Volume for learning	0 > 9999	
486	01E6	“OFFSET” Offset Learning	-9999 > 9999	

Configurable input values

Input value	Value code
Program Selection	0000
Capil. Temp. Check (*)	10000
Temperature Check (*)	11000
Atm Pressure Check (*)	12000
P1 Sensor Check (*)	13000
Flow Check Cap 1(*)	14000
Flow Check Cap 2(*)	15000
Line P. Sensor Check (*)	16000
Regulator Adjust.	17000
Infinite Fill	18000
Piezo Az	19000
Code Reader	20000
Pre-Regul. Adjust.	21000
Print Results	22000
Volume Comp.	23000
Leak Offset Learn	24000
Offset+Vol. Learn	25000

(*) Available when the **Service special cycle** function is checked.

Unit table

This list gives all the units used in the instrument in hexadecimal code.

Unit code		Unit
Decimal	Hexadecimal	
0000	0000	cm^3/s
1000	03E8	cm^3/min
2000	07D0	cm^3/h
6000	1770	Pascal
11000	2AF8	Bar
12000	2EE0	Kilopascal
13000	32C8	PSI
14000	36B0	Millibar
15000	3A98	Megapascal
30000	7530	Liter/hour
46000	B3B0	$Inch^3/s$
47000	B798	$Inch^3/min$
48000	BB80	$Inch^3/hour$
49000	BF68	$Feet^3/hour$
50000	C350	Milliliter/second
51000	C738	Milliliter/minute
52000	CB20	Milliliter/hour
55000	D6D8	mm^3
56000	DAC0	cm^3
61000	EE48	Milliliter
62000	F230	Liter
63000	F618	$inch^3$
64000	FA00	$feet^3$
84000	01 4820	SCCM
92000	01 6760	Points

Reading of the parameters

The reading of the parameters is carried out by data exchange in the corresponding area depending on the configuration mode of the slave. Each parameter is identified by one identifier. See identifiers tables.

This table is an example based on the reading of two parameters:

- **Test time** (identifier number 3)
- **Stabilization time** (identifier number 2)

Master	Slave
— Select the program on which parameters has to be read — Write in the parameter area at the address 20(h), the number of parameters followed by their identifiers: On network: 02 00 03 00 02 00 0002(h) 0003(h) 0002(h) 0002(h) = two parameters 0003(h) = test time identifier 0002(h) = stabilization time identifier — Activate the “Read parameters” command: Write at the address 00(h), the value **0020(h)** Byte 0 = 20(h) (Bit 5 = 1) Byte 1 = 00(h)	
	Acknowledgement Command echo: — Byte 0 = 20(h) (Bit 5 = 1) — Byte 1 = 00(h) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Read parameters” command
	Command finished Command echo: — Byte 0 = 20(h) (Bit 5 = 1) — Byte 1 = 00(h) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 20(h) (Bit 5 = 1) — Byte 3 = 00(h)
— Wait the end of the command: command echo = 0020(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Read parameters” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) (Bit 5 = 0) Byte 1 = 00(h)	

Master	Slave
— Read the parameters at the address 20(h): Word 1 = identifier number of the first read parameter. Word 2 and Word 3 = first parameter value x1000 (long format). Word 4 = second identifier number of the read parameter. Word 5 and Word 6 = second parameter value x1000 (long format). **Example**: On network: 03 00 E8 03 00 00 02 00 F4 01 00 00 @20h = 0003h 03E8h 0000h 0002h 01F4h 0000h. - 0003h: test time identifier. - 000003E8h: test time value 1000(d)/1000 → 1 sec. - 0002h: fill time identifier. - 000001F4h: stabilization time value 500(d)/1000 → 0,5 sec.	

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Writing of the parameters

The writing of the parameters is carried out by data exchange in the corresponding area depending on the configuration mode of the slave. Each parameter is identified by one identifier. See identifiers tables.

This table is an example based on the reading of two parameters:

- **Test time** (identifier number 3)
- **Stabilization time** (identifier number 2)

Master	Slave
— Select the program on which the parameters have to be modified — Write in the parameter area at address 20(h), the number of parameters followed by their identifiers and their wanted value: **Example:** On network: 02 00 03 00 E8 03 00 00 02 00 D0 07 00 00 0002(h) 0003(h) 03E8(h) 0000(h) 0002(h) 07D0(h) 0000(h) 0002(h) = two parameters 0003(h) = test time identifier 000003E8(h) = 1000 => 1 second 0002(h) = stabilization time identifier 000007D0(h) = 2000 => 2 second — Activate the “Write parameters” command: Write at the address 00(h), the value **0040(h)** Byte 0 = 40(h) (Bit 6 = 1) Byte 1 = 00(h)	
	Acknowledgement Command echo: — Byte 0 = 40(h) (Bit 6 = 1) — Byte 1 = 00(h) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Write parameters” command
	Command finished Command echo: — Byte 0 = 40(h) (Bit 6 = 1) — Byte 1 = 00(h) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 40(h) (Bit 6 = 1) — Byte 3 = 00(h)

Master	Slave
— Wait the end of the command: command echo = 0040(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Write parameters” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) (Bit 6 = 0) Byte 1 = 00(h)	

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Reading of the program name

Master	Slave
— Select the program whose name you want to read — Activate the “Read program name” command: Write at the address 00(h), the value **2000(h)** Byte 0 = 00(h) Byte 1 = 20(h) (Bit 5 = 1)	
	Acknowledgement Command echo: — Byte 0 = 00(h) — Byte 1 = 20(h) (Bit 5 = 1) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Read program name” command
	Command finished Command echo: — Byte 0 = 00(h) — Byte 1 = 20(h) (Bit 5 = 1) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 00(h) — Byte 3 = 20(h) (Bit 5 = 1)
— Wait the end of the command: command echo = 2000(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Read program name” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) Byte 1 = 00(h) (Bit 5 = 0)	
— Read the program name of 12 characters/bytes maximum at the address 20(h):	

The program name is dependant of the program number in edition, a program selection has to be realized.

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Writing of the program name

Master	Slave
— Select the program whose name you want to modify — Write the program name of 12 characters/bytes maximum at the address 20(h). — Activate the “Write program name” command: Write at the address 00(h), the value **4000(h)** Byte 0 = 00(h) Byte 1 = 40(h) (Bit 6 = 1)	
	Acknowledgement Command echo: — Byte 0 = 00(h) — Byte 1 = 40(h) (Bit 6 = 1) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Write program name” command
	Command finished Command echo: — Byte 0 = 00(h) — Byte 1 = 40(h) (Bit 6 = 1) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 00(h) — Byte 3 = 40(h) (Bit 6 = 1)
— Wait the end of the command: command echo = 4000(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Write program name” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) Byte 1 = 00(h) (Bit 6 = 0)	

The program name is dependant of the program number in edition, a program selection has to be realized.

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

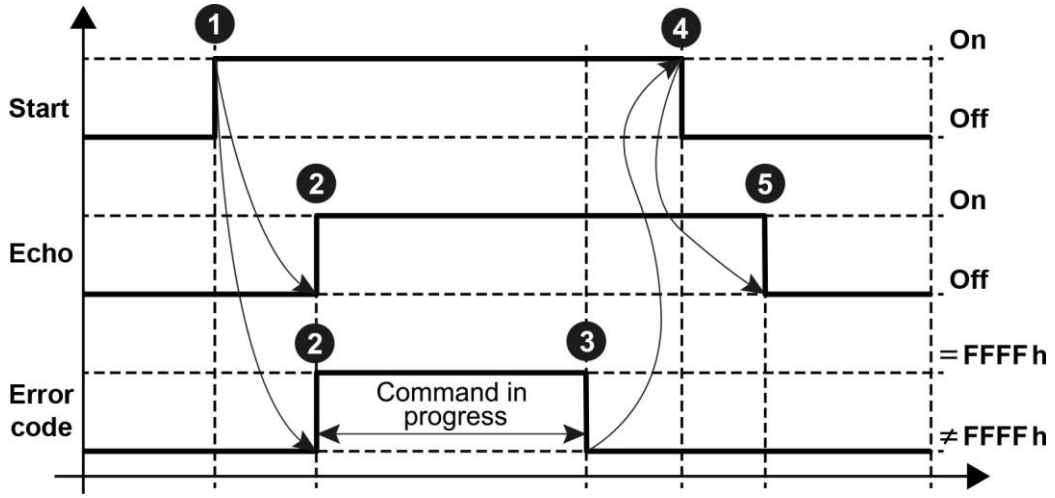
Standard command cycle

Start cycle command on the ATEQ device

Master	Slave
— Select the program you want to start — Activate the “Start” command: Write at the address 00(h), the value **0002(h)** Byte 0 = 02(h) (Bit 1 = 1) Byte 1 = 00(h)	
	Acknowledgement Command echo: — Byte 0 = 02(h) (Bit 1 = 1) — Byte 1 = 00(h) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Start” command
	Command finished Command echo: — Byte 0 = 02(h) (Bit 1 = 1) — Byte 1 = 00(h) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 02(h) (Bit 1 = 1) — Byte 3 = 00(h)
— Wait the end of the command: command echo = 0002(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Start” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) (Bit 1 = 0) Byte 1 = 00(h)	

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Start command diagram



1	**Start** command = On
2	Acknowledge by ATEQ = (**Echo** command = On) and (**Error code** command = FFFFh)
3	Wait end of **Start** command = (**Echo** command = On) and (**Error code** command ≠ FFFFh)
4	**Start** command = Off
5	Acknowledge by ATEQ = (**Echo** command = Off) and (**Error code** command ≠ FFFFh)

The Echo command is a copy of the Start command. The Start signal must be maintained (ON) till the end of the Start command condition is reached.

Reset command on the ATEQ device

Master	Slave
— Activate the “Reset” command: — Write at the address 00(h), the value **0001(h)** Byte 0 = 01(h) (Bit 0 = 1) Byte 1 = 00(h)	
	<u>Acknowledgement</u> Command echo: — Byte 0 = 01(h) (Bit 0 = 1) — Byte 1 = 00(h) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Reset” command
	<u>Command finished</u> Command echo: — Byte 0 = 01(h) (Bit 0 = 1) — Byte 1 = 00(h) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 01(h) (Bit 0 = 1) — Byte 3 = 00(h)
— Wait the end of the command: command echo = 0001(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Reset” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) (Bit 0 = 0) Byte 1 = 00(h)	

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Special cycles

Special cycle table

Write the identifier number of the wanted special cycle at the address 04(h) and its instruction if necessary.
@08(h) = identifier number of the special cycle
@09(h) = instruction for the special cycle

Numb	Special cycle
1	ATR learning Cycle.
4	Custom Unit Learn.
5	Custom Unit Check.
9	Piezo auto zero.
13	Regulator adjust.
25	Capil. Temp. Check (*).
26	Temperature Check (*).
27	Atm Pressure Check (*).
28	P1 Sensor Check (*).
29	Flow 1 Check (*).
30	Flow 2 Check (*).
31	Line P. Sensor check (*).

To activate a special cycle, you must send a **Start** command (Bit 1) and a **Start special cycle** command (Bit 2).
(*) Appears with the **Service special cycle** function checked.

Auto-zero on the ATEQ device

Master	Slave
— Select the program on which you want to make the auto zero — Write at the address 08(h) the identifier number of the special cycle for an auto zero — Activate the “Start” and the “Start special cycle” commands: Write at the address 00(h), the value **0006(h)** Byte 0 = 06(h) (Bit 1 = 1 and Bit 2 = 1) Byte 1 = 00(h)	
	<u>Acknowledgement</u> Command echo: — Byte 0 = 06(h) (Bit 1 = 1 and Bit 2 = 1) — Byte 1 = 00(h) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Start” and “Start special cycle” commands
	<u>Command finished</u> Command echo: — Byte 0 = 06(h) (Bit 1 = 1 and Bit 2 = 1) — Byte 1 = 00(h) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 06(h) (Bit 1 = 1 and Bit 2 = 1) — Byte 3 = 00(h)
— Wait the end of the command: command echo = 0006(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Start” and “Start special cycle” commands: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) (Bit 1 = 0 and Bit 2 = 0) Byte 1 = 00(h)	

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

FIFO results

FIFO list results structure

At the end of each cycle, a result is stored as an array of 12 words contained in a FIFO of 8 results.
This result includes the final state of the instrument (relays position, alarm signal, indicators state…), but also of the test (units, values measured for pressure and flow).
The results are in the memory of the instrument. To obtain them, it is necessary to carry out a “Read FIFO results” request.

Words	Meaning	Type	Bytes	Coeff
1	Program number.	Word	2	
2	Test type.	Word	2	
3	Image of the relays: Bit 0 = 1: pass part. Bit 1 = 1: fail part, maximum flow reject. Bit 2 = 1: fail part, minimum flow reject. Bit 3 = 1: alarm. Bit 4 = 1: unused. Bit 5 = 1: reserved. Bit 6 = 1: unused. Bit 7 = 1: unused.	Word	2	
4	Alarm code (refer to the alarm codes table).	Word	2	
5	Pressure low part word.	Long	4	x1000
6	Pressure high part word.			
7	Pressure unit code low part word (refer to units table).	Long	4	x1000
8	Pressure unit code high part word (refer to units table).			
9	Flow low section word.	Long	4	x1000
10	Flow high section word.			
11	Flow unit code low part word (refer to. Units table).	Long	4	x1000
12	Flow unit code high part word (refer to. Units table).			

All the numerical values are treated with **Long** format with fixed comma (10^{-3}). Thus, they must be multiplied by 1000 to get the value in units (see examples in “Basic notions” section).

Step table

This table represents the codes of the steps in the cycle.

Code		Steps
Decimal	Hexadecimal	
0	0000	Pre-fill.
1	0001	Fill
2	0002	Zero Diff.
3	0003	Stabilization
4	0004	Test
5	0005	Dump
65535	FFFF	No step in progress

Alarm codes table

This list gives all the alarms in hexadecimal code.

Identifier n°		Alarm
Decimal	Hexadecimal	
0	0000	No alarm.
1	0001	Pressure switched alarm (test pressure too high).
2	0002	Pressure switch (test pressure too small).
3	0003	Large leak on TEST (EEEE).
4	0004	Large leak on REF (MMMM).
7	0007	Sensor out of order (overrun).
43	002B	Pressure too high.
44	002C	Pressure too low.
45	002D	Piezo sensor out of order.
46	002E	Dump error.
47	002F	Calibration drift.
73	0049	Atmospheric pressure error.
74	004A	Temperature error.

Cycle results reading (last 8 results in FIFO)

Master	Slave
— Read the number of available results in the FIFO at the address 08(h): 08(h) = 0000(h) → no results 08(h) > 0000(h) → results available — Activate the “Read FIFO results” command: Write at the address 00(h), the value **0010(h)** Byte 0 = 10(h) (Bit 4 = 1) Byte 1 = 00(h)	
	Acknowledgement Command echo: — Byte 0 = 10(h) (Bit 4 = 1) — Byte 1 = 00(h) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Read FIFO results” command
	Command finished Command echo: — Byte 0 = 10(h) (Bit 4 = 1) — Byte 1 = 00(h) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 10(h) (Bit 4 = 1) — Byte 3 = 00(h)
— Wait the end of the command: command echo = 0010(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Read FIFO results” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) (Bit 4 = 0) Byte 1 = 00(h)	
— Read the result of 12 words at the address 20(h)	

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Reset FIFO results

This command resets the 8 last cycle's results available in the FIFO.

Master	Slave
— Activate the "Reset FIFO results" command: Write at the address 00(h), the value **0080(h)** Byte 0 = 80(h) (Bit 7 = 1) Byte 1 = 00(h)	
	Acknowledgement Command echo: — Byte 0 = 80(h) (Bit 7 = 1) — Byte 1 = 00(h) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running "Reset FIFO results" command
	Command finished Command echo: — Byte 0 = 80(h) (Bit 7 = 1) — Byte 1 = 00(h) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 80(h) (Bit 7 = 1) — Byte 3 = 00(h)
— Wait the end of the command: command echo = 0080(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the "Reset FIFO results" command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) (Bit 7 = 0) Byte 1 = 00(h)	

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Last results

Last results structure

At the end of each cycle, the last result is as an array of 12 words. This result includes the final state of the instrument (relays position, alarm signal, indicators state…), but also of the test (units, values measured for the pressure and the flow).
The last result is in the memory of the instrument. To obtain them, it is necessary to carry out a “Read last results” request.

Words	Meaning	Type	Bytes	Coeff
1	Program number.	Word	2	
2	Test type.	Word	2	
3	Image of the relays: Bit 0 = 1: pass part. Bit 1 = 1: fail part, maximum flow reject. Bit 2 = 1: fail part, minimum flow reject. Bit 3 = 1: alarm. Bit 4 = 1: unused. Bit 5 = 1: reserved. Bit 6 = 1: unused. Bit 7 = 1: unused.	Word	2	
4	Alarm code (refer to the alarm codes table).	Word	2	
5	Pressure low part word.	Long	4	x1000
6	Pressure high part word.			
7	Pressure unit code low part word (refer to units table).	Long	4	x1000
8	Pressure unit code high part word (refer to units table).			
9	Flow low section word.	Long	4	x1000
10	Flow high section word.			
11	Flow unit code low part word (refer to. Units table).	Long	4	x1000
12	Flow unit code high part word (refer to. Units table).			

All the numerical values are treated with **Long** format with fixed comma (10^{-3}). Thus, they must be multiplied by 1000 to get the value in units (see examples in “Basic notions” section).

Last results reading

For using this function, it is important to:
— Having done a start on the instrument before (“End of cycle” bit on in the relay status)
— Not having done a reset of the FIFO

Master	Slave
— Activate the “Read Last result” command: Write at the address 00(h), the value **8000(h)** Byte 0 = 00(h) Byte 1 = 80(h) (Bit 7 = 1)	
	Acknowledgement Command echo: — Byte 0 = 00(h) — Byte 1 = 80(h) (Bit 7 = 1) Command error code: — Byte 2 = FF(h) — Byte 3 = FF(h) (if command error code = FFFF(h), command is in progress)
	Running “Read Last result” command
	Command finished Command echo: — Byte 0 = 00(h) — Byte 1 = 80(h) (Bit 7 = 1) Command error code if the command is correctly carried out: — Byte 2 = 00(h) — Byte 3 = 00(h) OR if an error occurred during the command: — Byte 2 = 00(h) — Byte 3 = 80(h) (Bit 7 = 1)
— Wait the end of the command: command echo = 8000(h) command error code ≠ FFFF(h) (end of command)	
— Deactivate the “Read Last result” command: Write at the address 00(h) the value **0000(h)** Byte 0 = 00(h) Byte 1 = 00(h) (Bit 7 = 0)	

The master instrument must always set to zero the command bit. If it is not done, the slave instrument will not detect the following command on this bit. It has detection on the rising edge (when the bit state goes from 0 to 1).

Real time

Status and real time measures

The real time measurement is used for display curve or values during the cycle and not for the final measurement.

Do not take or use the final results in this section, it is just to see the status of the device for the “Cycle end” (bit 5) and “Key presence” (bit 15) information.
For the results, use only the FIFO list results structure or the Last results structure (see above)

Words	Meaning	Type	Bytes	Coeff
1	Program number.	Word	2	
2	Number of results waiting in the results FIFO memory.	Word	2	
3	Test type.	Word	2	
4	Status: Bit 0 = 1: pass part. Bit 1 = 1: fail part maximum flow. Bit 2 = 1: fail part minimum flow. Bit 3 = 1: alarm. Bit 4 = 1: pressure error.	Do not use these results while the Bit 5 (cycle end is not 1). Use only Bit 5 (cycle end) and Bit 15 (key presence).		
	Bit 5 = 1: cycle end.	Word	2	
	Bit 6 = 1: recoverable part. Bit 7 = 1: CAL error or drift. Bit 8 = 1: *Unused*. Bit 9 = 1: ATR error or drift. Bits 10 / 11 / 12 / 13 / 14 = 1: *Unused*. Bit 15 = 1: key presence.	Do not use these results while the Bit 5 (cycle end is not 1). Use only Bit 5 (cycle end) and Bit 15 (key presence).		
5	Step code (refer to steps table).	Word	2	
6	Low pressure section word.	Long	4	x1000
7	High pressure section word.			
8	Pressure unit code low part word (see units table).	Long	4	x1000
9	Pressure unit code high part word (see units table).			
10	Flow low section word.	Long	4	x1000
11	Flow high section word.			
12	Flow unit code low part word (refer to. Units table).	Long	4	x1000
13	Flow unit code high part word (refer to. Units table).			

Examples

Pressure value = 207
Pressure: Words 6 and 7
On network:

98	28	03	00

00032898h → 207000(d)/1000 → **207**

Flow value = -0.108
Flow: Words 10 and 11
On network:

94	FF	FF	FF

FFFFFF94h → -108(d)/1000 → **-0.108**