ATEQ

F6 Series – EtherCAT

Manual

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ATEQ Manufacturer Plants – Measurement Solution, Global Leader

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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 F6 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).

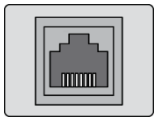
Your device has two RJ45 type connectors.

> 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.

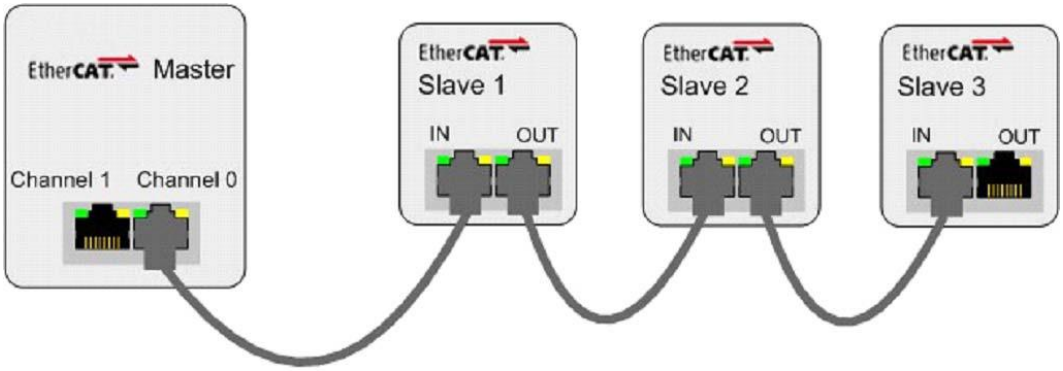


Figure 1: Standard Wiring in EtherCAT Network

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".

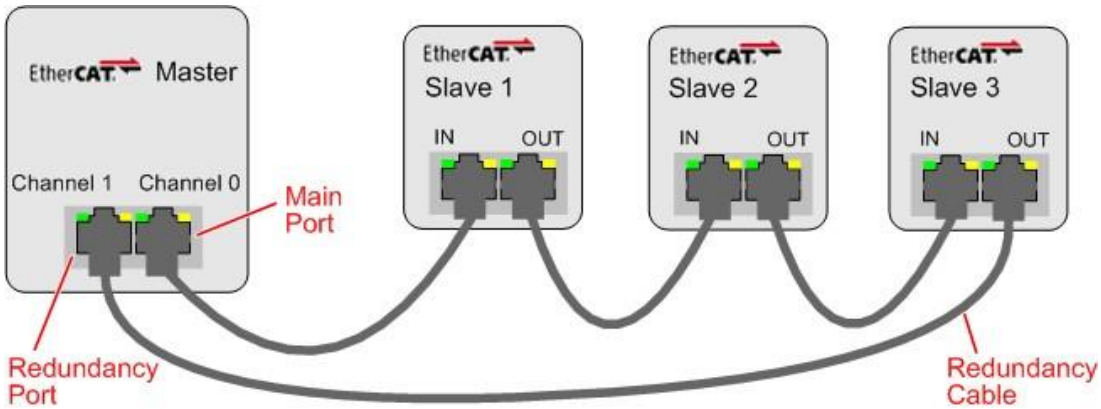


Figure 2: Redundant Wiring in EtherCAT Network

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.

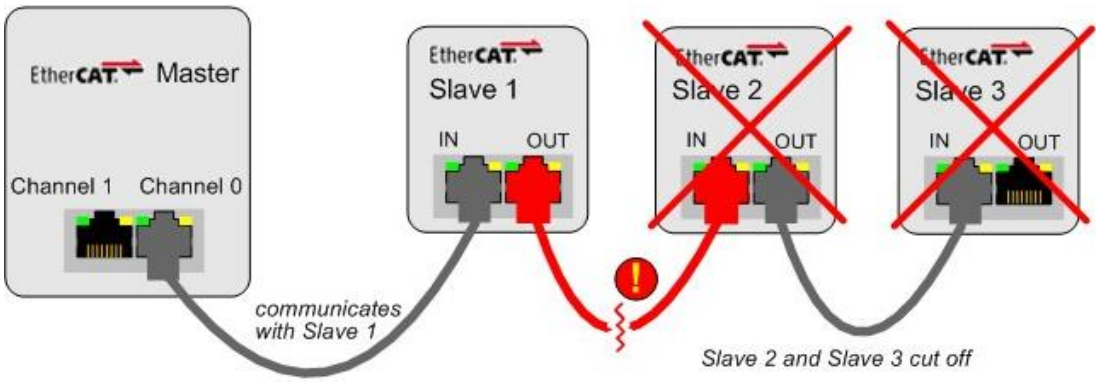


Figure 3: Cable Interrupt in Standard Wiring in EtherCAT Network

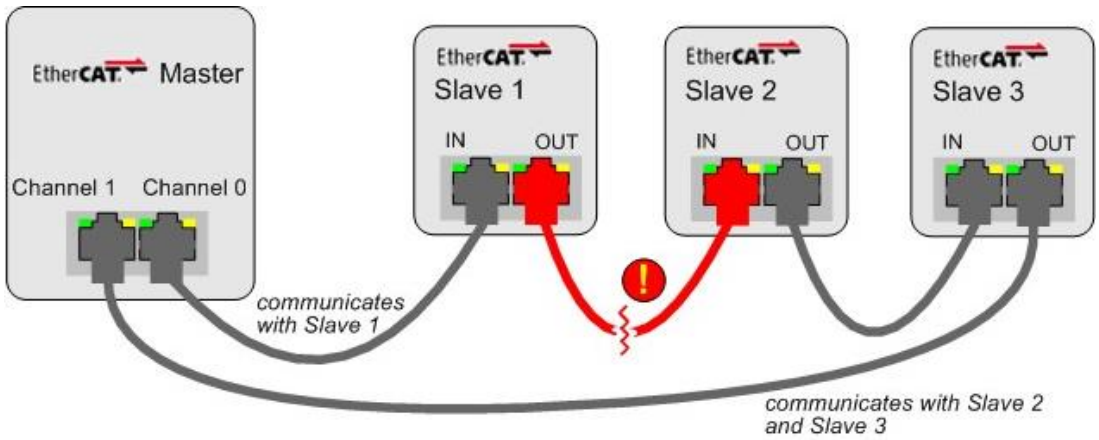


Figure 4: Cable Interrupt in Redundant Wiring in EtherCAT Network

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

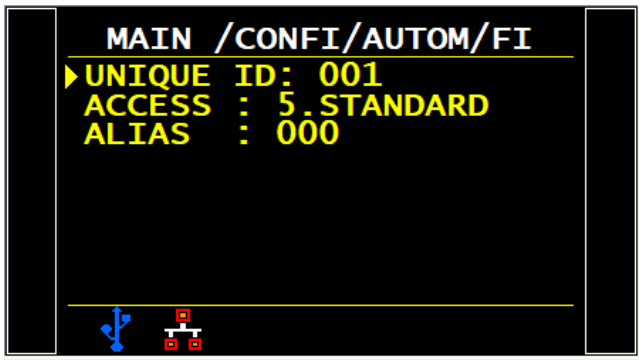
From the **MAIN MENU** screen of your ATEQ device:

- **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

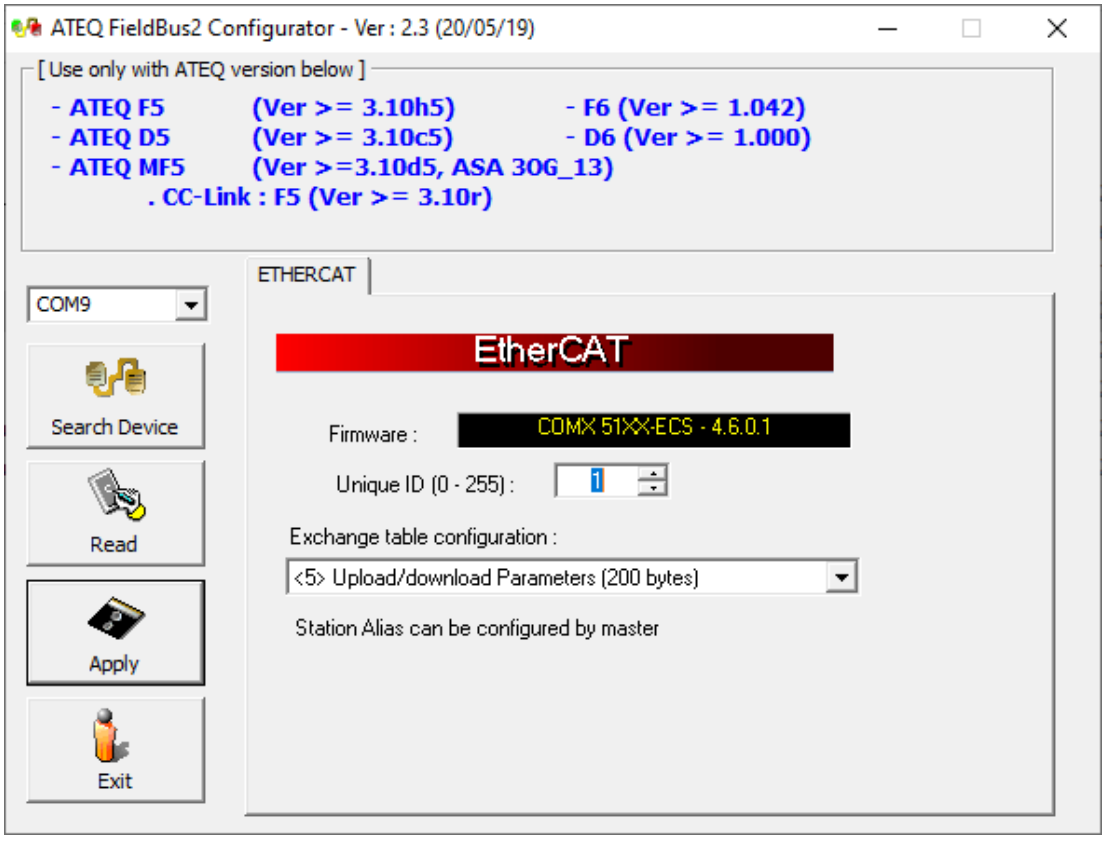


From the **MAIN MENU** screen of your ATEQ device:

- **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

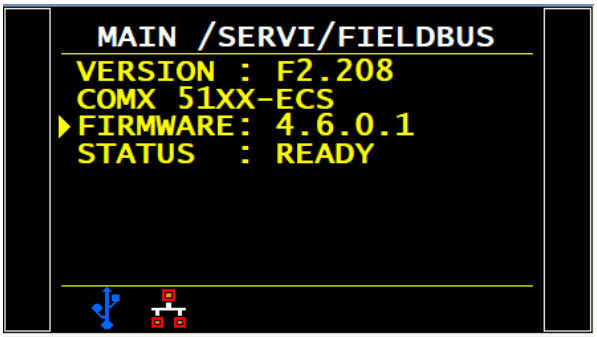
INSTALLATION OF THE ETHERCAT MODULE

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

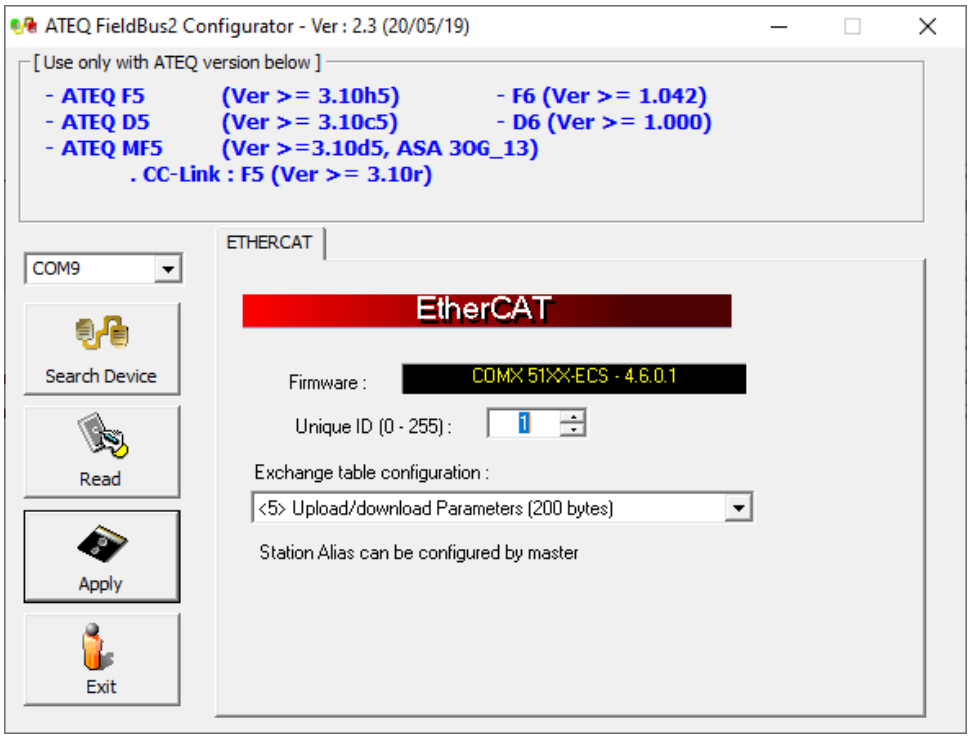


From the **MAIN MENU** screen of your ATEQ device:
- **SERVICE**
- **FIELDBUS**

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

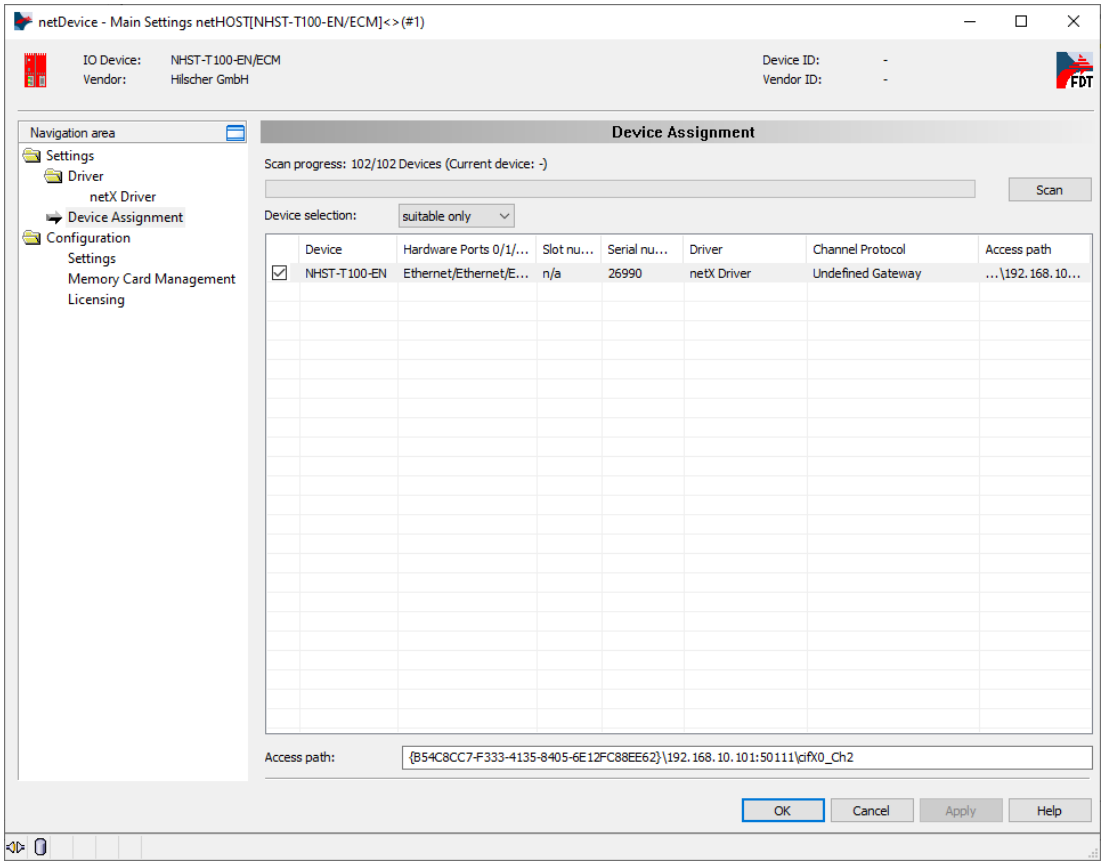
The table below gives the configuration file to use according to the hardware reference of the EtherCAT internal board of your ATEQ device (Hilscher hardware reference).

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.

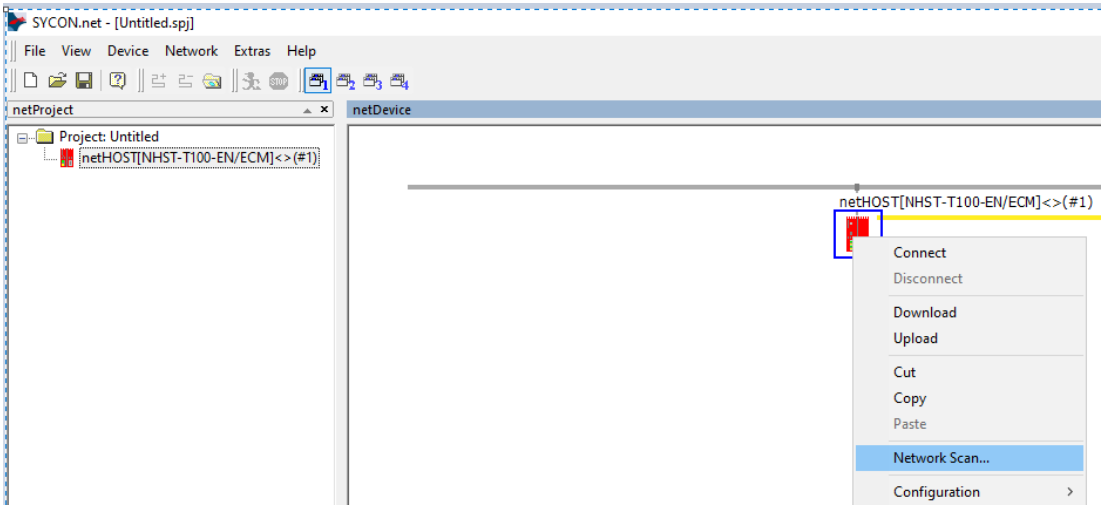
From the **Device Assignment** screen, select the master card:



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.

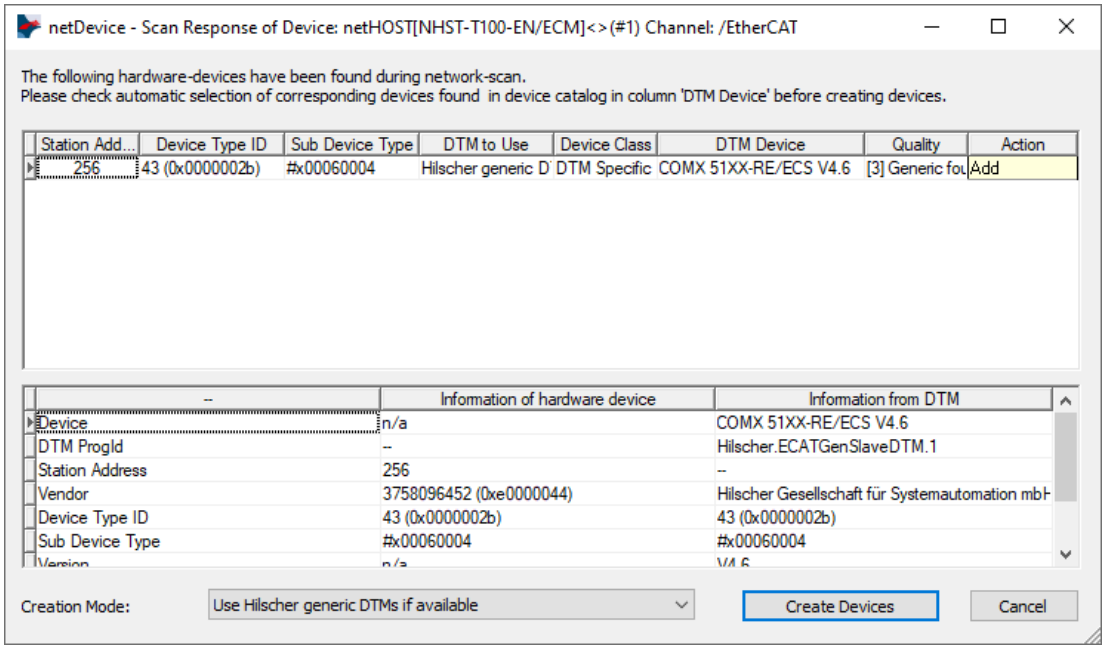
Scan the devices

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.



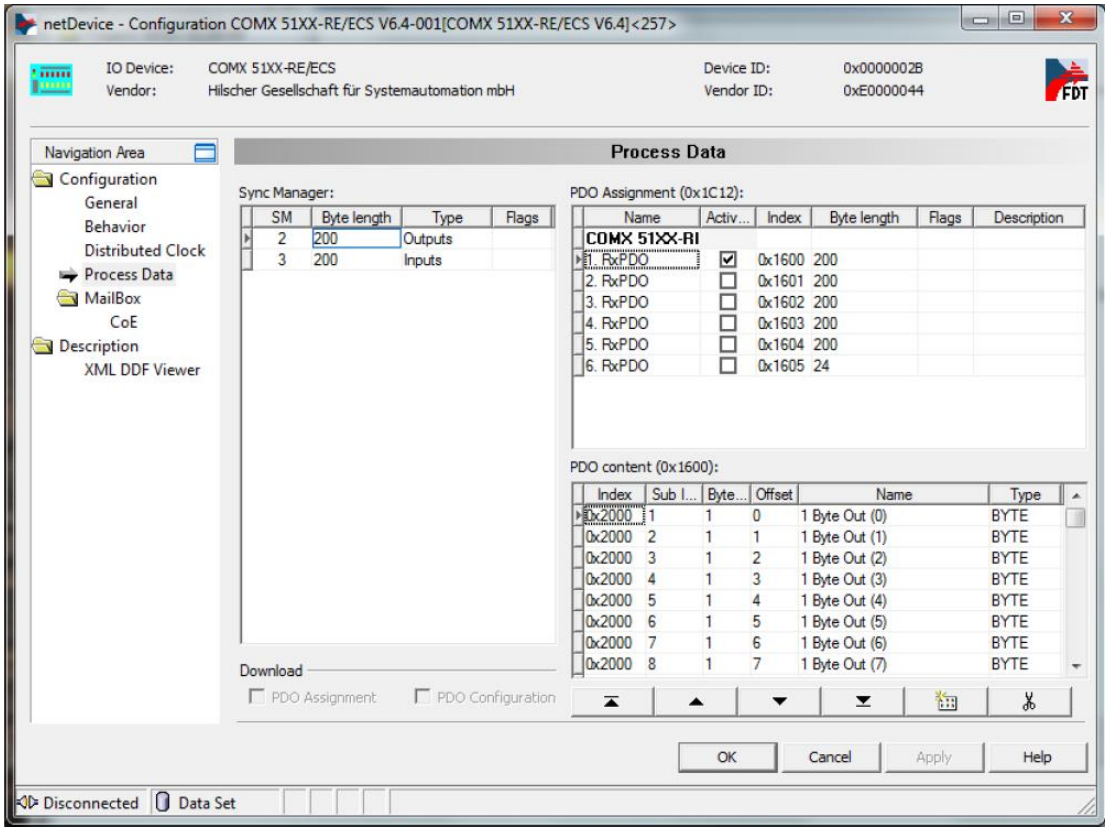
Five configuration modes are available according to the bytes number available (see Configuration of the ATEQ device (slave)).

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:

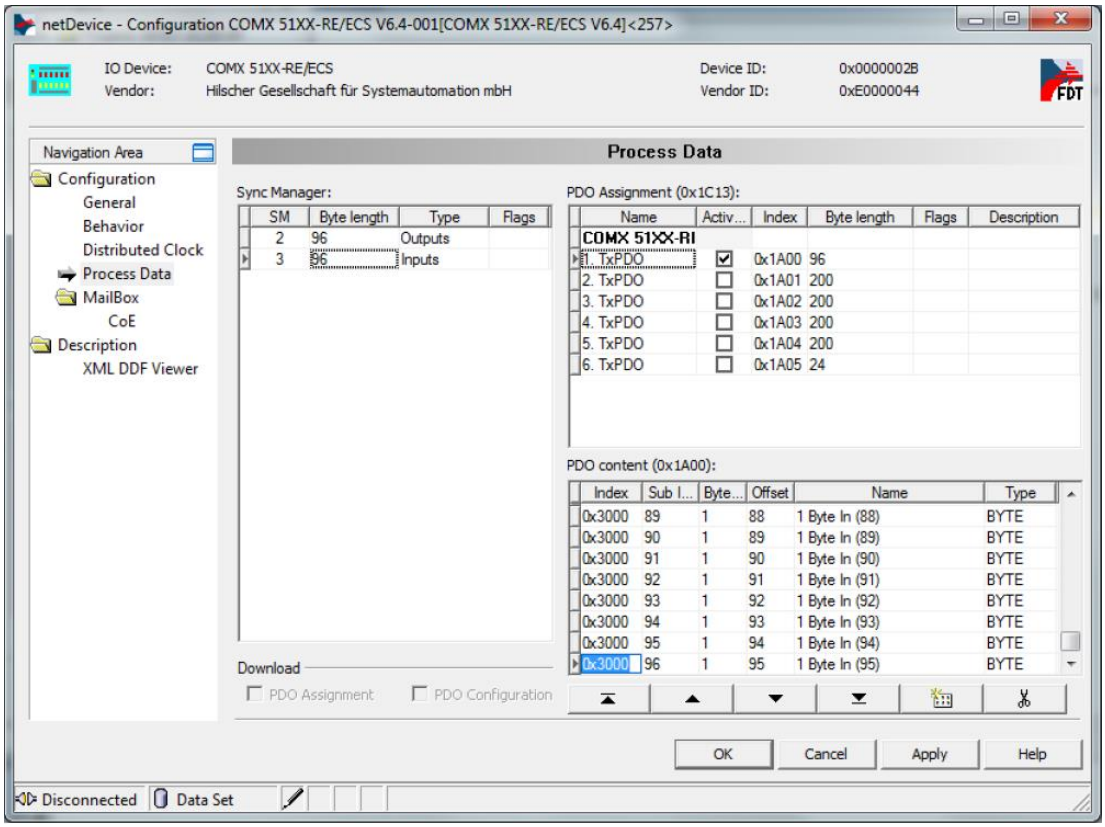
- Input_Data: IB = 200 bytes
- Output_Data: QB = 200 bytes



Setup of the Standard less mode

The parameters configuration must be like the following ones:

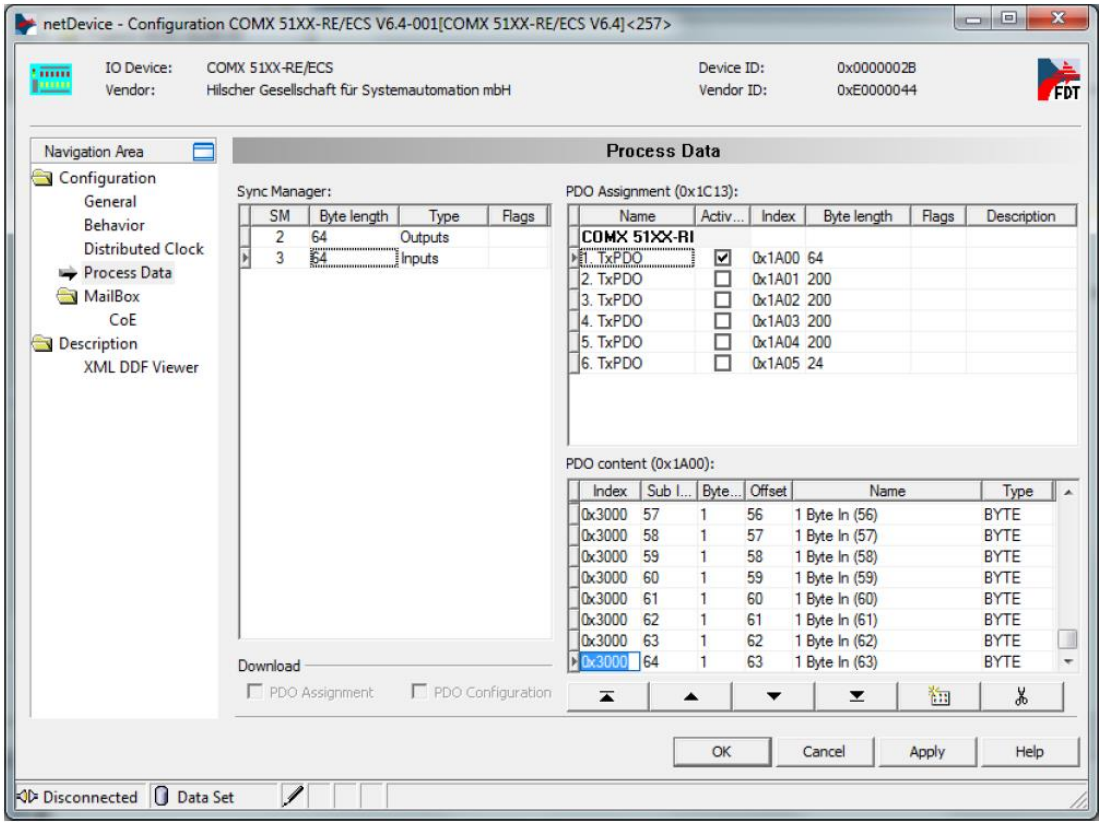
- Input_Data: IB = 96 bytes
- Output_Data: QB = 96 bytes



Setup of the Medium more mode

The parameters configuration must be like the following ones:

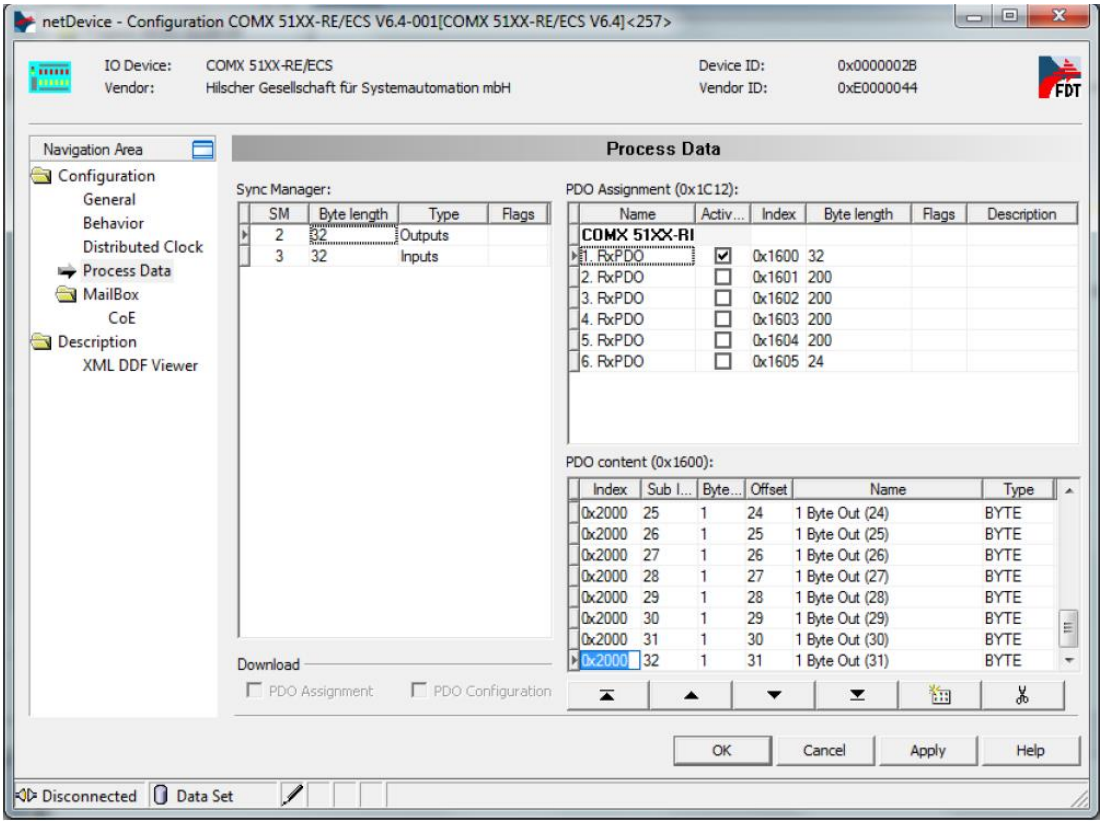
- Input_Data: IB = 64 bytes
- Output_Data: QB = 64 bytes



Setup of the Medium mode

The parameters configuration must be like the following ones:

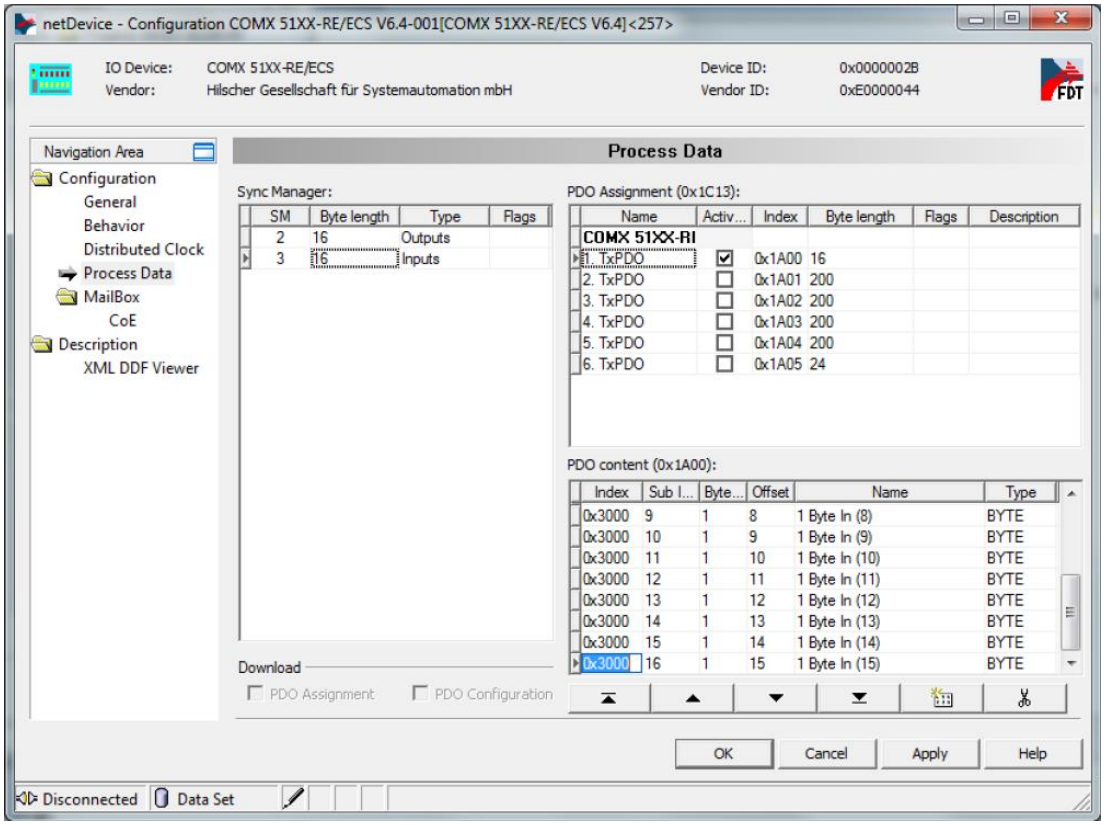
- Input_Data: IB = 32 bytes
- Output_Data: QB = 32 bytes



Setup of the Light mode

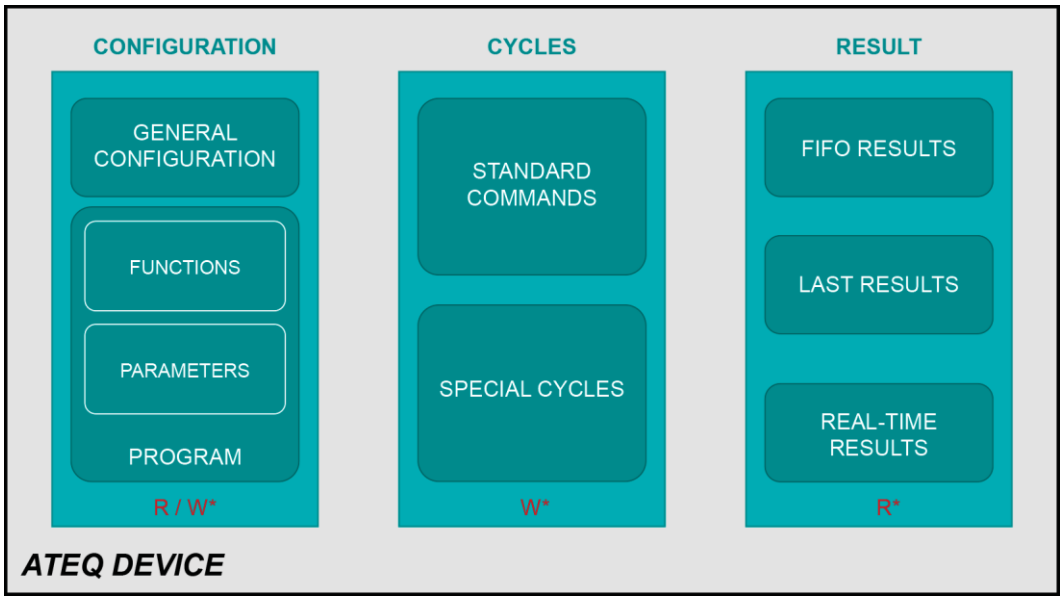
The parameters configuration must be like the following ones:

- 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 > Calibration check error.
	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	Leak 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	Leak 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)

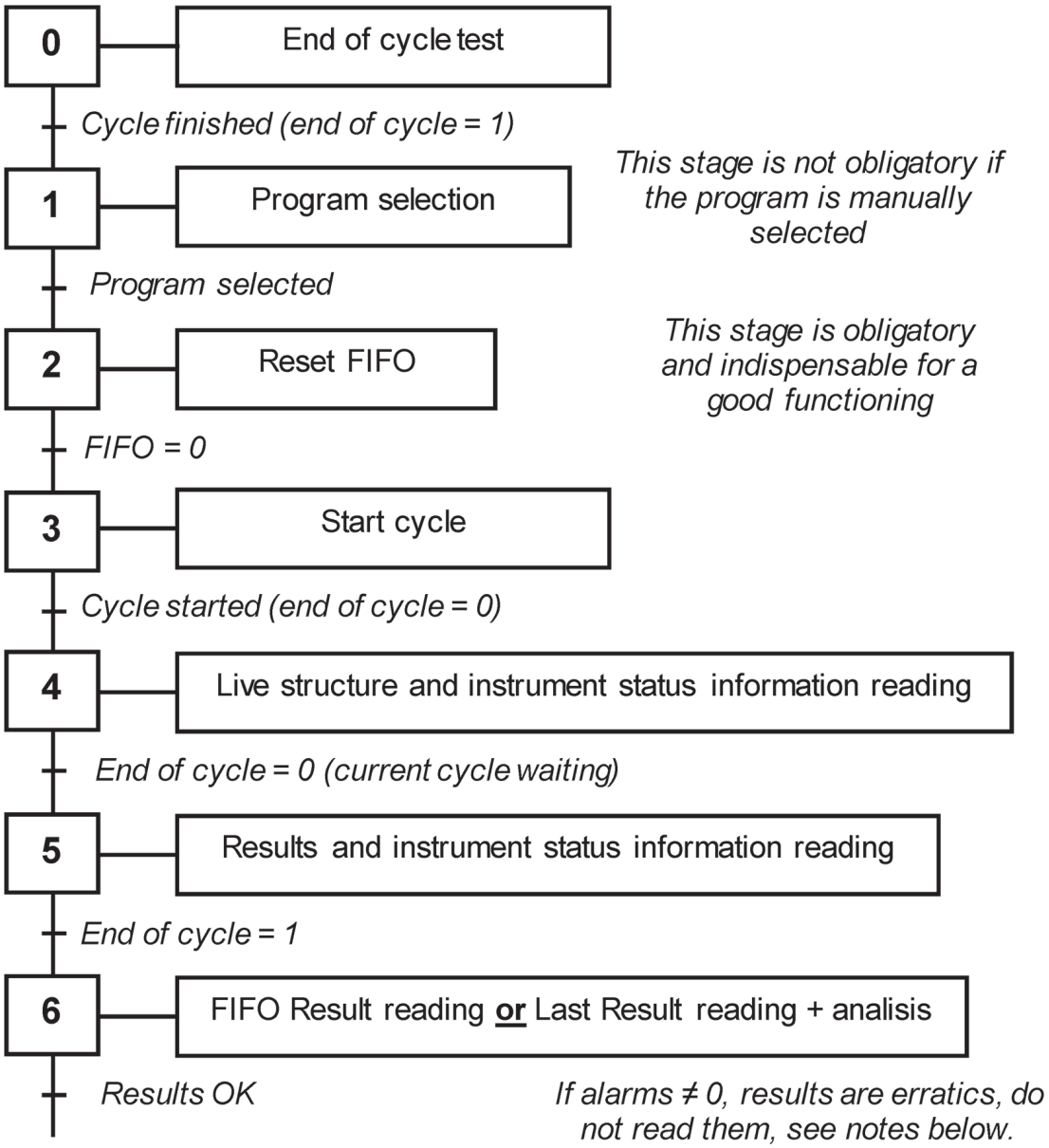
Address (bytes)	Description
20h – 9Fh	Cycle results exchange zone. Parameters reading and writing exchange zone.

Treatment of the commands

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

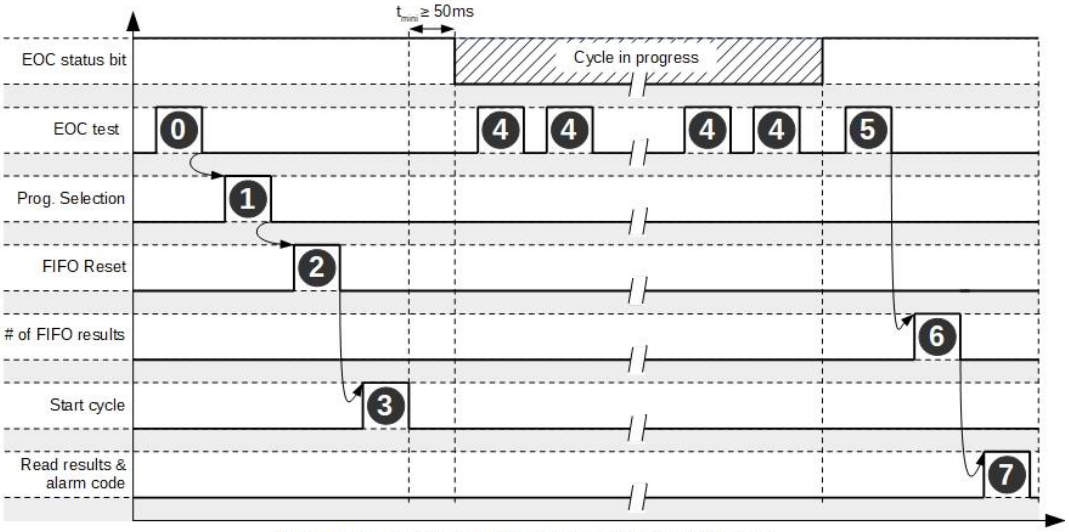
ATEQ device using

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	Permanent blowing activation.	Conf
	1	0002	2	Reserved.	
	2	0004	4	Fill type.	+Funct
	3	0008	8	Pre-fill type.	+Funct
	4	0010	16	Recovery thresholds.	+Funct
	5	0020	32	Cycle end.	+Funct
	6	0040	64	Mini valve.	+Funct
	7	0080	128	Peak meter.	+Funct
	8	0100	256	Reserved.	
	9	0200	512	Reference volume.	+Funct
	10	0400	1024	ATR 0.	+Funct
	11	0800	2048	ATR 1.	+Funct
	12	1000	4096	ATR 2.	+Funct
	13	2000	8192	Program name.	+Funct
	14	4000	16384	Chaining.	+Funct
	15	8000	32768	Automatic connector.	+Funct

Word	Bit n°	Mask		Meaning	Menu
		Hexa	Dec		
2	16	0001	1	Calibration check.	+Funct
	17	0002	2	Valve codes (output codes).	+Funct
	18	0004	4	Sealed component (Leak unit always PA, not changeable).	+Funct
	19	0008	8	Stamping.	+Funct
	20	0010	16	Reserved.	
	21	0020	32	N test.	+Funct
	22	0040	64	Reserved.	
	23	0080	128	Sending cond.: pass part.	RS232
	24	0100	256	Sending cond.: fail test part.	RS232
	25	0200	512	Sending cond.: fail ref. part.	RS232
	26	0400	1024	Sending cond.: alarm presence.	RS232
	27	0800	2048	Sending cond.: pressure error.	RS232
	28	1000	4096	Sending cond.: end of cycle.	RS232
	29	2000	8192	Sending cond.: recoverable.	RS232
	30	4000	16384	Sending cond.: calibration.	RS232
	31	8000	32768	Frame content: time stamp.	RS232
3	32	0001	1	Frame content: name.	RS232
	33	0002	2	Content of the frame: pressure.	RS232
	34	0004	4	Security.	Conf
	35	0008	8	External dump.	Conf
	36	0010	16	Exportation.	RS232
	37	0020	32	Automatic reset.	Conf
	38	0040	64	Reserved.	
	39	0080	128	Reserved.	
	40	0100	256	Reserved.	
	41	0200	512	Temperature correction.	+Funct
	42	0400	1024	Recovery or indirect test.	Conf
	43	0800	2048	Parameters automatic setting.	Conf
	44	1000	4096	Reserved.	
	45	2000	8192	Page feed.	RS232
	46	4000	16384	Sign change.	+Funct
	47	8000	32768	After sale service cycle.	+Funct

Word	Bit n°	Mask		Meaning	Menu
		Hexa	Dec		
4	48	0001	1	Unit type.	+Funct
	49	0002	2	Automatic reset piezo 2.	Conf
	50	0004	4	Reserved.	
	51	0008	8	Electronic regulator mode.	Conf
	52	0010	16	Auxiliary codes activation.	+Funct
	53	0020	32	Filtering.	+Funct
	54	0040	64	Reserved.	
	55	0080	128	Quick automatic reset activation.	Conf
	56	0100	256	Permanent electronic regulator.	Conf
	57	0200	512	Bar code.	Conf
	58	0400	1028	Flow reject.	+Funct
	59	0800	2048	No negative.	+Funct
	60	1000	4096	Dump threshold.	+Funct
	61	2000	8192	ATR 3.	+Funct
	62	4000	16384	In 7 test configuration.	Conf
	63	8000	32768	Reserved.	
5	64	0001	1	Absolute value.	Conf
	65	0002	2	Leak display mode.	+Funct
	66	0004	4	By pass valve.	Conf
	67	0008	8	Reserved.	
	68	0010	16	Inversed sealed component.	+Funct
	69	0020	32	Inversed sealed component 2.	+Funct
	70	0040	64	Reserved.	+Funct
	71	0080	128	Dump Off.	+Funct
	72	0100	256	Program selection on bar code reading.	+Funct
	73	0200	512	Bar code reset on end of cycle.	+Funct
	74	0400	1024	Cut Off.	+Funct
	75	0800	2048	ATF.	+Funct
	76	1000	4096	Reserved.	
	77	2000	8192	Reserved.	
	78	4000	16384	Reserved.	
	79	8000	32768	Reserved.	
6	80 > 95			Word Reserved.	

Word	Bit n°	Mask		Meaning	Menu
		Hexa	Dec		
7	96	0001	1	Buzzer function.	+Funct
	97	0002	2	Long test (x100) function.	+Funct
	98	0004	4	Permanent blowing.	Conf
	99	0008	8	Sealed Diff component function.	+Funct
	100	0010	16	Test or Ref Mode.	+Funct
	101	0020	32	Display optional.	+Funct
	102	0040	64	Pressure Drop.	+Funct
	103	0080	128	Pressure correction (≥v1.400).	+Funct
	104	0100	256	Standard conditions (≥v1.400).	+Funct
	105	0200	512	Ref No Dump.	+Funct
	106	0400	1024	Auto Vol.	+Funct
	107	0800	2048	Offset.	+Funct
	108	1000	4096	Old Flow Calcultion.	+Funct
	109	2000	8192	Reserved.	
	110	4000	16384	Auto Selection Prog.	Conf
	111	8000	32768	Save Volume Selection.	Conf

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)	
	Acknowledgement 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
	Command finished 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 regulator Number.	Funct
	1	0002	2	Pre-fill regulator Number.	Funct
	2	0004	4	Fill type function.	Funct
	3	0008	8	Pre-fill type function.	Funct
	4	0010	16	Recovery level function.	Funct
	5	0020	32	End of cycle function.	Funct
	6	0040	64	Automatic reset end cycle function.	Funct
	7	0080	128	Reset and dump end of cycle function.	Funct
	8	0100	256	Fill mode end of cycle function.	Funct
	9	0200	512	Peak hold function.	Funct
	10	0400	1024	Reference volume function.	Funct
	11	0800	2048	ATR0 function.	Funct
	12	1000	4096	ATR1 function.	Funct
	13	2000	8192	ATR2 function.	Funct
	14	4000	16384	Sequencing function.	Funct
	15	8000	32768	Pass part sequencing function.	Funct
2	16	0001	1	Fail test part sequencing function.	Funct
	17	0002	2	Fail reference part sequencing function.	Funct
	18	0004	4	Alarm sequencing function.	Funct
	19	0008	8	Pressure fault sequencing function.	Funct
	20	0010	16	End of cycle sequencing function.	Funct
	21	0020	32	Mini valve function.	Funct
	22	0040	64	Recovery part sequencing function.	Funct
	23	0080	128	Calibration check sequencing function.	Funct
	24	0100	256	Automatic connector function.	Funct
	25	0200	512	Calibration check function.	Funct
	26	0400	1024	Valve code function.	Funct
	27	0800	2048	External valve code 1 function.	Funct
	28	1000	4096	External valve code 2 function.	Funct
	29	2000	8192	External valve code 3 function.	Funct
	30	4000	16384	External valve code 4 function.	Funct
	31	8000	32768	External valve code 5 function.	Funct

Word	Bit n°	Mask		Meaning	Menu
		Hexa	Dec		
3	32	0001	1	External valve code 6 function.	Funct
	33	0002	2	Internal valve code 1 function.	Funct
	34	0004	4	Internal valve code 2 function.	Funct
	35	0008	8	Stamp function.	Funct
	36	0010	16	Pass part stamp function.	Funct
	37	0020	32	Fail test part stamp function.	Funct
	38	0040	64	Fail reference part stamp function.	Funct
	39	0080	128	Alarm stamp function.	Funct
	40	0100	256	Pressure fault stamp function.	Funct
	41	0200	512	End of cycle stamp function.	Funct
	42	0400	1024	Recovery part stamp function.	Funct
	43	0800	2048	Calibration check stamp function.	Funct
	44	1000	4096	N test function.	Funct
	45	2000	8192	Reserved.	
	46	4000	16384	Sealed components function (Leak unit always PA, not changeable).	Funct
	47	8000	32768	Reserved.	
4	48	0001	1	External dump function.	Funct
	49	0002	2	Temperature correction function.	Funct
	50	0004	4	Recovery test or indirect mode function.	Funct
	51	0008	8	Dump before sealed component.	Funct
	52	0010	16	Sign change function.	Funct
	53	0020	32	Obligatory reset on end of cycle.	Funct
	54	0040	64	Auxiliaries codes function.	Funct
	55	0080	128	Auxiliaries codes 1 function.	Funct
	56	0100	256	Auxiliaries codes 2 function.	Funct
	57	0200	512	Auxiliaries codes 3 function.	Funct
	58	0400	1024	Auxiliaries codes 4 function.	Funct
	59	0800	2048	Auto param function (not available).	Funct
	60	1000	4096	Filtering function.	Funct
	61	2000	8192	Bar code function.	Funct
	62	4000	16384	Flow reject function.	Funct
	63	8000	32768	No negative function.	Funct

Word	Bit n°	Mask		Meaning	Menu
		Hexa	Dec		
5	64	0001	1	Start after reading bar code function.	Funct
	65	0002	2	ATR3 function.	Funct
	66	0004	4	Absolute value function.	Funct
	67	0008	8	Bypass valve function.	Funct
	68	0010	16	Reserved.	
	69	0020	32	Inverted sealed component function.	Funct
	70	0040	64	Inverted sealed component 2 function.	Funct
	71	0080	128	Dump off function.	Funct
	72	0100	256	Cut off function.	Funct
	73	0200	512	ATF function.	Funct
	74	0400	1024	Asynchrony fill between bell and part in recovery or indirect mode.	Funct
	75 > 79			Reserved.	
6	80 > 95			Word Reserved.	
7	96	0001	1	Optional auxiliaries codes function.	Funct
	97	0002	2	Optional auxiliaries codes 1 function.	Funct
	98	0004	4	Optional auxiliaries codes 2 function.	Funct
	99	0008	8	Optional auxiliaries codes 3function.	Funct
	100	0010	16	Optional auxiliaries codes 4 function.	Funct
	101	0020	32	Optional valves codes function.	Funct
	102	0040	64	Optional external valves codes 1.	Funct
	103	0080	128	Optional external valves codes 2.	Funct
	104	0100	256	Optional external valves codes 3.	Funct
	105	0200	512	Optional external valves codes 4.	Funct
	106	0400	1024	Optional external valves codes 5.	Funct
	107	0800	2048	Optional external valves codes 6.	Funct
	108	1000	4096	Optional internal valves codes 1.	Funct
	109	2000	8192	Optional internal valves codes 2.	Funct
	110	4000	16384	Buzzer function.	Funct
	111	8000	32768	Pass part buzzer function.	Funct
8	112	0001	1	Fail part buzzer function.	Funct
	113	0002	2	Alarm buzzer function.	Funct
	114	0004	4	End of cycle buzzer function.	Funct
	115	0008	8	Long Test Time function.	Funct
	116	0010	16	Permanent dump function.	Funct
	117	0020	32	Input 7 test function.	Funct
	118	0040	64	Burst test function (results are inverted).	Funct
	119	0080	128	Sealed Diff components function.	Funct
	120	0100	256	Test or Ref Mode function.	Funct
	121	0200	512	Pressure Drop.	Funct
	122	0400	1024	Auto Verif Etal.	Funct
	123	0800	2048	Pressure correction (≥v1.400).	Funct
	124	1000	4096	Standard conditions (≥v1.400).	Funct
	125	2000	8192	Ref No Dump.	Funct
	126	4000	16384	Offset.	Funct
	127	8000	32768	Permanent Fill.	Funct

Word	Bit n°	Mask		Meaning	Menu
		Hexa	Dec		
9	128	0001	1	Old Flow Calcultion.	Funct
	129>143			Reserved.	

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			
01	0001	"FILL TIME" Fill time	0 > 650 seconds	
02	0002	"STAB TIME": Stabilization time	0 > 650 seconds	
03	0003	"TEST TIME" Test time	0 > 650 seconds	
06	0006	"PRE FILL" Pre fill time	0 > 650 seconds	
07	0007	"PRE DUMP" Pre dump time	0 > 650 seconds	
09	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	
17	0011	"Min Vol." Minimum volume reject level (volume test type measure)	0 > 9999	
18	0012	"Max. Vol." Maximum volume reject level (volume test type measure).	0 > 9999	
20	0014	"VOLUME" Part volume.	0 > 9999	
21	0015	"TYPE": Test type	Invalid Leak Blockage Desensitized Operator Burst test Volume test	0000 1000 2000 3000 4000 5000 6000
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	

Identifier N°		Meaning	Value	
Dec	Hexa			
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 ref. part in recovery	0 > 9999	
66	0042	“Set FILL” Fill instruction value:	- 9999 > 9999	
67	0043	“Set PreFILL“ Pre-fill instruction value:	- 9999 > 9999	
68	0044	“SEALED PART” Choice of the sealed component	Standard Large Leak	0000 1000
72	0048	“Drift Unit” Calibration drifts percent.	0 > 100%	
80	0050	“Diff A-Z” Differential auto reset time.	0 > 650 seconds	
102	0066	“BLOW MODE” Type of permanent blowing	Regulator 2 Regulator 1	0000 1000
103	0067	“FILL MODE” Type of fill.	Standard Instruction Ballistic Ramp Adjust Auto-Fill Ramp 2 EASY EASY Auto	0000 1000 2000 3000 4000 5000 6000 7000 8000
104	0068	“PreFILL” Type of pre-fill.	Standard Instruction Ballistic Ramp EASY EASY Auto	0000 1000 2000 3000 4000 5000
106	006A	“CheckTime” Commutation time of the equalization valve calibration check.	0 > 650 seconds	
107	006B	“% Drift” ATR absorption tolerance.	0 > 100%	
108	006C	“Start” Start value of the transient (ATR).	- 9999 > 9999	
110	006E	“EXT. DUMP” Type of external dump.	Normally close Normally open	0000 1000
111	006F	“Ref. VOL.“ Reference volume.	0 > 9999	

Identifier N°		Meaning	Value	
Dec	Hexa			
112	0070	'IN7:" Function attributed to the entry of the special cycles (input 7)	Refer to the "Configurable input values" table at the end of this chapter	
117	0075	"Set Blow" Permanent blowing pressure instruction.	- 9999 > 9999	
118	0076	"REJECT CALC." Original unit for the calculation of rejects in cm3/ min (Pa, Pa/s...).	Refer to Unit table.	
119	0077	"Min Level" (Sealed Diff menu) Minimum sealed component measurement pressure.	0 > 9999	
120	0078	"Max Level" (Sealed Diff menu) Maximum sealed component measurement pressure.	0 > 9999	
121	0079	"FILL TIME"(Sealed Diff menu) Fill time of the internal volume.	0 > 650 seconds	
122	007A	"TRANSFER"(Sealed Diff menu) Sealed component transfer time.	0 > 650 seconds	
123	007B	"LANGUAGE" Choice of the language.	Default language 2nd predefined language	0000 1000
124	007C	"Max Value" Reject in calibration check.	0 > 9999	
125	007D	"% Drift" Percentage of the calibration check.	0 > 100%	
126	007E	"Max PreFILL" Maximum pressure value in pre-fill.	- 9999 > 9999	
127	007F	"LeakUnit" Reject unit.	Refer to Unit table	
128	0080	"Leak Rate" Instruction value during a calibration.	0 > 9999	
135	0087	"% of T FAIL" Reject level percent of the auto parameter function	0 > 100%	
138	008A	"FILL REG" Regulator number selection for the fill.	Regulator 1 Regulator 2	0000 1000
139	008B	"PRE FILL REG" Regulator number selection for the pre-fill.	Regulator 1 Regulator 2	0000 1000
140	008C	"CORRECTION" (TEMP.CORR. 1 menu) Percentage concerning the temperature compensation.	0 > 100%	
141	008D	"TEST TIME"(TEMP.CORR. 1 menu) Test time for the temperature compensation.	0 > 650 seconds	
142	008E	"Max FILL" Max pressure in indirect test (piezo 2).	- 9999 > 9999	
143	008F	"Min FILL" Min pressure in indirect test (piezo 2).	0 > 9999	
144	0090	"OUTPUTS CONFIG." Setup of the outputs (standard or compact).	Standard Compact	0000 1000
148	0094	"FILTER" Filtering.	0 > 650 seconds	
149	0095	"UNITS" Unit type	SI SAE CUSTOM	0000 1000 2000

Identifier N°		Meaning	Value	
Dec	Hexa			
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	
175	00AF	“REGUL. CTRL.” Regulator check during its learning.	Automatic Ext	0000 1000
203	00CB	“ELEC. REG.” Activation or not of the built in electronics regulators.	None Reg 1 Reg 2 ALL Reg	0000 1000 2000 3000
232	00E8	“ATR DRIFT” Drift transient (ATR).	0 > 100%	
233	00E9	“AZ SHORT” Quick auto-zero time.	0 > 650 seconds	
273	0111	“DUMP” Dump time in calibration check mode	0 > 650 seconds	
291	0123	“T.ATR2” Stabilization time for the ATR 2 function	0 > 650 seconds	
295	0127	“DUMP LEVEL” Minimum dump pressure level to reach	- 9999 > 9999	
297	0129	“MAX BLOW” Blowing maximum pressure level	- 9999 > 9999	
298	012A	“MIN BLOW” Blowing minimum pressure level	- 9999 > 9999	
315	013B	“Start FILL” Start value of the fill instruction in burst test mode	- 9999 > 9999	
334	014E	“RAMP” Rise time in burst test mode	0 > 650 seconds	
335	014F	“T. LEVEL” Step time in burst test mode	0 > 650 seconds	
336	0150	”N. OF STEPS” Step number in burst test mode	0 > 650 seconds	
340	0154	“Transient” ATR transient value.	- 9999 > 9999	
349	015D	“FILL TIME” (Indirect menu) Fill time in recovery test mode	0 > 650 seconds	
353	0161	“Press. UNIT” (configuration/pneumatic menu) General pressure unit	Refer to Unit table.	
354	0162	“LINE P. MIN” Minimum line pressure level	- 9999 > 9999	
355	0163	“FILL TIME” (AUTO VOL menu) Internal volume fill time in program selection by volume function	0 > 650 seconds	
356	0164	“TRANSFER” (AUTO VOL menu) Transfer time in program selection by volume function	0 > 650 seconds	

Identifier N°		Meaning	Value	
Dec	Hexa			
357	0165	“DUMP TIME” (AUTO VOL menu) Dump time in program selection by volume function	0 > 650 seconds	
358	0166	“PRESSU. VOL” (AUTO VOL menu) Internal volume in program selection by volume function	0 > 9999	
359	0167	“Ref. VOL.” (AUTO VOL menu) Reference volume in program selection by volume function	0 > 9999	
360	0168	“INT REF VOL” (AUTO VOL menu) Internal reference volume in program selection by volume function	0 > 9999	
361	0169	“INT TEST VOL” (AUTO VOL menu) Internal test volume in program selection by volume function	0 > 9999	
362	016A	“VOL. STEP“ (AUTO VOL menu) Volume slice in program selection by volume function	0 > 9999	
363	016B	“DUMP TIME” (Sealed Diff menu) Dump time in sealed components	0 > 650 seconds	
364	016C	“DISPLAY MODE“ Leak display management	xxxx xxx.x xx.xx x.xxx	0000 1000 2000 3000
366	016E	“MODE” (EXT DUMP menu) Dump mode	Continuous Time	0000 1000
367	016F	“Program” (DUMP OFF menu) Program number of the dump of function	0 > 128	
368	0170	“Tolerance A” Tolerance level A for ntest cycle	0 > 100%	
369	0171	“Tolerance B” Tolerance level B for ntest cycle	0 > 100%	
370	0172	“OFFSET”(TEMP.CORR. 1 menu) Temperature correction offset	- 9999 > 9999	
371	0173	“NAME:”(Units menu) CAL unit personalization	CHAR[5]	
372	0174	“BYPASS” Bypass valve mode selection	Pre-Fill + Fill Pre-Fill Fill	0000 1000 2000
373	0175	“% Cut OFF” Cut off function Percent	0 > 100%	
374	0176	“ATF TIME” Divisor time of ATF function	0 > 650 seconds	
375	0177	‘IN8:” Function attributed to the entry of the special cycles (input 8)	Refer to the “Configurable input values” table at the end of this chapter	
376	0178	‘IN9:” Function attributed to the entry of the special cycles (input 9)	Refer to the “Configurable input values” table at the end of this chapter	
377	0179	“MEAS. START” Waiting time for starting the measurement in burst test	0 > 650 seconds	
378	017A	“Time Adj” Adjusting fill time (electronic regulator)	0 > 650 seconds	

Identifier N°		Meaning	Value	
Dec	Hexa			
379	017B	“USB:” USB mode (printer or supervision)	Supervision Printer Bar code Auto None	0000 1000 2000 3000 4000
380	017C	“Press. UNIT“(Indirect menu) Pressure unite for recovery test	Refer to Unit table	
405	0195	“TRANSF.TIME” (Sealed Diff menu) Sealed Diff, Transfer time.	0 > 650 seconds	
406	0196	“PRESS.CORR.” (Sealed Diff menu) Sealed Diff, Pressure Correction.	- 9999 > 9999	
407	0197	“LARGE LEAK” (Sealed Diff menu) Sealed Diff, Large Leak Max.	0 > 9999	
408	0198	“OFFSET” (Sealed Diff menu) Sealed Diff, Offset.	- 9999 > 9999	
409	0199	“FILL MODE”(Indirect menu) Type of fill Reg 2.	EASY EASY Auto	0000 1000
410	019A	“DUMP TIME” (Indirect menu) Indirect Dump Time	0 > 650 seconds	
455	01C7	“DROP PRESS.%” Drop Press function Percent	0 > 100%	
456	01C8	“ATM PRESS.“ Atmospheric Pressure	900 > 1100	
457	01C9	“TEMP.” Temperature	0 > 800	
458	01CA	“DISP. OPT.” Display Option in flow reject	None Pa Display Ambient Temp. Object Temp. Test check ATR Temp. correction Leak offset learning PATM correction	0000 1000 2000 3000 4000 5000 6000 7000 8000
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	

Identifier N°		Meaning	Value	
Dec	Hexa			
485	01 E5	"EXT. ACCES" Security by external access (Fieldbus/Modbus) Reset value with Modbus: → Writing at address 0xC1E5 Reset value with Fieldbus: → Writing one word with ID = 0xC1E5	Read/Write Read Only No Access	0000 1000 2000
486	01 E6	"OFFSET" Offset Learning	- 9999 > 9999	

Regulator selection

Regulator selection for fill and pre-fill (word 1, bit n°0 and 1) in the table of the functions bits.

	Fill regulator	Pre-fill regulator
Regulator 1	0	0
Regulator 2	1	1

Configurable input values

F6 V1.3XX			
Input value	Value code	Input value	Value code
Program Selection	0000	Atr Learning Cycle	17000
P1 Sensor Check (*)	4000	Sd Prt Pass Learn	18000
P1 Reg1 Check (*)	5000	Sd Prt Fail Learn	19000
P2 Sensor Check (*)	6000	Volume Comp.	20000
Leak Sensor Check (*)	7000	Test Check Result	21000
Auto Test (*)	8000	Step By Step	22000
Regul. 2 Adjust	9000	Auto Setup	23000
Regul. 1 Adjust	10000	Atr+Custom Learn.	24000
Part Regulator	11000	Code Reader	25000
Infinite Fill	12000	Auto Vol	26000
Piezo Auto Zero	13000	Test On Caps	27000
Custom Unit Learn	14000	Temp.2 Corr. Learn	30000
Custom Unit Check	15000	Temp.2 Sensor Read	31000
Chck+Lrn Cust. Unit	16000		

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

F6 V2.XXX			
Input value	Value code	Input value	Value code
Program Selection	0000	Chck+Lrn Cust. Unit	24000
Diff Temp. Check (*)	8000	Atr Learning Cycle	25000
Direct P. Check (*)	9000	Sd Prt Pass Learn	26000
P1 Reg1 Check (*)	10000	Sd Prt Fail Learn	27000
Indirect P. Check (*)	11000	Volume Comp.	28000
Leak Sensor Check (*)	12000	Test Check Result	29000
Line P. Sensor Check (*)	13000	Atr+Custom Learn.	30000
Temperature Check (*)	14000	Code Reader	31000
Atm Pressure Check (*)	15000	Auto Vol	32000
Auto Test (*)	16000	Test On Caps	33000
Regul. 2 Adjust	17000	Temp.2 Corr. Learn	36000
Regulator Adj.	18000	Temp.2 Sensor Read	37000
Part. Regulator Adj.	19000	Leak Offset Learn	38000
Infinite Fill	20000	Offset+Vol. Learn	39000
Piezo Auto Zero	21000	N Start	40000
Custom Unit Learn	22000	Sync Test	41000
Custom Unit Check	23000		

(*) 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
3000	0BB8	mm^3/s
4000	0FA0	Calibrated Pascal (Pa)
5000	1388	Calibrated Pascal/second (Pa/s)
6000	1770	Pascal (Pa)
7000	1B58	High resolution Pascal (Pa HR)
8000	1F40	Pascal/second (Pa/s)
9000	2328	High resolution Pascal/second (Pa/s HR)
10000	2710	Second (s)
11000	2AF8	Bar
12000	2EE0	KiloPascal (kPa)
13000	32C8	PSI
14000	36B0	Millibar (mbar)
15000	3A98	Mega Pascal (MPa)
16000	3E80	Liter (l)
17000	4268	Calibration check unit
18000	4650	KiloPascal/second (kPa/s)
19000	4A38	Millimeter (mm)
30000	7530	Liter/hour (l/h)
43000	A7F8	D mode Pascal (Pa)
44000	ABE0	Low resolution Pascal (Pa LR)
45000	AFC8	Low resolution Pascal/second (Pa/s LR)
46000	B3B0	$Inch^3/s$
47000	B798	$Inch^3/min$
48000	BB80	$Inch^3/hour$
49000	BF68	$Feet^3/hour$
50000	C350	Milliliter/second (mm/s)
51000	C738	Milliliter/minute (mm/min)
52000	CB20	Milliliter/hour (mm/h)
53000	CF08	Liter/minute (l/min)
54000	D2F0	$Meter^3/hour$ (m^3/h)
55000	D6D8	$Millimeter^3$ (mm^3)
56000	DAC0	$Centimeter^3$ (cm^3)
57000	DEA8	Microsecond (µs)
58000	E290	USA cm^3/s same as the cm^3/s
59000	E678	USA cm^3/min same as the cm^3/min
60000	EA60	USA cm^3/h same as the cm^3/h
61000	EE48	Milliliter (ml)

Unit code		Unit
Decimal	Hexadecimal	
62000	F230	Liter (l)
63000	F618	Inch³
64000	FA00	Feet³
68000	01 09A0	oz(US)/s
69000	01 0D88	oz(US)/mn
70000	01 1170	oz(US)/h
71000	01 1558	oz(UK)/s
72000	01 1940	oz(UK)/mn
73000	01 1D28	oz(UK)/h
74000	01 2110	US gallon
75000	01 24F8	UK gallon
76000	01 28E0	PPM
77000	01 2CC8	PPM HR
78000	01 30BO	Calibrated PPM
80000	01 3880	mmCE
81000	01 3C68	mmCE/s
84000	01 4820	SCCM
92000	01 6760	Points
93000	01 6B48	Feet³/s F620
94000	01 6F30	Feet³/min F620
95000	01 7318	ACCM MF
96000	01 7700	Inch Mercure (inHg)
99000	01 82B8	Millimeter Mercure (mmHg)
100000	01 86A0	µg H2O/min
102000	01 8E70	No unit

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).

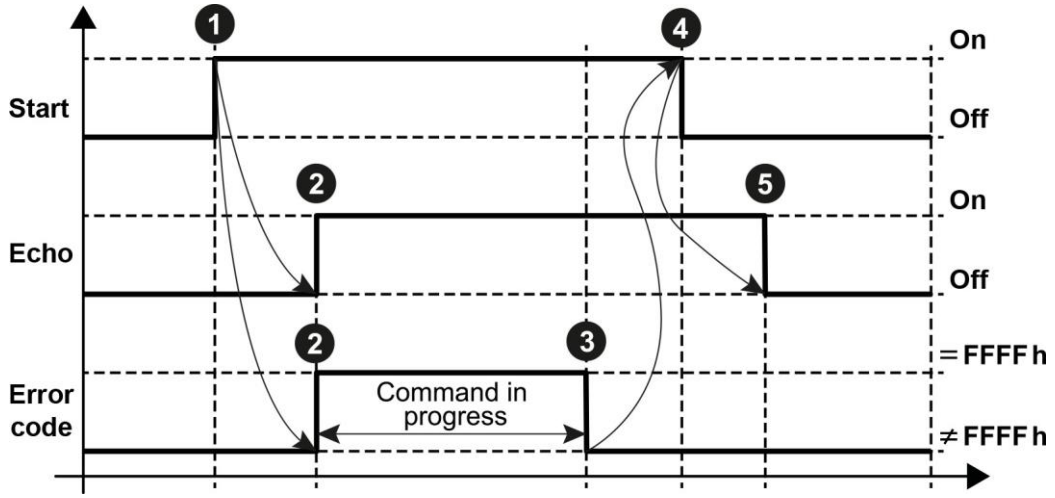
Standard command cycle

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	Numb	Special cycle
1	ATR Learning Cycle	17	Sd Prt FAIL Learn
2	Test Check Result	18	Direct P. Check (*) (**)
3	AUTO TEST	19	Leak Sensor Check (*) (**)
4	Custom Unit Learn	20	Reserved
5	Custom Unit Check	21	Reserved
6	ATR+Custom Learn	22	Reserved
7	Piezo auto zero Reg 1	23	No special cycle
8	Piezo auto zero Reg 2	24	Reserved
9	Regul. 2 adjust	25	Line P. Sensor Check (*) (**)
10	Regulator Adj	26	No special cycle
11	Infinite fill	27	Reserved
12	Volume Comp	28	Reserved
13	Auto Vol	29	Temperature check (*) (**)
14	No special cycle	30	Atm Pressure Check (*) (**)
15	No special cycle	31	No special cycle
16	Sd Prt PASS Learn		

To activate a special cycle, you must send a **Start** command (Bit 1) and a **Start special cycle** command (Bit 2).
(*) For version ≥ 1.400 only.
(**) 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 40 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	Leak low section word.	Long	4	x1000
10	Leak high section word.			
11	Leak unit code low part word (refer to. Units table).	Long	4	x1000
12	Leak unit code high part word (refer to. Units table).			
13	Pressure piezo 2 low part word.	Long	4	x1000
14	Pressure piezo 2 high part word.			
15	Pressure piezo 2 unit code low part word (refer to units table).	Long	4	x1000
16	Pressure piezo 2 unit code high part word (refer to units table).			
17	Test check result low part word.	Long	4	x1000
18	Test check result high part word.			
19	Test check result unit code low part word (refer to units table).	Long	4	x1000
20	Test check result unit code high part word (refer to units table).			
21	Large Leak low part word.	Long	4	x1000
22	Large Leak high part word.			
23	Large Leak unit code low part word (refer to units table).	Long	4	x1000
24	Large Leak unit code high part word (refer to units table).			

Words	Meaning	Type	Bytes	Coeff
V2.xxx Only				
25	Pa – Pa/s Leak result low part word	Long	4	x1000
26	Pa – Pa/s Leak result high part word			
27 - 36	*Unused*			
37	Atmospheric pressure in hPa low part word	Long	4	x1000
38	Atmospheric pressure in hPa high part word			
39	Temperature in °C low part word	Long	4	x1000
40	Temperature in °C high part word			

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	Pre-dump.
2	0002	Sealed component fill.
3	0003	Sealed component stabilization.
4	0004	Fill.
5	0005	Stabilization.
6	0006	Test.
7	0007	Dump.
65535	FFFF	No steps 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).
8	0008	ATR error.
9	0009	ATR drift.
10	000A	CAL error.
11	000B	Volume too small (sealed component).
12	000C	Volume too large (sealed component).
14	000E	Equalization valve switching error.
43	002B	Pressure too high.
44	002C	Pressure too low.
45	002D	Piezo sensor out of order.
46	002E	Dump error.
47	002F	CAL drift error.
48	0030	Calibration check error.
49	0031	Leak in calibration check too high.
50	0032	Leak in calibration check too low.
51	0033	Sealed component learning error.
64	0040	Piezo sensor 2 out of order.
65	0041	Pressure Piezo 2 too high.
66	0042	Pressure Piezo 2 too low.
68	0044	Pressure Piezo 2 switched alarm (test pressure too high).
69	0045	Pressure Piezo 2 switch (test pressure too small).
72	0048	Learning Electrical Regulator Default.

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 40 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 40 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	Leak low section word.	Long	4	x1000
10	Leak high section word.			
11	Leak unit code low part word (refer to. Units table).	Long	4	x1000
12	Leak unit code high part word (refer to. Units table).			
13	Pressure piezo 2 low part word.	Long	4	x1000
14	Pressure piezo 2 high part word.			
15	Pressure piezo 2 unit code low part word (refer to units table).	Long	4	x1000
16	Pressure piezo 2 unit code high part word (refer to units table).			
17	Test check result low part word.	Long	4	x1000
18	Test check result high part word.			
19	Test check result unit code low part word (refer to units table).	Long	4	x1000
20	Test check result unit code high part word (refer to units table).			
21	Large Leak low part word.	Long	4	x1000
22	Large Leak high part word.			
23	Large Leak unit code low part word (refer to units table).	Long	4	x1000
24	Large Leak unit code high part word (refer to units table).			

Words	Meaning	Type	Bytes	Coeff
V2.xxx Only				
25	Pa – Pa/s Leak result low part word	Long	4	x1000
26	Pa – Pa/s Leak result high part word			
27 - 36	*Unused*			
37	Atmospheric pressure in hPa low part word	Long	4	x1000
38	Atmospheric pressure in hPa high part word			
39	Temperature in °C low part word	Long	4	x1000
40	Temperature in °C high part word			

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: Calibration check error 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**

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

94	FF	FF	FF

FFFFFF94h → -108(d)/1000 → **-0.108**