TAGSYS RFID™
e-connecting goods

50x50 CONVEYOR TUNNEL READER

User's Guide

Revision 1.0

November 2007

www.tagsys.net

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Printed in France.

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Document Reference: DOC12454A0

Read This First

Welcome to the TAGSYS RFID System. This User's Guide is designed to help you get up and running quickly using this high-quality Radio Frequency Identification (RFID) system. It describes all you need to know about how to install and use the TAGSYS system and its associated applications.

It provides a step-by-step guide for the following procedures:

- Installation of the CONVEYOR TUNNEL READER
- Select the best-adapted configuration for your application (Standalone Mode)
- Troubleshoot any eventual problems.

After you become familiar with the basic functions of the product, you can use the rest of this handbook as a reference for less common tasks, for maintaining your system, and also as a source of information if you have problems operating the system.

This End User's Guide is designed for all CIT (Certified Integrators by TAGSYS) and for TAGSYS Expert Network customers implementing a low-cost and high-performance RFID solution.

This document does not assume any previous knowledge of Radio Frequency Identification (RFID) technology.

Conventions

Symbol	Meaning
	**CAUTION**: A note that advises users that a specific action could result in the loss of data or damage the hardware. **WARNING**: A note that advises users that a specific action may result in physical harm.
	A note that provides additional information that helps the user perform a task or obtain the best performance from the product.

Abbreviations and Acronyms

ASK	Amplitude Shift Keying
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
DLL	Dynamic-Link Library
DSP	Digital Signal Processor
ETX	End of Text
HPI	Host Port Interface
I/O	Input/Output
LED	Light Emitting Diode
LSB	Least Significant Bit

MSB	Most Significant Bit
OS	Operating System
PC	Personal Computer
PCB	Printed Circuit Board
PLC	Programmable Logic Controller
RAM	Random Access Memory
RF	Radio Frequency
RFID	Radio Frequency Identification
RFU	Reserved for Future Use
RTF	Reader Talks First
TTF	Tag Talks First
TTL	Transistor-Transistor Logic
TTY	TeleTYpe

Glossary

Anti-Collision Tag capability making it readable while other tags are present in the RF field.

Antenna An aerial that receives and/or transmits radio frequency signals. Aerials are manufactured in a variety of forms, shapes and sizes.

Baud A unit of measure of data transmission speed representing the number of signal changes per second.

BNC Connector Cylindrical metal connector with a copper core that is located at the tip of a coaxial cable, and is used to connect cables together. It attaches by pushing and twisting the outer cylinder on to two locking pins.

Digital Signal Processor This part of the Radio Processing Unit (RPU) performs real-time smart label decoding and manages the Medio L200 configuration.

Dynamic-Link Library Executable routines that are stored as separate files with DLL extensions and executed only when needed by the program.

Host Port Interface Interface used to access the DSP memory.

Monitoring Port Parallel Port granting access to the HPI. It communicates directly with the Radio Processing Unit

Multi-Read See Anti-Collision

Packaged Reader A reader in its casing.

Phase Shift Difference of phase between the 13.56 MHz field emitted by two antennas. This feature is dedicated to rotating field applications and three-dimensional volume smart label detection.

PLC Programmable Logic Controller

Protocol A set of rules governing a particular function, such as the flow of data/information in a communication system (communication between a smart label and a reader or a reader and a PC or host computer).

Radio Frequency Identification System (RFID) An automatic identification and data capture system comprising one or more readers and one or more smart labels in which data transfer is achieved by means of suitable modulated inductive or radiating electromagnetic carriers.

Radio Processing Unit This unit controls the main features of TAGSYS Lx00 reader units, such as the RF channels, the multiplexer and the smart label decoding.

Reader Electronic system for the communication between smart labels and host computers.

Reader Talks First Chip protocol for exchanges between the reader and the chip, whereby the chip waits for a command from the reader to which it responds.

RS-232 Electronic Industries Association (EIA) standard for serial interfaces between computers and peripherals that defines the function, the electrical characteristics and the timing of signals.

RS-485 Electronic Industries Association (EIA) standard for multipoint, differential data transmission. It allows multiple nodes to communicate bi-directionally over 1 or 2 twisted pairs.

Smart Label Small, flexible tag from the 13.56 MHz TAGSYS product line. A smart label is made of a chip connected to an etched antenna.

Tag See Smart Label.

Tag Talks First Chip protocol for exchanges between the reader and the chip, whereby the tag sends information continuously, without waiting for a specific command from the reader.

Transceiver A combined transmitter and receiver.

Transponder A combined receiver/transmitter that automatically transmits a signal when a ‘trigger’ is received by it. The trigger is often a pulse, called an interrogation pulse.

If you need assistance

Please contact your nearest TAGSYS sales representative or the TAGSYS welcome desk at:

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Contact for Comments

We welcome your feedback to help us provide high quality documentation.

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Please remember to quote the Document Reference Number DOC12454A0, your job title and your company.

Quality Issues

TAGSYS implements stringent quality controls at all stages of its manufacturing process. However, should you find a defect with this product, please notify your TAGSYS Quality Service representative using the dedicated Product Return Form.

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Table of Contents

1 For Your Safety

1.1 General Use

The CONVEYOR TUNNEL READER is designed to be rugged and reliable and to provide years of trouble-free service. Please observe the following general tips:

- Take care not to scratch the device. Keep the device clean. When working with the device, use only TAGSYS-approved accessories.
- This device is not waterproof and should not be exposed to rain or moisture. Under extreme conditions, water may enter the circuitry.
- Take care not to drop the device or subject it to any strong impact.
- Protect the device from extreme temperatures. For example, do not leave the device in front of a window on a hot day, and keep it away from heaters and other heat sources.
- Do not store or use the device in any location that is extremely dusty, damp, or wet.
- Use a soft, damp cloth to clean the device. If the surface of the device becomes soiled, clean it with a soft cloth moistened with a diluted window-cleaning solution.

1.2 Care and Maintenance

This device is a product of superior design and should be handled with care. The suggestions below will further increase the lifetime of this device.

- Keep the device and all parts and accessories out of the reach of small children.
- Keep the device dry. Precipitation, humidity and liquids contain minerals that will corrode electronic circuits.
- Do not use or store the device in dusty, dirty areas. Its moving parts can be damaged.
- Do not store in hot areas. High temperatures can shorten the life of electronic devices, damage batteries and warp or melt certain plastics.
- Do not store in cold areas. When the device warms up (to its normal temperature), moisture can form inside the device, which may damage electronic circuit boards.
- Do not attempt to open the device. Non-professional handling of the device may damage it.
- Handle the device with care. Shocks may break internal circuit boards.
- Do not clean the device with harsh chemicals, cleaning solvents or strong detergents. Gently wipe the device with a soft cloth slightly dampened in a mild soap-and-water solution.
- Do not paint the device. Paint may clog the device’s moving parts and prevent proper operation. Paint with metallic contents may limit device performance.

1.3 Important Safety Information

1.3.1 Operating Environment

Follow all special regulations that are applicable in any area and always switch off the device whenever its use is prohibited, or when it may cause interference or danger.

When connecting the device or any accessory to another device, read its user's guide for detailed safety instructions. Do not connect incompatible products.

As with all RF equipment, users are advised that the equipment should only be used in its normal operating position.

2 Certification

At the moment UL certification is in progress for this product.

2.1 Occupational Health and Safety Notices

TAGSYS CONVEYOR TUNNEL READER has been designed and tested to be in conformity with the limits given in the European Standard EN 50364 “Limitation of human exposure to electromagnetic fields from devices used in Electronic Article Surveillance (EAS), Radio Frequency Identification (RFID) and similar applications” in conjunction with the European Standard EN 50357 describing how to evaluate the exposure level.

CAUTION: Modification of any TAGSYS System is prohibited without the written consent of TAGSYS. Unauthorized modifications may void the conformity of the equipment to safety standards and will void the TAGSYS warranty.

2.2 Regulatory Notices

An RFID system typically composed of an RF emission device such as the CONVEYOR TUNNEL READER is subject to national regulations that may differ by country.

One important item to consider is the maximum permissible magnetic field intensity at a distance of 10 meters from the antenna that must not exceed 42 dBµA/m in Europe and 38 dBµA/m in US.

The CONVEYOR TUNNEL READER meets these limits.

It is the responsibility of the CIT (Certified Integrators by TAGSYS) to install the CONVEYOR TUNNEL READER as described in this User’s Guide or in TAGSYS Documentation.

2.2.1 In Europe (CE and RTTE Directives)

The CONVEYOR TUNNEL READER complies (CE Declaration of Conformity granted) with the European EMC directive.

The CONVEYOR TUNNEL READER complies with the requirements of the Telecommunication Terminal Equipment Act (FTEG) and the RTTE Directive 1995/5/EC.

If a CONVEYOR TUNNEL READER is further integrated in a different product, it is the responsibility of the manufacturer of this complementary product to obtain the required approvals for this product.

2.2.2 In USA (FCC Directive)

The CONVEYOR TUNNEL READER has been designed to comply with Part 15 of the FCC Rules, FCC ID Number QHKL200TUN500ANT, and is delivered to work in Standalone mode with no possibility to change the settings as a default factory-configured product.

CONVEYOR TUNNEL READER

WARNING TO USERS IN THE UNITED STATES

FEDERAL COMMUNICATIONS COMMISSION (FCC) RADIO

INTERFERENCE STATEMENT 47 CFR Section 15.105(b)

This equipment has been tested and been found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the CONVEYOR TUNNEL READER.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different to that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NO UNAUTHORIZED MODIFICATIONS

47 CFR Section 15.21

CAUTION: This equipment may not be modified, altered, or changed in any way without signed written permission from TAGSYS SA. Unauthorized modification may void the equipment authorization from the FCC and will void the TAGSYS warranty.

ANTENNA REQUIREMENT

47 CFR Section 15.203

CAUTION: This equipment must be professionally installed. The installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded. Non-professional installation or installation of the equipment with an improper antenna may void the equipment authorization from the FCC and will void the TAGSYS warranty.

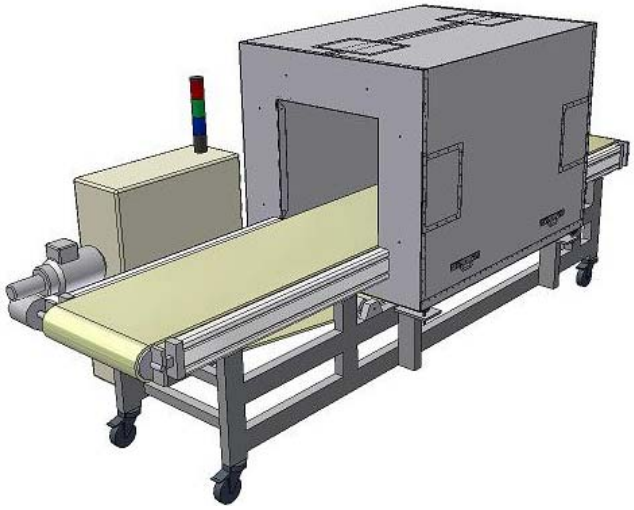
Operation is subject to the following two conditions: (1) The system devices may not cause harmful interference, and (2) The system devices must accept any interference received, including interference that may cause undesired operation.

2.2.3 In Canada

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

3 System Overview



The CONVEYOR TUNNEL READER is intended for Original Equipment Manufacturer (OEM) and end users applications.

It is designed to identify batches of tagged carried by a conveyor through the tunnel. Items can be either in bulk (in a box, a bag …), or in stacks.

It incorporates hardware and software to manage the Radio Frequency (RF) interfaces as:

- power supply
- data exchange
- RFID reader communication protocols
- PLC (Programmable Logic Controller to control the conveyor).

When delivered, the CONVEYOR TUNNEL READER is set in standalone mode (ready to work) with the application settings.

Customized software can also be developed and downloaded to fit with application command set of the RFID reader and the conveyor.

Whatever the configuration, the CONVEYOR TUNNEL READER will be installed and set up by a CIT (Certified Integrators by TAGSYS).

3.1 Features

- Optimized design for ISO15693 chips (370DL Laundry Tag, C370 chip based tags)
- Included 13.56-MHz RF multi-channel packaged long-range reader
- Shielded arrangement and antenna arrangement to guarantee a 3D reading in any tag orientation
- 110VAC/60 Hz and 230VAC/50Hz power input versions
- Automatic start and stop of the RFID reading operation each time a batch of items tagged enter and exit the tunnel

- Configurable standalone mode settings (reader and multiplex settings, conveyor speed, …)
- Serial port for the communication with the RFID reader (RS-232)
- Ethernet port available for the industrial PLC (for customized conveyor command)
- Parallel port to monitor the RFID reader
- Stacklight indicators (optional)

3.2 Brief Conveyor Tunnel Reader Description

Figure 1 : Conveyor Tunnel Reader

Being a standalone solution, TAGSYS Conveyor Tunnel Reader does not require additional equipment to operate.

The CONVEYOR TUNNEL READER is made of three parts:

- The Tunnel (Electromagnetic shielded antenna arrangement)
- An electric cabinet including the RF reader and electrical devices to manage the conveyor. The RF reader is based on the L200 TAGSYS reader with specific hardware and software improvement for tunnel application.
- The Conveyor, with a soft PVC belt or a plastic modular belt.

To operate, the Conveyor Tunnel Reader needs a power supply single-phase 110-120V AC / 60 Hz or 230V AC / 50Hz (depending on the version). Power consumption is less than 500W.

A RS232 serial cable is provided to connect the tunnel reader to the host PC, to collect and manage data from the read tags.

Also provided, an Ethernet crossed cable for PLC command, and a DB25 parallel cable for RF reader monitoring.

TAGSYS Medio L200 Reader for Tunnel (included in the electrical cabinet) is optimized for use with TAGSYS TUNNEL antennas only.

The reader and the tunnel are fit together and cannot be used independently.

The antennas are factory-calibrated to an impedance of 50 Ohms/ 0° that offers optimal performances.

It is advised not to open tunnel to modify the antennas arrangement at the risk of loosing performance and may conduct the TAGSYS TUNNEL READER to be unserviceable.

2 different mode to operate the CONVEYOR TUNNEL READER:

- standalone mode
- slave mode

They are described in following chapter.

4 Modes of operation

4.1 Conveyor Tunnel Standalone Mode

In standalone mode no software application development is required. The tunnel is fully autonomous, and the RFID reader sends automatically the read tags ID N° to the PC. The only connection between host PC and the system is the serial RS232 cable to collect reader output data (read tags can be displayed on the PC using Hyperterminal software).

The reader settings (baud rate, data frame format, RFID settings…) and PLC standard program (ConvoyeurStandardDM_V2.pro) are loaded in the non volatile memory of the reader and the PLC allowing tunnel to automatically run at power on.

TAGSYS Tunnels on conveyors are used to be delivered with customer application standalone mode setting. The customer just has to push the green button on the front door of the electrical cabinet to start the conveyor and place the tagged items on the conveyor.

4.1.1 RS232 Serial Communication Parameters

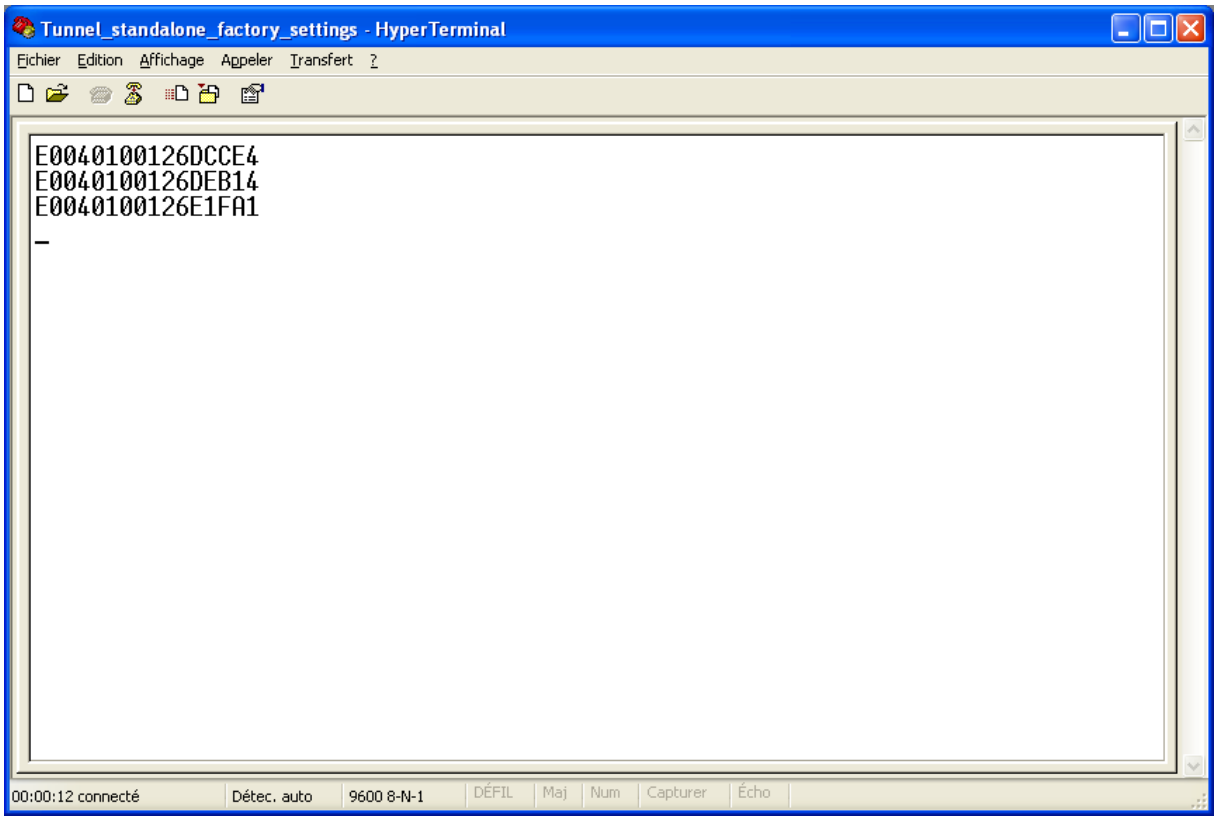
- baudrate: adjustable (9600, 18200 or 38400 bauds) – factory setting = 9600
- data bits: 8
- parity: none
- stop bit: 1
- flux control: none
- Frame format: Tag ID in hexadecimal, number of digits adjustable up to 16 (factory setting = 16 digits)

Uniqueness of tag ID can only be guaranteed if Tag ID is transmitted with 16 digits

- Trailer: adjustable – factory settings = carriage return + line feed (\0D\0A)
- Sorting: adjustable – factory settings = sorting activated (tag ID of a read tag is sent only once by the reader)

Medio L200 reader cannot sort out more than 48 tags at a time, if more an additional sorting sequence must be carried on by the customer application (otherwise the tunnel reader may send several times the same tags ID)

Below is an example of frames sent by the reader after 3 tags have been read (factory settings, frames displayed on hyperterminal)



4.1.2 Additional Features to Standalone Mode Frame Format

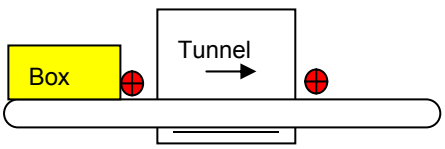
- CRC at the end of each ID frame
- sorting depth: minimal number of tags to be read before re-read the first one (max 48)
- sorting timeout: minimal time before re-read the first one
- watchdog characters and delay: check reader is still alive

All standalone reader parameters are adjusted using L200 Explorer software on the host PC.

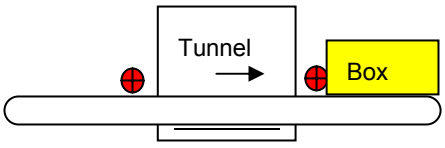
Please refer to Chapter 8 and Medio **L200 Reader User's Guide** for further information. These parameters can easily be changed during/after installation.

For automation conveyor standard Standalone PLC program functionalities are as follow:

- Automatic start and stop of the RFID reading operation each time tagged items is going through the tunnel (PLC manages upstream and downstream photocells information to send an output trigger to the Medio L200 Reader) :



Trigger start



Trigger stop

Photocells located at entry/exit of the tunnel are used to start and stop RFID reading operations. If the container to read is too thin, it may not be detected by the photocell. If so, the photocell must be placed just above the belt level, or the trigger features must be cancelled in the standalone mode settings (permanent reading).

- Counting or discounting number of boxes entering the tunnel trigger activation (trigger must stop only when the last box has exited the tunnel). This feature is useful only when boxes are moving one after the other.
- A stacklight indicator is provided with the conveyor tunnel reader. It is not mounted at delivery but can be easily plugged on top of the electrical cabinet.

While operating the TAGSYS TUNNEL READER in standalone mode the stacklight (red, green and white) will show process status.

1. White lamp is switched on when the RF field is ON. RF field is triggered by a box crossing the optical sensor at the tunnel entry
2. Green lamp is switched on (for 500ms) when a new tag is read
3. Red lamp is switched on (for 500ms) after the box has crossed the tunnel and no tag has been read
4. White lamp is switched off after a box has crossed the optical sensor at the tunnel exit

Figure 2 : Indicating Lights

In standalone mode, Ethernet port on the WAGO PLC is not useful, unless the customer wants to access (reading only) to the state of the inputs/outputs of the PLC (see below):

- Standard program loaded in the PLC (ConvoyeurStandardDM_V2.pro) does not run the conveyor. Only buttons on the front door cabinet are used to start/ stop the conveyor. Speed is adjusted using the potentiometer inside the electrical cabinet (nominal speed is adjust by Tagsys during installation; it must not be changed without TAGSYS agreement).
- Optionally conveyor can be run in standalone mode if the program called (ConvoyeurMoteurDM_V2.pro) is loaded in the PLC. The conveyor starts automatically when the entry photocell sees the box (placed manually on the conveyor belt), and stops automatically when the box exits the tunnel.
- Trigger features can be cancelled in the standalone mode settings and so the RF reading is permanent at power on.

4.2 Conveyor Tunnel Slave Mode

A custom software application has to be developed to fit with customer requirements. This software application will drive the RFID Reader and the PLC conveyor.

The TAGSYS CONVEYOR TUNNEL READER is delivered with the STX-E standard protocol application to operate in slave mode: the reader is the slave of the host PC or PLC and replies to any STX-E command received. For more information about STX-E communication protocol, please refer to the **Lx00 Command Set documentation**.

The STX-E Protocol is the TAGSYS standard protocol. It is compatible with all TAGSYS products. We recommend using the STX-E protocol in order to address all TAGSYS reader functions.

RS232 connection to the reader is used to set the reading parameters, start and stop the reading or writing operations, etc. It will also be used to get the tags ID data exiting the reader.

Ethernet/Modbus connection to the WAGO Controller can be used for external command of the conveyor (reading of the state of any Input or Output, changing the state of any outputs → start, stop, belt speed selection, etc).

TAGSYS can provide full commands set, DLLs and JAVA package for software developers to develop their own application to drive the RFID reader.

WAGO DLLs (about $100 US) are also available for software developers to develop their own application to drive PLC (conveyor) commands.

The PLC type is WAGO I/O System 750-842 TCP/IP Programmable Field Bus Controller equipped with an Ethernet port. Standard IP address of the controller is 192.168.0.2.

List of PLC Inputs:

- Sensor In = photocell at the enter of the RFID tunnel
- Sensor Out = photocell at the exit o the RFID tunnel
- WhitelampL200, GreenlampL200n and RedlampL200 = not used in that mode

PLC Inputs reading can be used to:

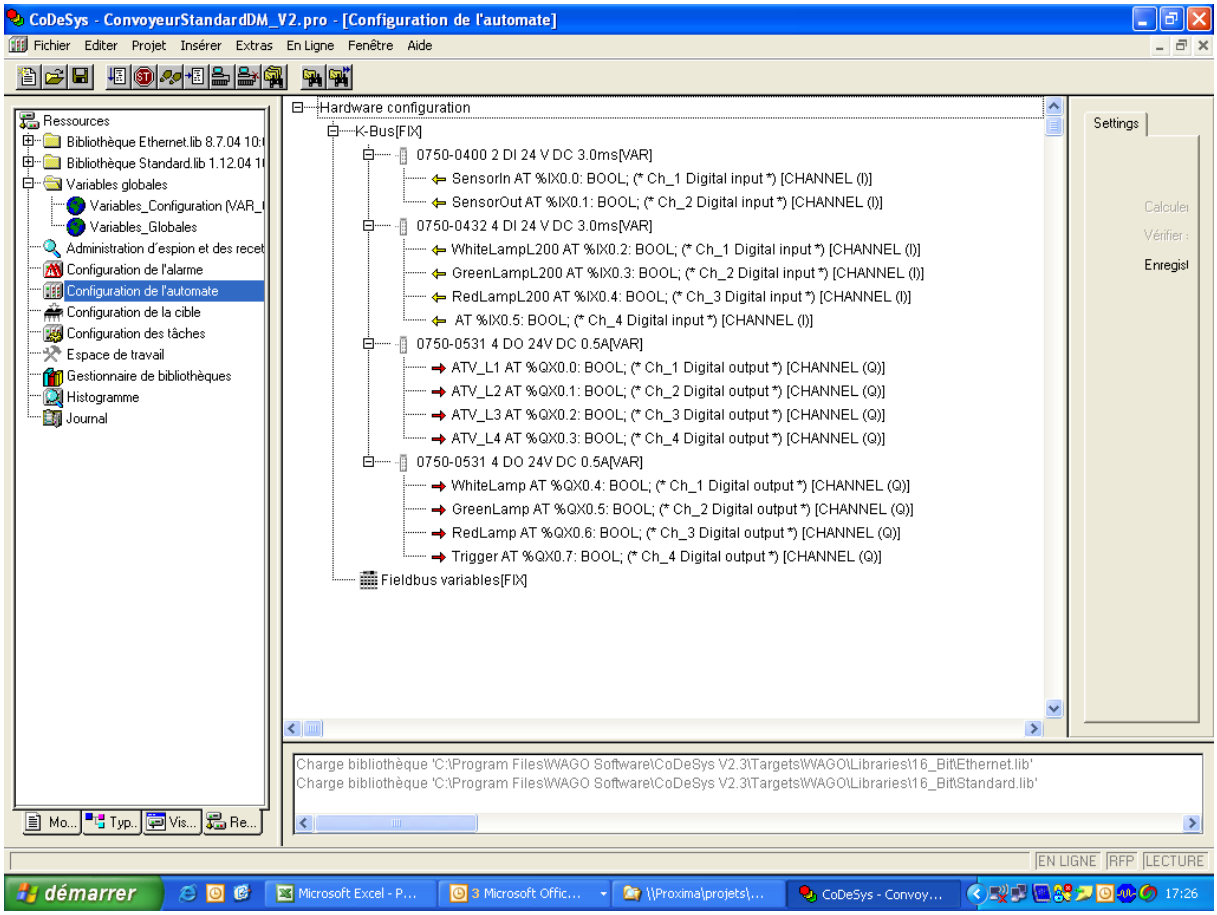
- Trig the RFID reading
- Start any external operation

List of PLC Outputs:

- ATVL1, ATVL2, ATVL3, ATVL4 = outputs for conveyor start and speed management (see § conveyor commands below)
- White-lamp, red-lamp, green-lamp = outputs corresponding to the stacklight
- Trigger = not used in that mode

PLC Outputs writing can be used to:

- start the conveyor forward or backward
- select one of the 3 preprogrammed conveyor speeds, or the speed adjusted by the potentiometer inside the electrical cabinet
- light on any of the 3 lamps of the stack light



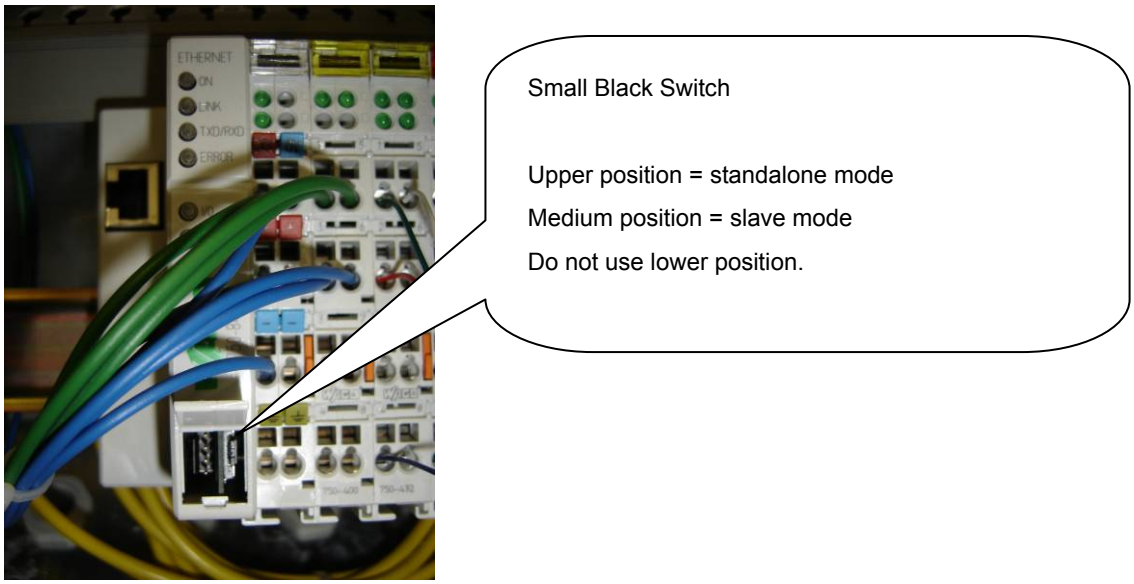
Here are the MODBUS bits addresses of the Inputs / Outputs of the WAGO controller

Identification	Access	Input /Output	Address JBUS	Address Modbus
SensorIn	Read	In	0	1
SensorOut	Read	In	1	2
WhiteLampL200	Read	In	2	3
GreenLampL200	Read	In	3	4
RedLampL200	Read	In	4	5
ATV_L1	Read / Write	Out	512	513
ATV_L2	Read / Write	Out	513	514
ATV_L3	Read / Write	Out	514	515
ATV_L4	Read / Write	Out	515	516
WhiteLamp	Read / Write	Out	516	517
GreenLamp	Read / Write	Out	517	518
RedLamp	Read / Write	Out	518	519
Trigger	Read / Write	Out	519	520

- To read the state of an Input from a supervisor, you need to make a read bit at the corresponding address. Inputs, by definition, can not be modified.
- To read the state of an Output, you need to make a read bit at the corresponding address. To modify the state of an Output, you need to make a write bit at the corresponding address.

For more information on the variables addressing on WAGO I/O 750 system, please ask your TAGSYS representative or go to http://www.wago.com/wagoweb/documentation/index_e.htm and check manuals concerning 750-842 Ethernet TCP/IP Programmable Controller.

Check the position of the small black switch on your PLC. It must be in the position corresponding to your case (standalone or slave mode)



4.2.1 Conveyor Commands (for slave mode with external conveyor command)

The conveyor motor is controlled by a Speed Variator Telemecanique Altivar 11.

Altivar basic commands are available through following input:

- ATVL1 to ATVL4, that correspond to outputs on the WAGO PLC Controller):
- Stop
- Forward
- Backward
- SP3 (pre-programmed speed)
- SP2 (pre-programmed speed)
- SP4 (pre-programmed speed)
- Conveyor Speed from external potentiometer

See below Tables of settings and related actions:

ATVL1 to ATVL4 are 4 electrical inputs to command the motor speed variator (outputs from the PLC):

Input ATVL1	Input ATVL2	Function
0	0	Stop
Front (0->1)	0	Forward
0	Front (0->1)	Backward
1	Front (0->1)	Nothing
Front (0->1)	1	Nothing

Input ATVL3	Input ATVL4	Speed
0	0	Potentiometer on conveyor front panel
0	1	SP3 (pre-programmed)
1	0	SP2 (pre-programmed)
1	1	SP4 (pre-programmed)

These commands can be used to start and stop the conveyor depending on external conditions (downstream saturation…).

Altivar User Guide

Manuel_technique_GB.pdf

4.3 Tag compliance

The TAGSYS TUNNEL READER is designed for ISO15693 tags reading in Laundries, Pharmaceutical, and retail warehouse or distribution centers.

Table 1: Reader Chip Compatibility

Reader	Compatible Chips
TAGSYS READER	ISO 15693 (TAGSYS 370DL , CD tag 370 or FOLIO 370 tags)

4.4 Architecture of the Included Long Range Reader

TAGSYS conveyor tunnel reader includes a Medio L200 Tunnel long range reader.

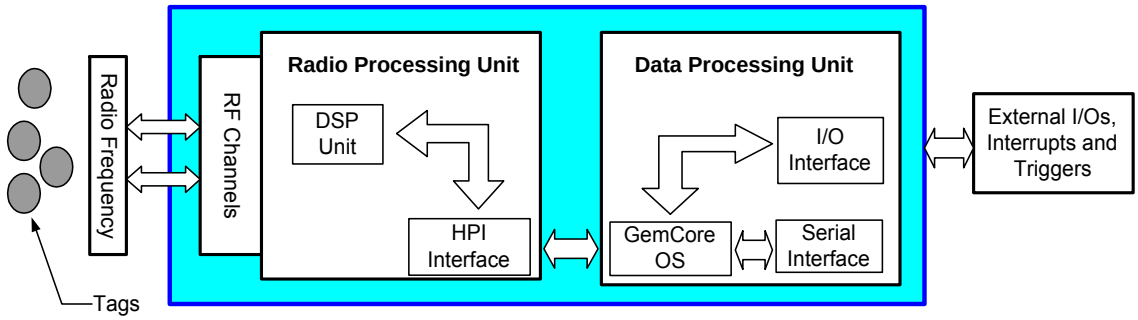
The 4 I/O reader ports are used to manage the stacklight indicator and trigger reading operation.

The Reader consists of two main parts: the Radio Processing Unit and the Data Processing Unit.

The Radio Processing Unit (RPU) manages the communication with the tags. This includes the channel multiplexing management, RF output power levels and tag decoding. This part is built around a high-performance Digital Signal Processor (DSP). Depending on the product reference, the specific firmware associated to the DSP is downloaded into the DSP Flash memory. For more details concerning the RPU architecture, please refer to the Lx00 Full Firmware Reference Guide.

The Data Processing Unit (DPU) consists of the GemCore® OS. The DPU controls the serial communication link, I/O ports, and commands sent to the DSP. Custom application software can be downloaded into the DPU. The standard application software is the TAGSYS STX-E communication protocol.

Figure 3: Lx00 Reader Architecture



For set up, debug or monitoring purpose, the Host PC communicates directly with the DSP via the Monitoring port. When the Monitoring port is in use, the DPU block (I/O ports and serial communication link) is disabled.

Please refer to the **Lx00 Firmware Reference Guide** for further information about CONVEYOR TUNNEL READER Firmware.

4.5 TAGSYS Conveyor Tunnel Reader Connections

4.5.1 Serial Connector

The DB9 serial connector on the electrical cabinet is used to communicate with an external environment (host PC).

- In standalone mode, this port transmits tags data to the host PC (Please refer to chapter 4.1).

- In slave mode, user commands and data exchanges are transmitted through this port. It can be set to RS-232, RS-485 or RS-422 mode by software. Different baudrates are available to each mode.

Refer to Serial Port Pin Assignment for more details about cabling serial links.

Tx (Transmit Data) and Rx (Receive Data) LEDs indicate the activity of the serial port.

The RS-232 cable is a null modem cable.

4.5.2 Monitoring Port (Parallel Port)

This port (connector on the RFID reader inside the electrical cabinet) is dedicated to monitoring the reader. (Not to be used with customer application)

The monitoring port communicates directly with the DSP firmware stored in the Flash memory. When the parallel cable is plugged in, the GemCore® OS and STX application software is automatically deselected. The parallel port can be used as a monitoring tool or as a means to set up or debug the CONVEYOR TUNNEL READER via the L200 Explorer.

The parallel cable uses pin-to-pin DB25 connectors. A shielded cable must be used to prevent disruptions when antennas have a high output power.

4.5.3 Ethernet Port on the PLC Controller

This port is devoted to external monitoring of the PLC, for customized conveyor command or I/O management.

The RJ45 connector is on the WAGO PLC, inside the electrical cabinet of the Conveyor Tunnel Reader.

4.5.4 Main Power Supply

A 3-pole shielded cable of section >=3G2,5² must be connected by a sworn electrician directly on the electrical terminals N°1, 2, and 3 inside the electrical cabinet.

Yellow / green terminal refer to the ground cable.

Conveyor Tunnel Reader power consumption less than 500W.

CAUTION: 2 versions of Conveyor Tunnel Reader are available: 230VAC/50Hz and 110VAC/60Hz power supply.
Therefore check carefully the version before connecting the power cable.

5 Installation

5.1 Conveyor Tunnel Reader

CAUTION: This equipment is intended for indoor use only under the conditions described in this document. Should it be used outside these conditions cannot be guaranteed, and is not recommended. Please read section 1“ For Your Safety “ before installation or use.

5.1.1 Installing

After having defined the location of the Conveyor Tunnel Reader, immobilize it by applying the brakes on at least two of the four conveyor wheels.

Conveyor elevation can be adjusted by acting on the feet position (2 screws on each foot).

Then, connect the power cable to the electrical terminal, and the plug the host PC to the serial port.

6 Operation

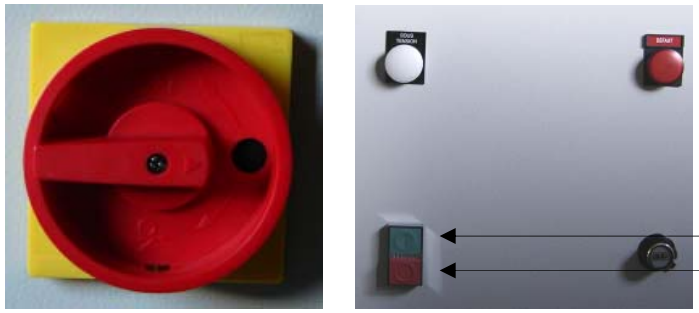
6.1 Starting the System

- To power on the system, switch on the main power switch.
- To start and stop the conveyor, use the red and yellow pushbuttons. If in standalone mode, the reading will start and stop automatically as a batch of items is going through the tunnel. Tags ID will also be transmitted automatically on the serial link.

Left picture shows the main power switch located on the edge of the electric cabinet.

Right picture shows the START/STOP push buttons for the conveyor.

Figure 4: Switches and push buttons



6.2 Normal Operation

No operating procedures are required. The system continues to operate as long as power is supplied.

Avoid letting the conveyor running all day long if not necessary.

6.3 Shutdown

Stop the conveyor by pressing the red pushbutton, and then turn off the main power switch.

In case of emergency push the red button located at the top of the electric cabinet to stop the Tunnel reader conveyor.

Figure 5: Emergency button

7 Using the L200 Explorer

The TAGSYS L200 Explorer is utility software that enables the user to identify the current smart label reader system or system components (reader reference, firmware version, supported chips, etc.) and to perform the following tasks:

- Perform debug operations and reading tests
- Configure the reader for operation in Standalone mode
- DSP firmware upgrades

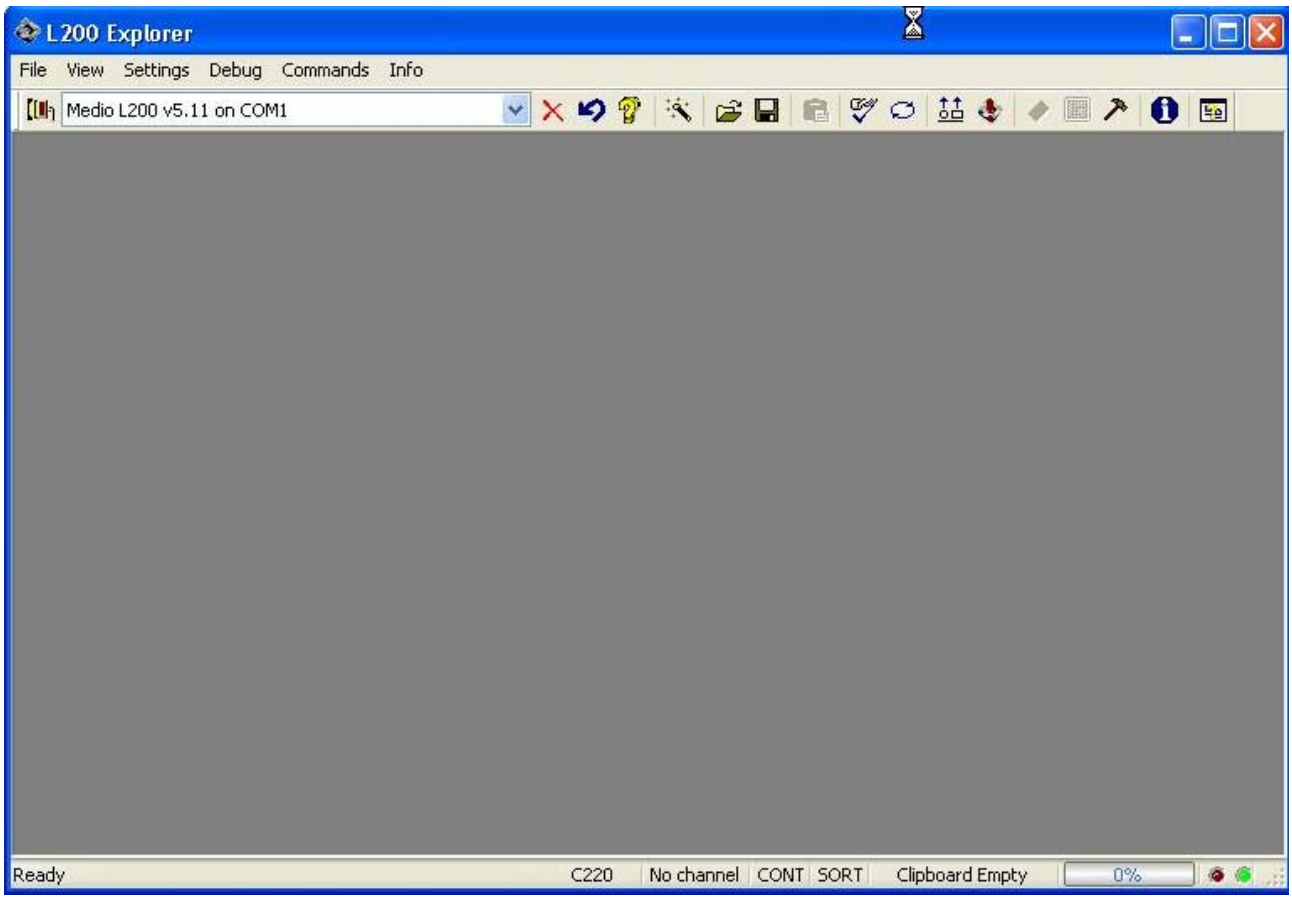
For optimal performances during debug operations, the Lx00 reader must be connected via the monitoring port, using a parallel cable (supplied), to the host PC running the L200 Explorer software.

However, a serial connection is also possible if the STX-E GemCore® application, version 2.0 or more recent, is downloaded into the Medio™ Lx00 Reader. In this case, performances may be affected.

The STX-E Standalone mode can only be configured using the serial communication link.

The L200 Explorer resembles a typical Windows®-based user interface. A Wizard function  is provided to guide the user through each step of how to read or program specific smart labels (tags).

Figure 6: L200 Explorer

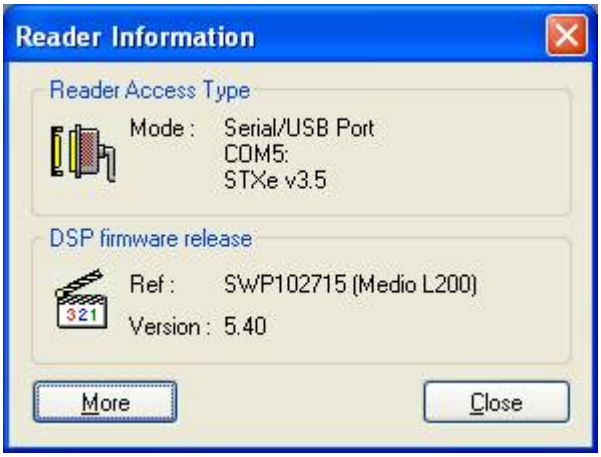


An on-line help function is included (CTRL+H).

7.1 Reader Information

To display the current Reader Access type and DSP Firmware version, in the Info menu, select Reader Information (CTRL + I).

Figure 7: Reader Info (Example)

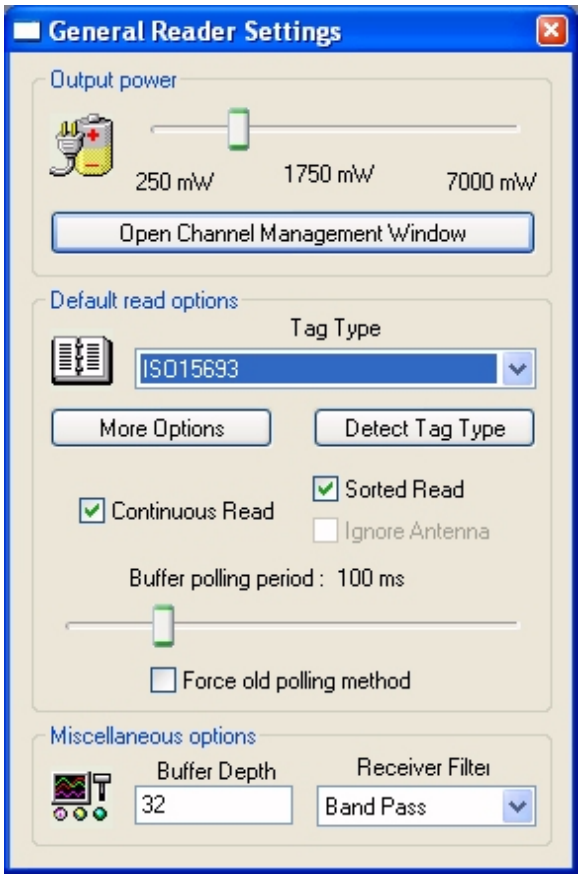


Click More to display the list of additional features and supported chip types.

7.2 General Reader Settings

The General Reader Settings dialog box (CTRL + G) in the Settings menu is used to set the reader parameters in order to test a given application. Several parameters can be set; i.e. antenna RF power, channel multiplexing, chip type, read mode, etc.

Figure 8: General Reader Settings (Example)



7.3 Debugging Tools

The Lx00 Reader features debugging tools to optimize your RFID system installation and communication with the tags. Debugging tools consist of:

- A real-time oscilloscope to display the antenna signals received by the Lx00 Reader,
- A real-time frequency analyzer to display the frequency information of the antenna signal,
- Certain statistical information about the quality of your RFID system environment.

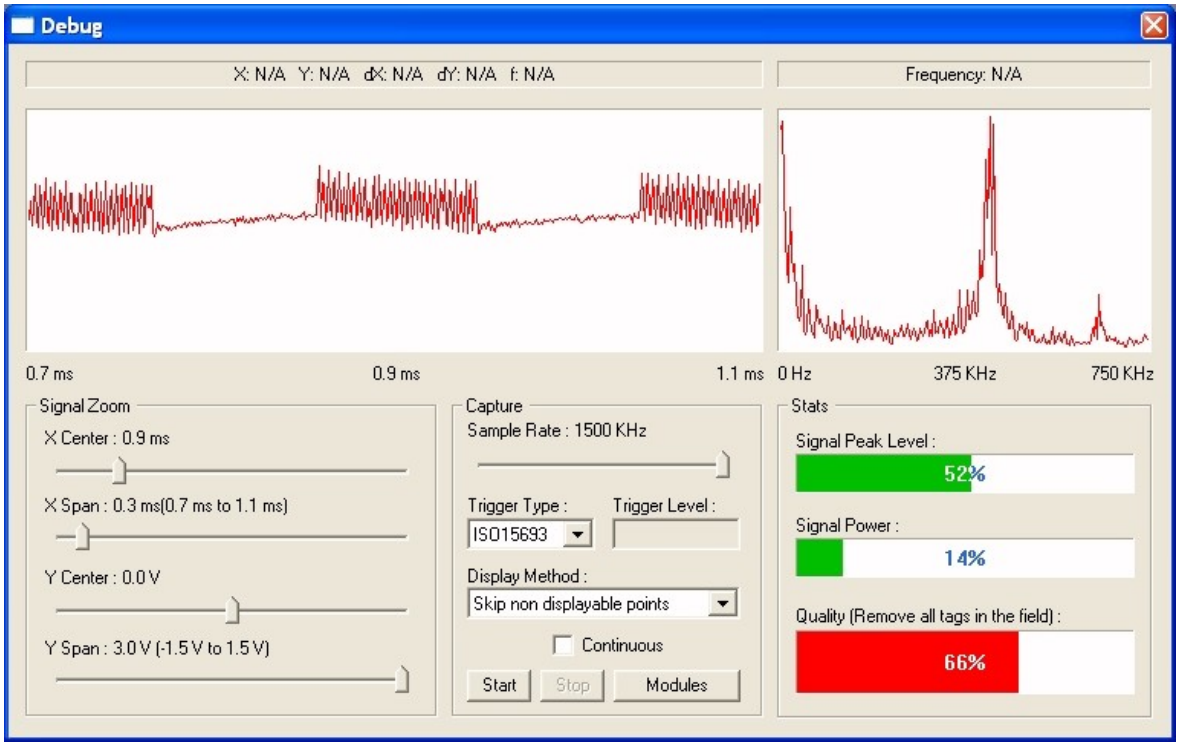
Please refer to “L200 Explorer User’s Guide” for further information about debugging tools.

7.3.1 Debug Dialog Box

Medio Lx00 Readers can be debugged to locate possible decoding problems due to ambient noise. The L200 Explorer provides an oscilloscope graphics display enabling the user to capture and display the receiver analog signal and its Fast Fourier Transform. Of course, one of the channels must be enabled.

The Debug dialog box also displays several indicators concerning the quality of the reader performance. For more information, please refer to the L200 Explorer User's Guide.

Figure 9: Debug Dialog Box



7.4 Standalone Mode Configuration

Standalone Mode is designed to use the reader without using any command set. While in this mode, the reader is limited to tag reading.

Requirements: The STX-E GemCore® application, version 2.0 or more recent, must be downloaded into the Lx00 Reader. In addition, the serial communication link must be used to configure Standalone mode using the L200 Explorer.

The Standalone Configuration Mode dialog box is used to define all parameters of the Standalone mode: chip type, frame format, baud rate, etc. For more information, please refer to Section 8.2, "L200 Reader Standalone Mode" and the L200 Explorer User's Guide.

8 L200 Reader Configuration

The purpose of this chapter is just to provide guidelines that may be useful for customers who need to configure the Medio L200 Reader for tunnel that is included in the Conveyor Tunnel reader (for a modification of standalone mode parameters or for the development of an application in slave mode).

The GemCore® Development Kit is also available for developing custom on-board applications other than the one supplied.

8.1 L200 Reader Slave Mode Configuration

The host PC or PLC is the master of the serial communication links. In this mode, the Lx00 reader replies to any STX-E command sent by the host PC or PLC. All Lx00 reader resources are accessible via the STX-E commands (I/O ports, serial communication type, DSP features, etc.). For more information, please refer to the Lx00 Reader Full Command Set documentation.

8.2 L200 Reader Standalone Mode Configuration

The Standalone Module included in the STX-E application software is used to generate an ASCII message frame with configurable data fields.

Requirements: The STX-E GemCore® application, version 2.0 or more recent, must be downloaded into the Medio™ Lx00 Reader. In addition, the serial line must be used to configure Standalone mode using the L200 Explorer.

Standalone mode features can only be configured using the L200 Explorer software.

8.2.1 General Parameters

These parameters are used to define:

- Standalone Activation mode: Start upon next reset, Start Now or Inactive.
- Communication Baud rate: 4800, 9600, 19200 or 38400 bauds can be selected. Other parameters are set to standard values: No parity, 1 stop bit and 8-bit characters.
- Chip Type to be read in Standalone mode: Only one single chip type can be selected in Standalone mode. Depending on the selected chip type, specific chip parameters can be configured.
- To improve reading performances when using high-quality factor antennas or when the antenna RF power is greater than 1.5 W, select Activate High Pass Receiver Filter to set the receiver filter to High Pass filter mode.

8.2.2 Channel Parameters

These parameters are used to define the general channel configuration:

- RF antenna output power (between 250 mW and 4 W for L100 platforms)
- Channel mode: Either one single channel or a Multiplex configuration is enabled. If no channel is selected, all channels are switched off and no tag commands can be executed. When one channel is selected, it is switched on immediately.

CAUTION: Antennas **MUST** be connected to the reader unit before the Channel settings are enabled.

If Multiplex mode is selected, all channels are switched off. In this case, the reader uses the multiplexer patterns during default read operations. In Multiplex mode, only the default Standalone read command can be executed. For more information, please refer to Section 4 of the Lx00 Full Firmware Reference Guide.

8.2.3 Tag Message Frame Format

The format of the ASCII message used in Standalone mode is user-defined. The Header and Trailer strings are optional, as is the Antenna (RF channel) and its separator string. The Tag ID field contains the tag ID. The number of tag ID characters to be displayed can also be defined.

An optional Checksum field is available to verify the validity of the data.

Messages are sent in frames with the elements shown in Figure 10. The elements sent in the message can be individually selected.

Figure 10: Tag Message Frame Format

The Header and Trailer can each contain from 1 to 16 characters or be absent. Their presence is independent of one another.

The Antenna Number is from 1 to 4 depending on the product reference. This Separator can contain between 1 and 16 characters.

The number of ASCII characters in the ID field can be configured between 2 and 16.

The ID Field is always present.

The second Separator can contain between 1 and 16 characters. The CRC field is the XOR of the sum of all the characters (in hexadecimal format) included in the message. Two ASCII characters represent this value.

8.2.4 Sorting Parameters

The Standalone module of the STX-E on-board software application features a Sorting mode. In normal conditions, each tag frame is sent to the host PC or PLC as soon as it is decoded by the Lx00 Reader.

In Sorting mode, the tags are sorted by the Lx00 Reader before the tag frames are sent to the host PC or PLC. The tags are sorted by a combination of three parameters selected by the user.

- Buffer depth: between 1 and 50 frames
- Timeout per tag: between 0 and 255 seconds in steps of 1 second.
- Reader sorts tags by antenna or regroups all tags into a single group

8.2.5 Trigger Parameters

Standalone mode is able to function using an external trigger. In this Trigger mode, the I/O ports are used with the following functions:

I/O 1: Trigger (input)

I/O 2: Copy of trigger (output)

I/O 3: Active when tag is correctly read (output)

I/O 4: Active when no tag has been read after a trigger (output)

The trigger function operates based on the voltage level; i.e. active high or active low. The IDs of tags detected when the trigger is active can either be sent immediately or after the trigger is reset (inactive). If no tags are detected during a valid trigger condition, a specific character string can be sent. This character string is called a "No Read" message and can be defined by the user. This string replaces the tag ID field in the tag message frame.

The output duration of I/Os 3 and 4 can be individually set for a time between 0 and 63750 milliseconds in steps of 250 milliseconds. These outputs are generally used in connection with a signal box.

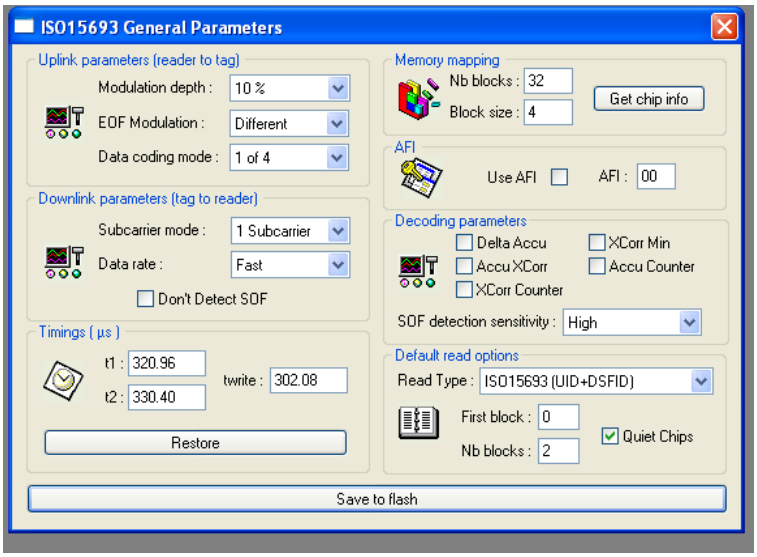
In Trigger mode, the antenna RF field is switched on only when the trigger is activated.

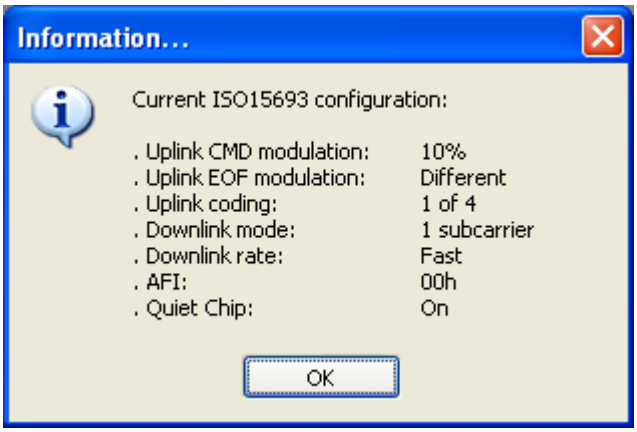
8.2.6 Watchdog

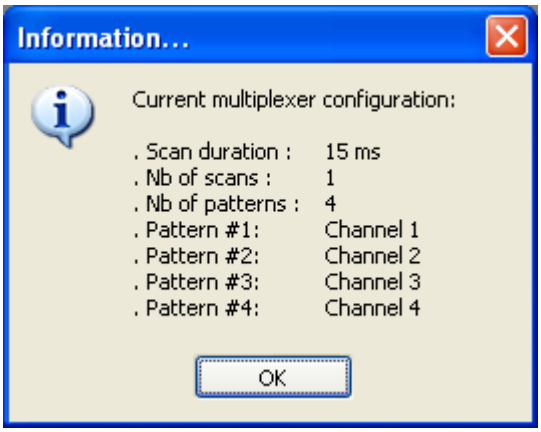
A Watchdog function is available. A specific user-defined ASCII message can be regularly sent.

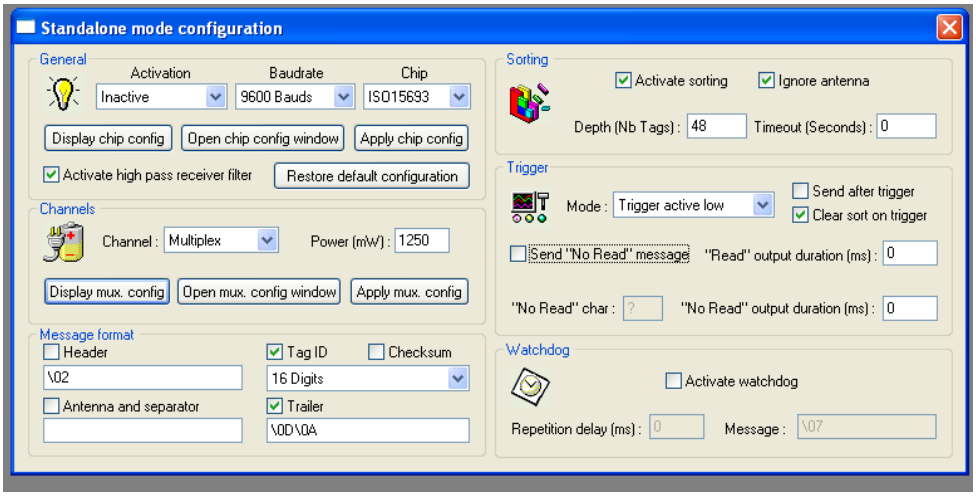
The Repetition Delay can be set up to 63750 milliseconds in steps of 250 milliseconds.

8.2.7 Typical Standalone Mode Parameters for 370DL Laundry Tag Reading









9 Technical Specifications

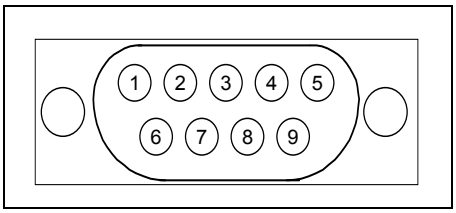
9.1 Technical Specifications

Table 2: Technical Specifications

Parameter	Value
Size (L x W x H)	Please see Figure 13
Weight	330kg. (727.5lbs.)
Ambient Operating Temperature	0 °C to 55 °C (32 °F to 131 °F)
Storage Temperature	–20 °C to 70 °C (–4 °F to 158 °F)
Power Supply	110 o 120 V AC / 60 Hz or 230V AC / 50 Hz
Communication Speed	Serial: Up to 38400 Kbps
Communication Interface	Serial: RS-232, RS-485 and RS-422 Parallel: Bi-directional and Enhanced
RF Output Power	Up to 7 W with multiplex capability and balanced 0° / 180° operation
Power Consumption	Up to 500W (maximum)
L-200 reader Conformity	CE EN 300-330, ETS 300-683 European Radio FCC Part 15 (for typical configurations)
Embedded Application Software	512 KB of Flash memory
Reader Inputs/Outputs	4 I/O ports (Using I/Os in STX-E Standalone Mode)
PLC Inputs/Outputs	

9.1.1 Serial Port Pin Assignment

Figure 11: DB9 Serial Connector



Connector	Description	Connector	Description
1	NC	6	TRx+ RS485/ Rx+ RS422
2	Rx RS232 / TRx- RS485 / Rx- RS422	7	NC
3	Tx RS232 / TRx- RS485 / Tx- RS422	8	NC
4	NC	9	TRx+ RS485/ Tx+ RS422
5	NC		

Following pages show the mechanical and electrical characteristics of the CONVEYOR TUNNEL READER.

Figure 12

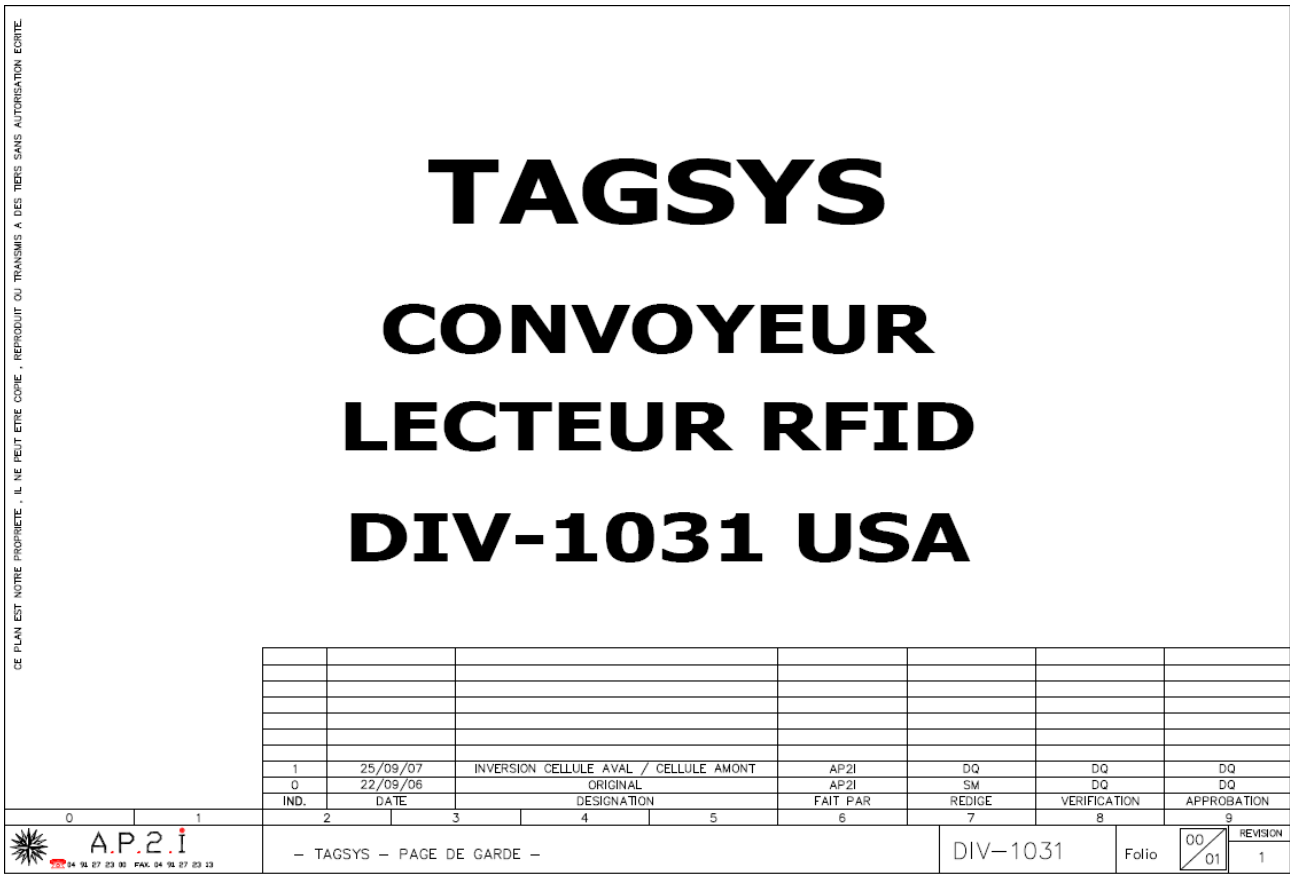


Figure 13 Mechanical Dimensions

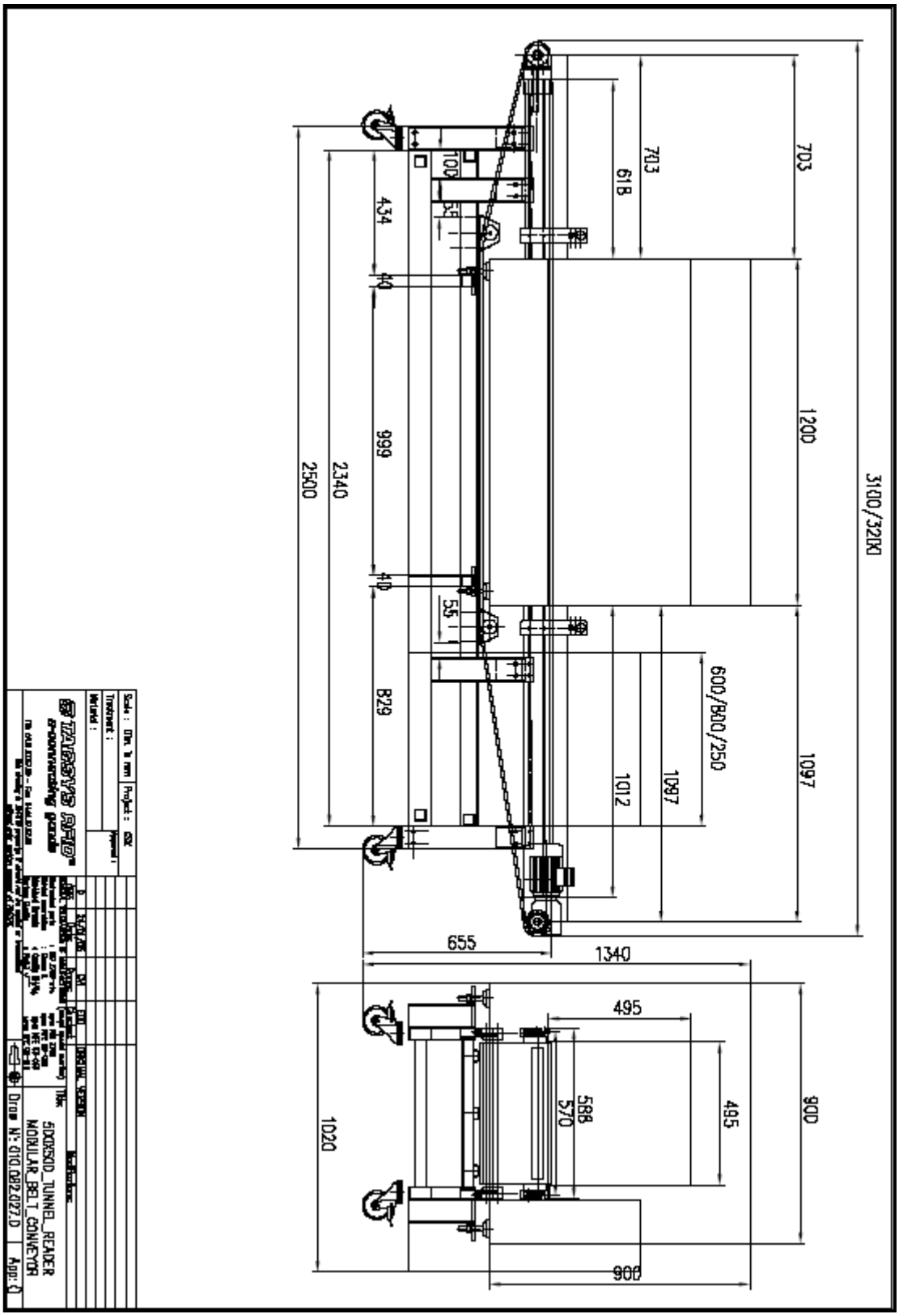
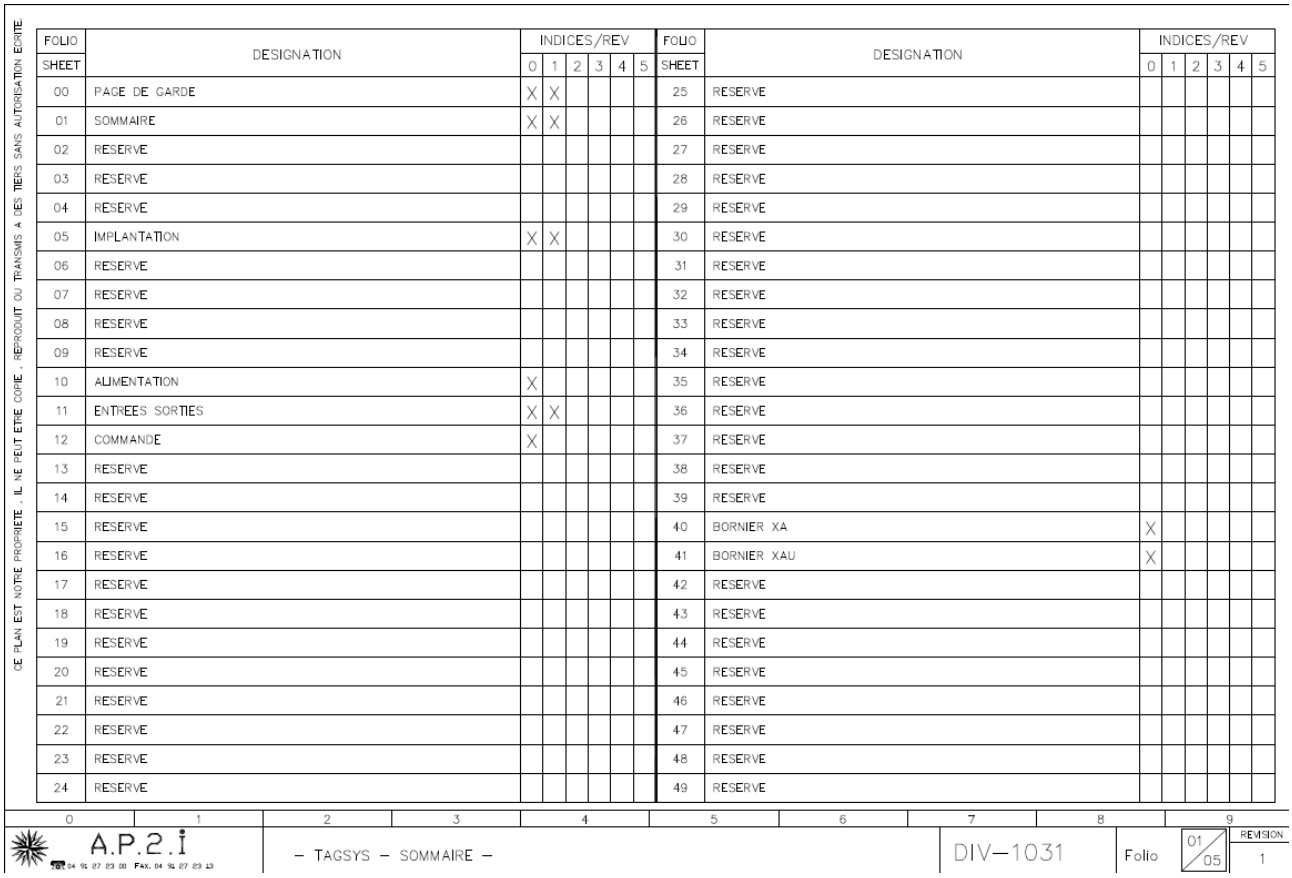


Figure 14



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FOLIO SHEET	DESIGNATION	INDICES/REV 0	1	2	3	4	5	FOLIO SHEET	DESIGNATION	INDICES/REV 0	1	2	3	4	5
00	PAGE DE GARDE	X	X					25	RESERVE						
01	SOMMAIRE	X	X					26	RESERVE						
02	RESERVE							27	RESERVE						
03	RESERVE							28	RESERVE						
04	RESERVE							29	RESERVE						
05	IMPLANTATION	X	X					30	RESERVE						
06	RESERVE							31	RESERVE						
07	RESERVE							32	RESERVE						
08	RESERVE							33	RESERVE						
09	RESERVE							34	RESERVE						
10	ALIMENTATION	X						35	RESERVE						
11	ENTREES SORTIES	X	X					36	RESERVE						
12	COMMANDE	X						37	RESERVE						
13	RESERVE							38	RESERVE						
14	RESERVE							39	RESERVE						
15	RESERVE							40	BORNIER XA	X					
16	RESERVE							41	BORNIER XAU	X					
17	RESERVE							42	RESERVE						
18	RESERVE							43	RESERVE						
19	RESERVE							44	RESERVE						
20	RESERVE							45	RESERVE						
21	RESERVE							46	RESERVE						
22	RESERVE							47	RESERVE						
23	RESERVE							48	RESERVE						
24	RESERVE							49	RESERVE						

0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

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Figure 15

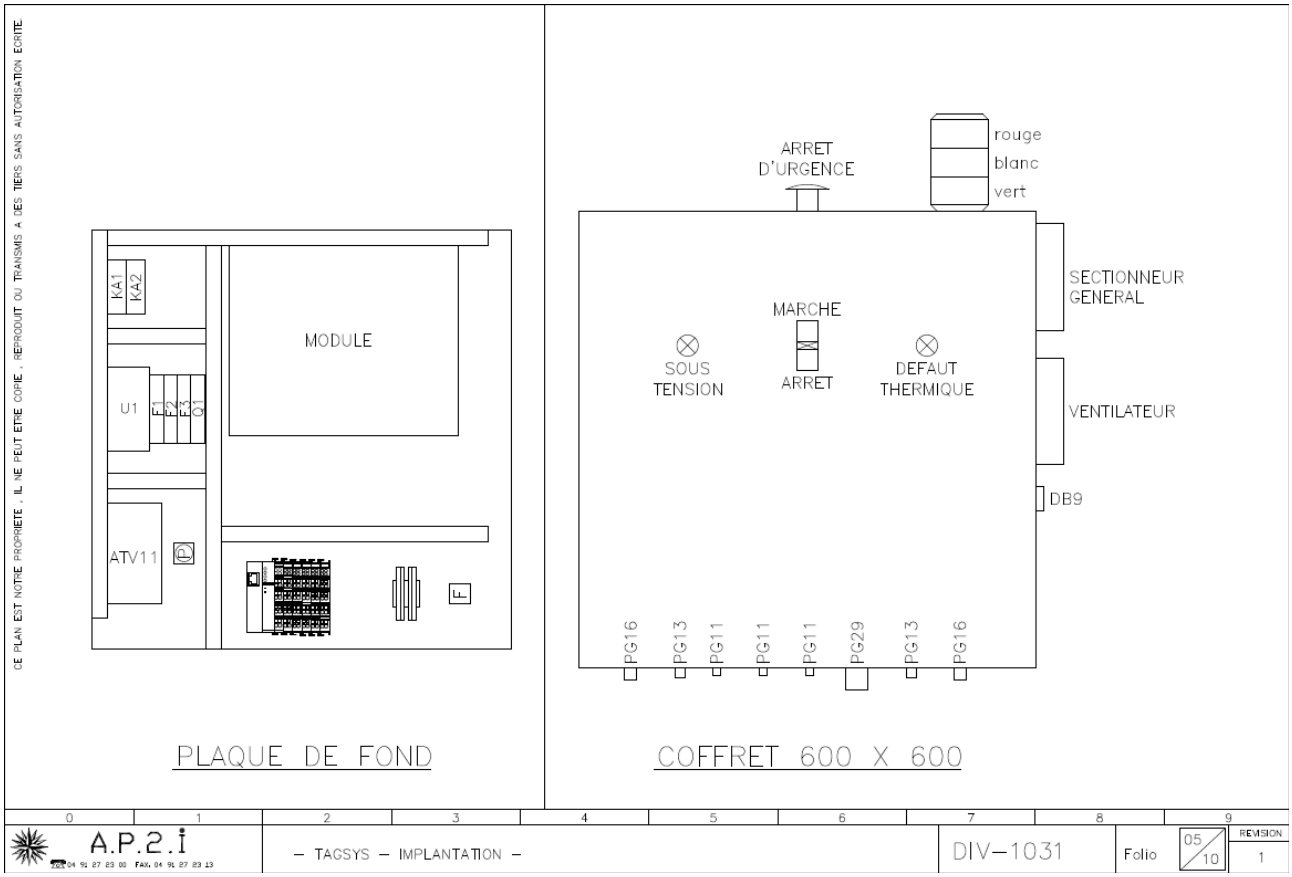


Figure 16

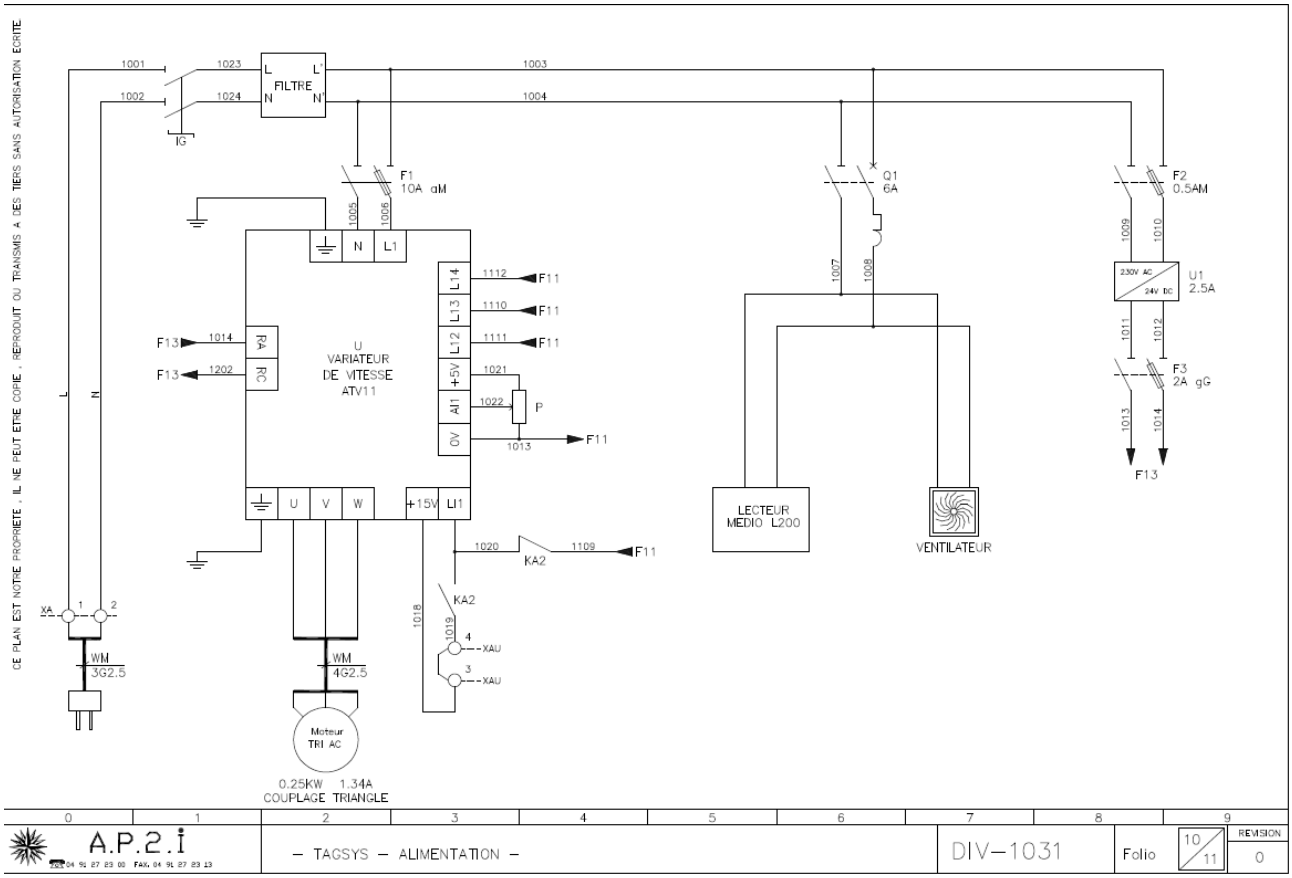


Figure 17

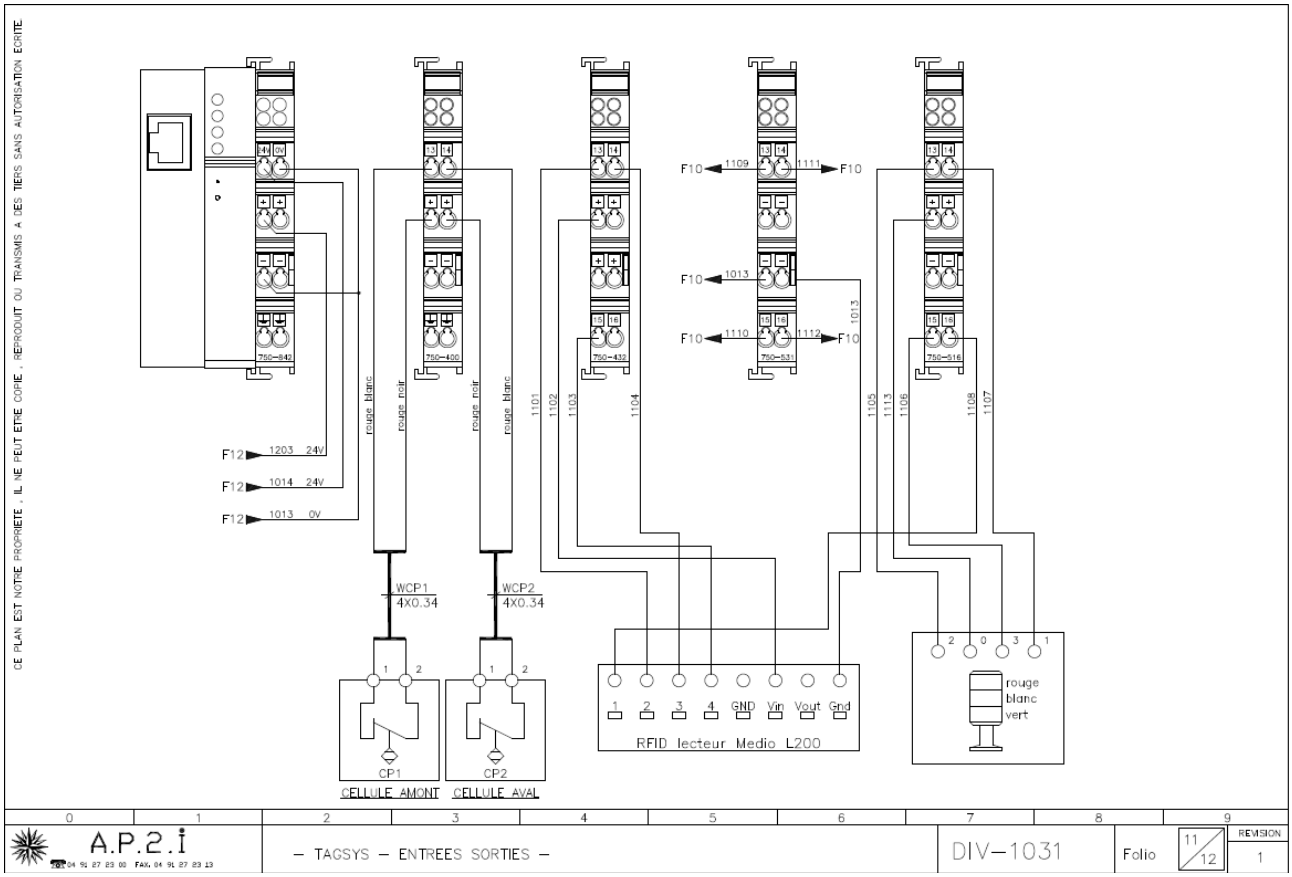


Figure 18

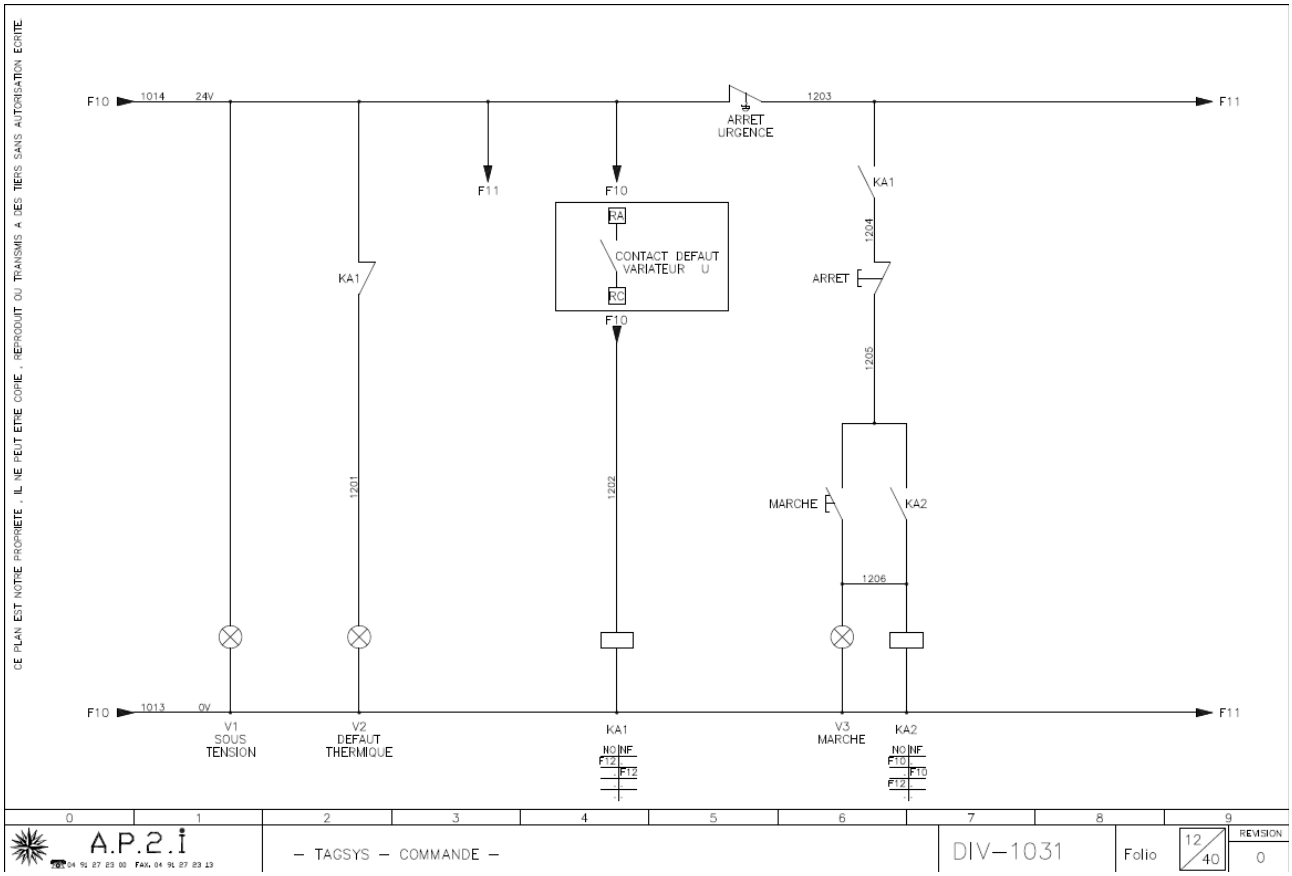


Figure 19

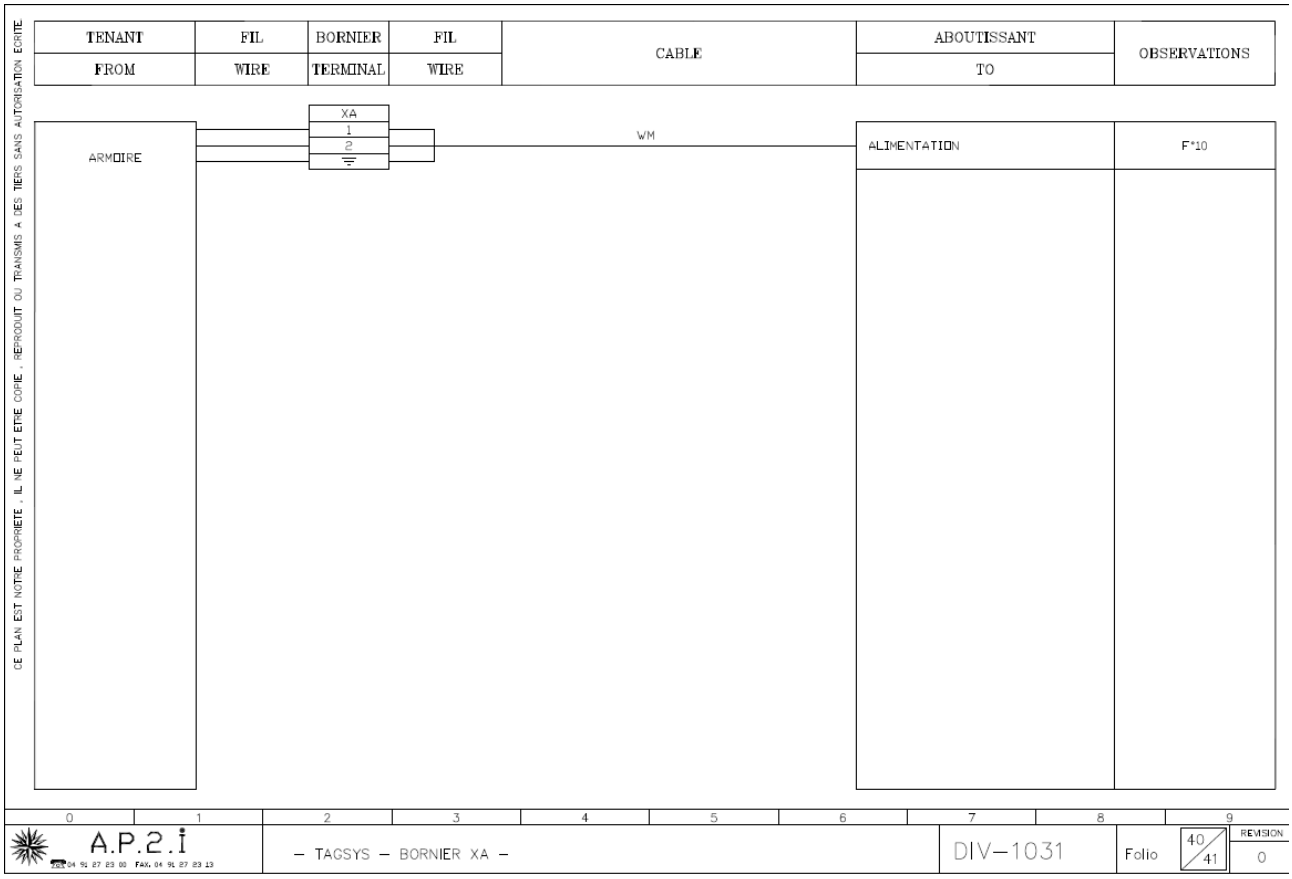
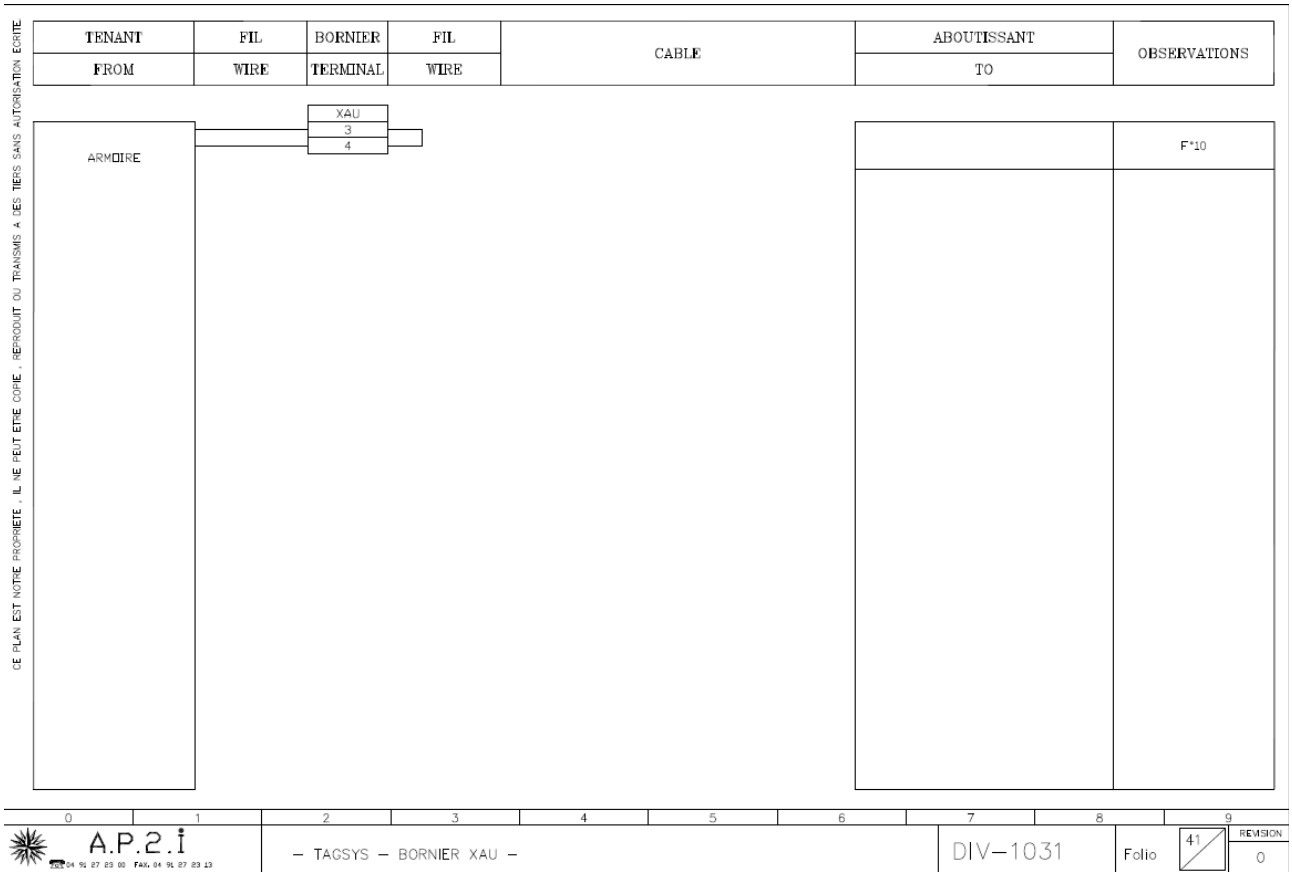


Figure 20



10 Warranty Conditions

TAGSYS warrants that this Product shall comply with the functional specifications set forth herein for a period of one year from the date of delivery to the Buyer.

This warranty is valid for the original Buyer of the Product and is not assignable or transferable to any other party.

TAGSYS cannot be responsible in any way for, and disclaims any liability in connection with the operation or performance of:

- Any product in which the Product is incorporated;
- Any equipment not supplied by TAGSYS which is attached to or used in connection with the Product; or
- The Product with any equipment

This warranty does only cover the Product to the exclusion of any such other equipment.

Optimal operation and performance of the Product are obtained by using TAGSYS' readers, by applying TAGSYS installation guidelines and by having your installation reviewed by a TAGSYS' technical consultant.

TAGSYS warranty does not cover the installation, maintenance or service of the Product and is strictly limited to the replacement of Products considered as defective by TAGSYS and returned according to the return procedure defined below; in such case, TAGSYS will, at TAGSYS' option, either replace every defective Product by one new Product or refund the purchase price paid by Buyer to TAGSYS for the defective Product.

10.1 Warranty Exclusions

- Defects or damages resulting from storage of the Product under conditions which do not comply with TAGSYS specifications or normal usage
- Defects or damages resulting from use of the Product in abnormal conditions (abnormal conditions being defined as any conditions exceeding the ones stated in the product specifications).
- Defects or damages from misuse, accident or neglect.
- Defects from improper testing, operation, maintenance or installation.
- Defects from alteration, modification except modifications or adjustments specifically described in this Product reference guide, adjustment or repair, or any attempt to do any of the foregoing, by anyone other than TAGSYS.
- Any action on Product that prevents TAGSYS from performing an inspection and test of the Product in case of a warranty claim.
- Tampering with or abuse of the Product.
- Any use or incorporation by the Buyer or a third party of TAGSYS' Product into life saving or life support devices or systems, or any related products, TAGSYS expressly excludes any liability for such use.

10.2 General Provisions

This warranty sets forth the full extent of TAGSYS responsibility regarding the Product.

In any event, TAGSYS warranty is strictly limited to (at TAGSYS' sole option) the replacement or refund of the Products purchase price to TAGSYS, of Products considered as defective by TAGSYS.

The remedy provided above is in lieu and to the exclusion of all other remedies, obligations or liabilities on the part of TAGSYS for damages, whether in contract, tort or otherwise, and including but not limited to, damages for any defects in the Products or for any injury, damage, or loss resulting from such defects or from any work done in connection therewith or for consequential loss, whether based upon lost goodwill, lost resale profits, impairment of other goods or arising from claims by third parties or otherwise.

TAGSYS disclaims any explicit warranty not provided herein and any implied warranty, guaranty or representation as to performance, quality and absence of hidden defects, and any remedy for breach of contract, which but for this provision, might arise by implication, operation of law, custom of trade or course of dealing, including implied warranties of merchantability and fitness for a particular purpose.

10.3 How to Return Defective Products

The Buyer shall notify TAGSYS of the defects within 15 working days after the defects are discovered.

Defective Products must be returned to TAGSYS after assignment by a TAGSYS Quality Department representative of an RMA (Return Material Authorization) number. No Products shall be returned without their proof of purchase and without the acceptance number relating to the return procedure.

All Products must be returned in their original packaging.

All Products shall be returned with a report from the Buyer stating the complete details of the alleged defect.

Call +33 4 91 27 57 36 for return authorization and shipping address.

If returned Products prove to be non-defective, a charge will be applied to cover TAGSYS' analysis cost and shipping costs.

If the warranty does not apply for returned Products (due to age, or application of a warranty exclusion clause), a quote for replacement will be issued, and no replacement will be granted until a valid purchase order is received. If no purchase order is received within 30 days after the date of TAGSYS quote, TAGSYS will return the products and charge the analysis cost and shipping costs.

All replaced Products shall become the property of TAGSYS.

The Product Return Form is included on the following page. This form should accompany any product you need to return to TAGSYS for analysis in the event of a problem.

Product Return Form

Customer Profile:

Company: .....
Address: .....
.....
.....
City & State:.....
Zip Code:.....
Country:.....

Contact Name: .....
Contact e-mail: .....
Contact Phone: .....
Contact Fax:.....

Order identification:

Product Name:.....
Order Number (OEF):.....

Invoice Number:.....
Return Quantity: .....

Reason for return:

.....
.....
.....
.....
.....

To inform TAGSYS of this return, please email it to
RMA@tagsysrfid.com
Address to ship the product with this document attached:
TAGSYS
QUALITY DEPARTMENT
180, chemin de Saint Lambert
13821 La Penne sur Huveaune France

To inform TAGSYS of this return, please also fax it to your Customer Service Representative
+33 4-9127-5701

Return Procedure:

The product returned will go through stringent quality controls.
A final analysis report will be sent to you as soon as possible.
Please contact your Quality Service representative for further details.
+33 4-91-27-5736