AGE 300

TRIPLE TECHNOLOGY CARD READER

User Manual

Revision History

Date	Revision	Changes
18/11/2019	1.0	Initial Release

Note

Every possible care has been taken in the preparation of this manual. Nevertheless, it is not possible to guarantee at all times the absolute correspondence of the descriptions contained therein with the characteristics of the product.

The manufacturer declines any and all responsibility towards the user with reference to damages, losses, or claims of third parties, consequently the use of the product causes misinterpretations of the present manual.

The manufacturer reserves the right to modify, without notice and in any way, any part of this manual and the technical specifications of the device, in the continuous pursuit of improving its products.

Table of Content

Introduction

The AGE300 reader can be used with 3 different kind of cards:

Triple-track magnetic stripe card.
Asynchronous contact chip card.
Multiple protocol contactless card at 13.56MHz (optional).

Reads and decodes up to three tracks of magnetic data (F2F) simultaneously.

Communicates with asynchronous chip cards using T=0 or T=1 protocol according to ISO/IEC7816. Power supply of 5 volt, 3 volt and 1,8 volt are supported.

Support all NFC Forum modes (optional, refer to AGE300 NFC Manual).

Features

RS232 Serial Interface
CcTalk Serial Interface
USB 2.0 Full Speed Interface
Integrated Antenna
Multiple color RGB Led in the bezel
Bootloader (refer to AGE300 Bootloader Manual)
Dimension 91 x 70 x 25 max.

Description

The AGE300 can work in two mode:

SERIAL Protocol mode.

CcTalk Protocol mode.

In **SERIAL** mode the reader work as a general-purpose card reader. It is command-driven and any operation is required by the host. Only few bad events are reported. In this mode the RS232 connector or the USB connector must be use.

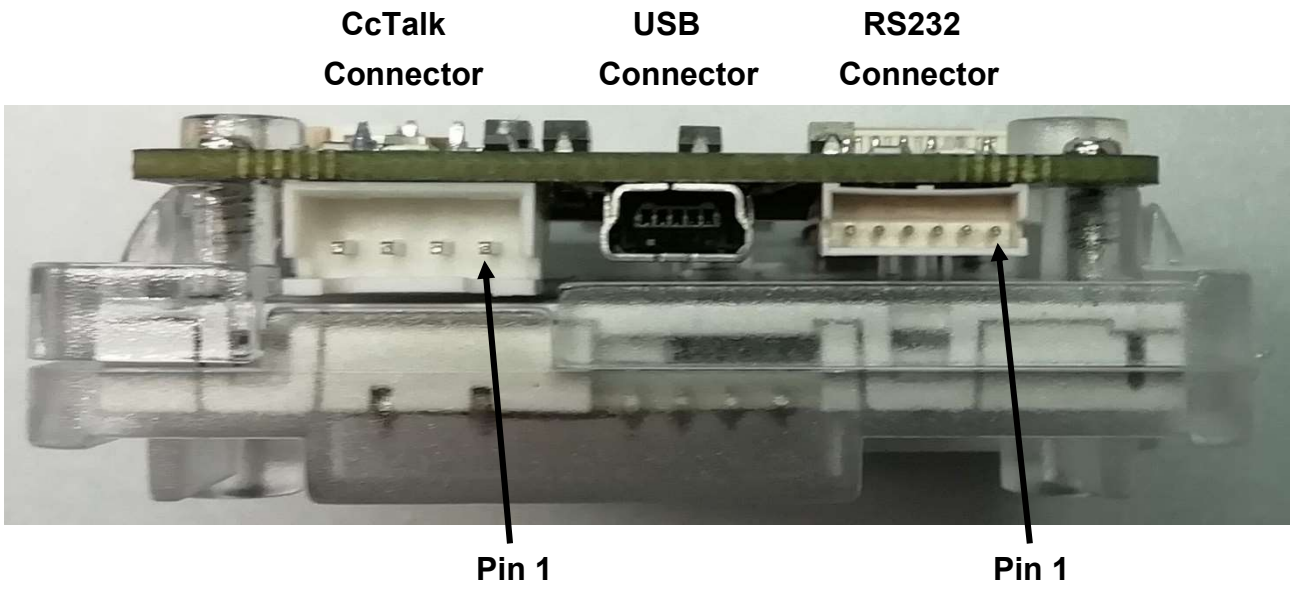
The power supply for this mode is 5 Volt.

In **CcTalk** mode the reader work as *"Italian TS-CSN card"* dedicated reader. For each card inserted, the reader automatically extracts all the necessary data to compute date of birth and other information.

- When the reader waiting for a card the bezel is blue.
- When the card is inserted and read the bezel is yellow. After the read the bezel turn green if data read are valid.
  Turn red if data are wrong.
  The reader never start communication.
  The host must poll periodically the reader to obtain information.
  In this mode only the CcTalk connector can be use.
  The power supply for this mode is 8-12 Volt.

NOTE: at the power on the reader is in SERIAL mode, regardless the power supply arrivals. After the first CcTalk valid Header (if any) the reader switch in CcTalk mode.

Connector Details and Technical Informations



RS232 Connector

Pin 1 = NC

Pin 2 = TXD output

Pin 3 = NC

Pin 4 = RXD input

Pin 5 = GND power

Pin 6 = VCC power

*Use this connector to power the reader and transmit/receive data in **SERIAL** mode.*

RS232 interface details:

- The value for VCC is 5 Volt +/- 5%. Maximum supply current < 500 mA.
- The serial format is: 1 start bit, 8 data bits, no parity and 1 stop bit.
- The baud rate is: 2400, 4800, 9600, 19200, 38400 (default), 57600, 76800, 115200
- The connector type is: Wurth 648106131822

USB Connector

Standard USB 2.0 mini B connector.

*Use this connector to power the reader and transmit/receive data in **SERIAL** mode.*

USB interface details:

Interface Class	HID (Human Interface Device)
Speed	Full (12 Mbit/s)
Vendor ID	0x0483
Product ID	0x5740
Device Descriptor	AGE300
Endpoint0 00h	0x00 Control endpoint
Endpoint1 IN	0x81 interrupt endpoint to retrieve data
Endpoint1 OUT	0x01 interrupt endpoint to send data
Packet size	Fixed to 64 bytes (unused bytes set to 0x00)
	Multiple packets in case of bigger frames

CcTalk Connector

Pin 1 = VCC power

Pin 2 = NC

Pin 3 = GND power

Pin 4 = TX/RX CcTalk data

*Use this connector to power the reader and transmit/receive data in **CcTalk** mode.*

CcTalk interface details:

The value for VCC is 8-12 Volt. Maximum supply current < 500 mA.

The serial format is: 1 start bit, 8 data bits, no parity and 1 stop bit.

The baud rate is: 9600

The connector type is: JST S4B-XH-SM4-TB

SERIAL Protocol

Raeder Configuration

The configuration and data of the reader is defined by 25 registers stored in NVRAM.

Address	*Name*	*Description*
0	MEMSTAT	Memory status (Read only)
1	ADDRESS	Address of the reader
2	SERIAL0	Serial Number LSB byte0
3	SERIAL1	Serial Number byte1
4	SERIAL2	Serial Number byte2
5	SERIAL3	Serial Number MSB byte3
6	RCOUNT0	Number of read cycles LSB byte0
7	RCOUNT1	Number of read cycles byte1
8	RCOUNT2	Number of read cycles byte2
9	RCOUNT3	Number of read cycles MSB byte3
10	RFU	Reserved for future use
11	RFU	Reserved for future use
12	RFU	Reserved for future use
13	CONFIG0	Configuration register 0
14	CONFIG1	Configuration register 1
15	CONFIG2	Configuration register 2
16	CONFIG3	Configuration register 3
17	CONFIG4	Configuration register 4
18	CONFIG5	Configuration register 5
19	RFU	Reserved for future use
20	RFU	Reserved for future use
21	RFU	Reserved for future use
22	PDATE	Production Date DAY
23	PDATE	Production Date MONTH
24	PDATE	Production Date YEAR

Configuration Registers

CONFIG0

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	**RFU**	**RFU**	**RFU**	**RFU**	**RFU**	**RFU**	**RFU**
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Default value = 0x70

CONFIG1

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	**RFU**	**RFU**	**RFU**	**BRS3**	**BRS2**	**BRS1**	**BRS0**
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Default value = 0x04

Serial baud rate selection:

BRS3	BRS2	BRS1	BRS0	Baud Rate
0	0	0	0	2400
0	0	0	1	4800
0	0	1	0	9600
0	0	1	1	19200
0	1	0	0	38400 (default)
0	1	0	1	57600
0	1	1	0	76800
0	1	1	1	115200

CONFIG2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	**RFU**	**RFU**	**RFU**	**RFU**	**RFU**	**RFU**	**RFU**
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Default value = 0x05

CONFIG3

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	**NFC**	**RFU**	**RFU**	**CHIP**	**TRK3**	**TRK2**	**TRK1**
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Default value = 0x8F

TRK1: Track1 is active
TRK2: Track2 is active
TRK3: Track3 is active
CHIP: Chip module is active
NFC: Contactless module is active

CONFIG4

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	**NFC**	**RFU**	**RFU**	**MCL**	**AATR**	**ASRP**	**NATA**
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Default value = 0x02

NATA: Not ACK to ARM
ASRP: Automatic switch report
AATR: Auto ATR for chip cards
MCL: Multiple contactless cards are allowed

CONFIG5

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	**RFU**	**RFU**	**RFU**	**RFU**	**RFU**	**RFU**	**RFU**
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W

Default value = 0x00

Frame format

All information exchanged between host and reader is structured in frames, regardless of the interface used RS232 or USB. The frame is structured as follows:

SOF	ADDRESS	LENGTH	DATA	BCC
1 byte = 0x01	1 byte = 0x01	2 byte MSB first	payload	1 byte

SOF = Start of frame = 0x01

ADDRESS = The reader address = default 0x01.

LENGTH = This field is the DATA length and is encoded in two bytes (MSB first).

DATA = This is the command or the response message. The next section defines it.

BCC = Block Check Character. Its value is equal to the results of exclusive OR of all preceding bytes SOF included.

A maximum of 500ms is allowed between two consecutive characters when using the RS232 interface.

Data Format

Command = Host -> Reader

Command 1 Byte	Data from 0 to n bytes length

Answer = Reader -> Host

Status 1 Byte	Data from 0 to n bytes length

SERIAL Protocol Commands Set

READ STATUS

Command = 0x28
Command data = 0 byte

Answer = 0x00 (OK) or error code
Answer data = 4 bytes - From Status1 to Status4

Status1
Bit 0: 1 = RFU
Bit 1: 0 = If no card is inserted. 1 = if a card is completely inserted.
Bit 2: 0 = RFU
Bit 3: 0 = ICC is inactive. 1 = ICC is activated.
Bit 4: 0 = Automatic switch report mode off. 1 = automatic switch report mode on.
Bit 5: 0 = No magnet stripe. 1 = magnet stripe has been detected.
Bit 6: 0 = Magnetic read off. 1 = Magnetic read on.
Bit 7: 0 = Auto ATR off. 1 = auto ATR on.

Status2:
Bits 7 to 0: RFU

Status3:
Bits 7 to 0: RFU

Status4:
ICC error code data exchange.
Bit 0: 1 = Electrical abnormality
Bit 1: 1 = Timeout in ATR reception
Bit 2: 1 = Character reception timeout
Bit 3: 1 = Parity error during reception
Bit 4: 1 = Collision detection during transmission
Bit 5: 1 = Parity error during transmission
Bit 6: 1 = Error in protocol T=0
Bit 7: 1 = Error in protocol T=1

READ REGISTER

Command = 0x30

Command data = 4 bytes ADDR0 ADDR1 (MSB first) LEN0 LEN1 (MSB first)

Answer = 0x00 (OK) or error code

Answer data = n bytes - The value of selected registers

WRITE REGISTER

Command = 0x31

Command data = n bytes ADDR0 ADDR1 (MSB first) LEN0 LEN1 (MSB first)
DATA0 DATAn (new data for selected registers)

Answer = 0x00 (OK) or error code

Answer data = 0 byte

READER RESET

Command = 0x33

Command data = 0 byte

Answer = 0x00 (OK) or error code

Answer data = 0 byte

READER MODE

Command = 0xA9

Command data = 0 byte

Answer = 0x00 (OK) or error code

Answer data = 1 byte 0x32 The reader is running

READER INFORMATIONS

Command = 0x72

Command data = 1 byte
- 0 = All Information (92 Bytes)
- 1 = Serial number (4 Bytes)
- 2 = Firmware Version (6 Bytes)
- 3 = Version & Copyright (58 Bytes)
- 4 = Model (6 Bytes)
- 5 = PCB (11 Bytes)
- 6 = Cycle (4 Bytes)
- 7 = Production date (3 Bytes DDMMYY)

Answer = 0x00 (OK) or error code

Answer data = n bytes – The requested informations string

CARD POSITION

Command = 0xC2

Command data = 0 byte

Answer = 0x00 (OK) or error code

Answer data = 1 byte
- 0x71 = Card not completely inserted
- 0x73 = Card completely inserted

ENABLE (ARM) MAGNETIC READING

Command = 0xC8

Command data = 0 byte

Answer = 0x00 (OK) or error code

Answer data = 0 byte

The purpose of this command is to prepare the reader waiting for a new magnetic card. Also clear all previous magnetic read data. This status is called “ARM mode”.

When a card is being moved through the reader, magnetic decoding is performed. Data are analyzed, and reader can now return the valid (or invalid) magnetic stripe data. After this, the reader exiting the “ARM mode”.

Depending on the reader configuration, the option “ACK to ARM” makes the reader automatically inform the host when it leaves the ARM mode and data are available. This option is useful to avoid a reader polling.

When the option “ACK to ARM” is not activated (NATA bit in Config4 = 1). When the ARM mode is done, the reader does not transmit any message (by itself). So, this principle requires the host to poll the reader (using for example the READ STATUS command) to know about a status change on the reader.

When the option “ACK to ARM” is activated (NATA bit in Config4 = 0), the following sequence applies just after a card has been inserted into the reader:

Send the event ARM_ACK and three track status bytes when the magnetic decoding process has been done

Send the event ARM_NACK if no magnetic stripe has been detected

DISABLE MAGNETIC READING

Command = 0xC7

Command data = 0 byte

Answer = 0x00 (OK) or error code

Answer data = 0 byte

Turn off the “ARM mode”

GET MAGNETIC VALID DATA

Command = 0xB2

Command data = 1 byte 01 get the data of track 1
02 get the data of track 2
03 get the data of track 3

Answer = 0x00 (OK) or error code

Answer data = n bytes – The data of requested track in ASCII format

This command performs the ISO decoding of the bits read from the requested track, and then returns the response in ASCII format. The Start, End and LRC characters are not returned. Data are returned *only* if valid (no parity or LRC error).

GET MAGNETIC DATA

Command = 0xB5

Command data = 1 byte 01 get the data of track 1 (optional)
02 get the data of track 2 (optional)
03 get the data of track 3 (optional)

Answer = 0x00 (OK) or error code

Answer data = n bytes – The data of requested track in ASCII format

When the GET MAGNETIC VALID DATA command return no errors, this command can be used to obtain data regardless of errors.

If the optional TRACK parameter is not given, the reader returns the data of the track specified in the last GET MAGNETIC VALID DATA.

CHIP ACTIVATE

Command = 0xBF

Command data = 0 byte

Answer = 0x00 (OK) or error code

Answer data = n bytes – The ATR of the chip

Turn on the T=0 or T=1 chip. If the “Auto ATR” is active (AATR bit in Config4 = 1), the chip activation procedure is automatically performed, as soon as a card is detected into the reader. If the activation is successful, the ATR is automatically returned to the host.

CHIP DEACTIVATE

Command = 0xC0

Command data = 0 byte

Answer = 0x00 (OK) or error code

Answer data = 0 byte

Turn off the chip.

CHIP TRANSFER

Command = 0xBB

Command data = n bytes – Command APDU data

Answer = 0x00 (OK) or error code

Answer data = n bytes – Response APDU data

SET BEZEL COLOR

Command = 0x41

Command data = 1 byte

0x00 = Bezel off
0x10 = Bezel blue
0x20 = Bezel green
0x30 = Bezel cyan
0x40 = Bezel red
0x50 = Bezel magenta
0x60 = Bezel yellow
0x70 = Bezel white

Answer = 0x00 (OK) or error code

Answer data = 0 byte

Reader Answer Status
Codes which are returned as answer status.

Status	*Code*	*Description*
OK	0x00	Command successfully performed
BUFFER_OVERFLOW_ERR	0x07	The received frame is too long
ADR_OVERFLOW_ERR	0x08	The given address + length overflows
UNKNOWN_CMD	0x09	This command is not supported
ERROR	0x0A	Non categorized error
COMM_TIMEOUT	0x0B	Communication timeout
USB_DEVICE_ERROR	0x0C	USB connection or communication error
INVALID	0x11	Invalid operation
NO_DATA	0x12	No magnetic data decoded
UNAVAILABLE	0x13	Cannot perform this command
MAG_DATA_NOT_VALID	0x14	Magstripe data not valid
BCC_ERROR	0x16	Received frame has a wrong BCC
MAG_ERR	0x19	Magnetic data decoding error

Reader bad events
Codes which are returned as bad events.

AUTOMATIC SWITCH REPORT
Card inserted = 0x34 0x0003
Card extracted = 0x34 0x0001

ACK TO ARM
0x3A [Track1 status (1 byte)] [Track2 status (1 byte)] [Track3 status (1 byte)]

NACK TO ARM
0x3B [Track1 status (1 byte)] [Track2 status (1 byte)] [Track3 status (1 byte)]

AUTO ATR
0x36 [ATR]

CcTalk Protocol

The frame and format follow the standard CcTalk specifications.

Standard Headers List

The AGE300 reader support the following CcTalk standard Headers.

254 Simple poll

253 Address poll

252 Address clash

251 Address change

250 Address random

246 Request manufacturer id

245 Request equipment category id

244 Request product code

242 Request serial number

241 Request software revision

192 Request build code

170 Request base year

For more information about this Headers please refer to CcTalk standard documentations.

Extended Headers

With the standard Header 255 (0xFF) is possible extend the protocol with new Headers.
Example (in Hexadecimal).

The master transmits the following message: 0x33 0x02 0x01 0xFF 0xA0 0x01 0x2A
where:

0x33 is the slave address
0x02 is the data number of message
0x01 is the master address
0xFF is the standard Header for the extended protocol
0xA0 is the "*new non standard"* Header (the first data of standard message)
0x01 is the data of message (the second data of standard message)
0x2A is the checksum

The slave response is standard.

Extended Headers List

FFA0 Birth date reading

Return NACK if no card is present in the reader.

Return 0xFF (as single data byte) if the card in the reader is not compliant or recognized.

Return four bytes of data if the birth date is successfully read.

If the birth date is read from the magnetic stripe the format is the follow:

[0x00] [year] [month] [day] example:

00 always zero

79 year

11 month

21 day

If the birth date is read from the chip the format is the follow:

[year MSB] [year LSB] [month] [day] example:

19 year

79 year

11 month

21 day

FFA001 Birth date reading in ASCII format

Return NACK if no card is present in the reader.

Return 0xFF (as single data byte) if the card in the reader is not compliant or recognized.

Return eight bytes of data if the birth date is successfully read.

If the birth date is read from the magnetic stripe the format is the follow:

[‘0‘] [‘0‘] [‘7’] [‘9’] [‘1’] [‘1’] [‘2’] [‘1’] example:

0079 year

11 month

21 day

If the birth date is read from the chip the format is the follow:

[‘1‘] [‘9‘] [‘7’] [‘9’] [‘1’] [‘1’] [‘2’] [‘1’] example:

1979 year

11 month

21 day

FFA2 Read enable and priority settings

Return two bytes of data in the following format [enable mask] [reading priority]

enable mask value - bit0 = 0 magnetic stripe disable / bit0=1 magnetic stripe enable

enable mask value - bit1 = 0 chip disable / bit1=1 chip enable

reading priority value = 1 priority to magnetic stripe

reading priority value = 2 priority to chip

FFA3xxyy Set enable and priority settings
Master send two bytes of data [xx = enable mask] [yy = reading priority] to modify the enable and priority settings.

enable mask value - bit0 = 0 magnetic stripe disable / bit0=1 magnetic stripe enable

enable mask value - bit1 = 0 chip disable / bit1=1 chip enable

reading priority value = 1 priority to magnetic stripe

reading priority value = 2 priority to chip

If the values transmitted are in range the reader return ACK otherwise return NACK.

These parameters are saved in NVRAM.

FFABxx Read the available magnetic stripe characters number
Master send one data byte to select the magnetic track desired: 01 or 02.

The reader return NACK if no card is present in the reader or if the card in the reader is not compliant or recognized.

If the magnetic track is successfully read the reader return the number of all read characters (including any start, end, LRC characters).

FFABxxyyzz Read the available magnetic stripe characters in ASCII format
Master send three bytes of data:

xx = desired magnetic track 01 or 02.

yy = index of the first character to read (zero based).

zz = number of characters to read.

The reader return NACK if no card is present in the reader or if the card in the reader is not compliant or recognized.

If the magnetic track is successfully read the reader return all the read characters in ASCII format (including any start, end, LRC characters).

In any case, only the available characters are sent.

FFAE Read card status

Return one data byte with the following possible values:

0 = no card is present in the reader.

1 = card present and successfully read.

255 = card present but not compliant or recognized.

FFAF Card removal request (light signal)

Return the same data of the FFAE Header.

If a card is in the reader the bezel flash Magenta until the card is finally removed.

If no card is in the reader this Header has no effect.

Headers for further data of Italian TS-CSN card.

FFAD00 Status of last read
Return NACK if no card is present in the reader.

Return 0xFF (as single data byte) if the card in the reader is not compliant or recognized.

After a successfully read return a single data byte with the following value:

1 = Magnetic stripe read

2 = Chip read

3 = Both read

FFAD01 Surname reading (only with chip)
Return NACK if no card is present in the reader or if the card in the reader is not compliant or recognized or the card has no chip.

After a successfully read return some data bytes representing the ASCII string of the Surname.

FFAD02 Name reading (only with chip)
Return NACK if no card is present in the reader or if the card in the reader is not compliant or recognized or the card has no chip.

After a successfully read return some data bytes representing the ASCII string of the name.

FFAD03 Sex reading (only with chip)
Return NACK if no card is present in the reader or if the card in the reader is not compliant or recognized or the card has no chip.

After a successfully read return one data byte representing the ASCII string of the sex.

FFAD04 Italian Fiscal Code reading
Return NACK if no card is present in the reader or if the card in the reader is not compliant or recognized.

After a successfully read return 16 data bytes representing the ASCII string of the Italian Fiscal Code.

FFAD05 Place of birth reading (only with chip)
Return NACK if no card is present in the reader or if the card in the reader is not compliant or recognized or the card has no chip.

After a successfully read return 4 data bytes representing the ASCII string of the code of the place of birth.

FFAD06 Place of residence reading (only with chip)
Return NACK if no card is present in the reader or if the card in the reader is not compliant or recognized or the card has no chip.

After a successfully read return 4 data bytes representing the ASCII string of the code of the place of residence.

FFAD07 TS-CSN card ID reading (only with chip)
Return NACK if no card is present in the reader or if the card in the reader is not compliant or recognized or the card has no chip.

After a successfully read return 16 data bytes representing the ASCII string of the TS-CSN card ID. No Luhn checksum is performed.

FFAD08 TS-CSN card ID reading whit Luhn checksum (only with chip)
Return NACK if no card is present in the reader or if the card in the reader is not compliant or recognized or the card has no chip.

After a successfully read a Luhn checksum is performed and if the check failed return NACK.

If the check is correct return 16 data bytes representing the ASCII string of the TS-CSN card ID.

FFAD24 Italian Fiscal Code reading (only with chip)
Return NACK if no card is present in the reader or if the card in the reader is not compliant or recognized or the card has no chip.

After a successfully read return 16 data bytes representing the ASCII string of the Italian Fiscal Code.