Operation manual

Evaluation unit VETAS 3 V3

Vehicle measuring system

Dear customer,

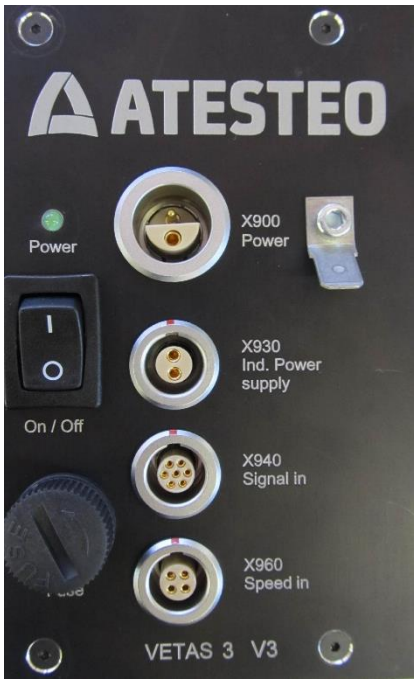
Before leaving our company, every unit is tested by extensive function and quality examinations, which guarantee that the system complies with the stated specifications. Nevertheless, should there be any problem, please contact us.

Before shipping a system, the serial number of each component of your configuration is registered by our company, so that an individual and short-term support can be guaranteed. It is understood that we will inform you about innovations and modifications of the system.

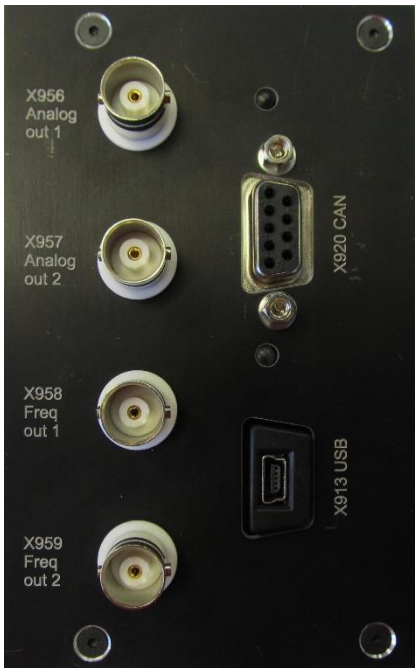
Warranty

In case of intended use, ATESTEO will issue a guarantee of 12 months according to warranty period regulated by law. In case of damages caused by improper use warranty claims cannot be submitted.

VETAS 3 V3



Rear Panel VETAS 3 V3



Front Panel VETAS 3 V3

CONTENTS

1 Introduction

In this manual, you will find all steps to be taken for electrical and software start-up of ATESTEO products, which are compatible with VETAS 3 (such as vehicle telemetry system or measuring steering wheel).

This manual is applicable for the following types of measuring systems:

- 1x torque, 1x speed
- 1x torque, 1x angle
- 1x torque, 1x temperature (rotor electronic temperature)
- 2x temperature (1x thermocouple, 1x rotor electronic temperature)
- 1x inductive torque
- 1x inductive temperature

For setting-up the corresponding measuring system, refer to the appropriate appendix.

Each measuring system is thoroughly checked before delivery to its technical functioning. Compliance with the technical specification is a requirement to stand this end of line test. If a complete measurement system is ordered, electrical and software parameters are pre-installed.

Upon reception of the shipment, the units should be checked to be in a perfect condition otherwise a damage report must be generated in cooperation with the delivery company. In addition, the content of the delivery should be double-checked against the ordered items. The delivered parts depend on customer-specific orders.

2 Description

The evaluation unit VETAS 3 V3 provides all necessary supply interfaces for running the compatible ATESTEO measurement systems. The USB interface can be used for external monitoring and controlling by the VECTO software package. Necessary software updates and an extra data connection can be linked by this USB serial interface too.
All measurement systems work contactless and are maintenance-free. The data transmission can be realized by a frequency-modulated infrared or by an inductive transmitter. The electrical power supply of the rotating electronic circuit is established by wear-free inductive power transmission.

2.1 Scope of delivery

- Evaluation unit VETAS
- Power supply cable with matching LEMO plug and banana plugs (4mm), 2.0 m length
- USB cable A mini, 1.5 m length
- User manual

2.2 Features

- Power supply 9V...36V/ 2A max.
- Sample rate of max. 2,000 readings per second
- Digital filter
    - Digital IIR filter 1st order with selectable corner frequency
    - Moving average depth up to 199
- CAN
    - Bus speeds: 1,000, 500, 100, 10 kbps
    - 11/29 bit Identifier
    - Data formats: 32/16 bit signed integer, 32 bit IEEE floating point
    - Motorola or Intel bit order
    - Send and command identifier user selectable
    - Update interval 0.5…1,000ms
- Analog output
    - Output range: 0..5V, 0..10V, ±5V, ±10V
    - Adjustable offset voltage

- Analog scaling (percentage of rated torque → full-scale)
- 500Hz analog output filter

2.3 LEDs

LED coding:

Color	Frequency	Description
Green	0.5 Hz	System is working
Red	Permanent on	a) Torque signal oscillation. Ensure sensor plug is connected properly. VECTO terminal error 0x4. b) Searching supply voltage. c) Test signal impossible after supply voltage searching. VECTO terminal error 0x10 d) “Continuous CAN transmission” active, but no CAN bus connected. VECTO terminal error 0x40

Table 1 LED coding

CAN errors can be reset by switch VETAS off and on. Pressing ‘E’ can reset other errors in the terminal.

2.4 Options

2.4.1 Remote control

A remote control can be optionally ordered with VETAS. With the remote control, the torque or angle value can be reset to zero by two individual push buttons. When connecting the VETAS with the remote control, each button will light up for 1 second as power indicator. During the operation with VETAS, each button can be used to trigger the zero point adjustment (zero reset). Each reset will take up to 7 seconds. Wait until a reset is finished or press both buttons at the same time to trigger zero point adjustment for both signals. A pressed button will light up three times as feedback to the user action. During a reset, the other push button is deactivated. The remote control has to be connected to X970 slot.

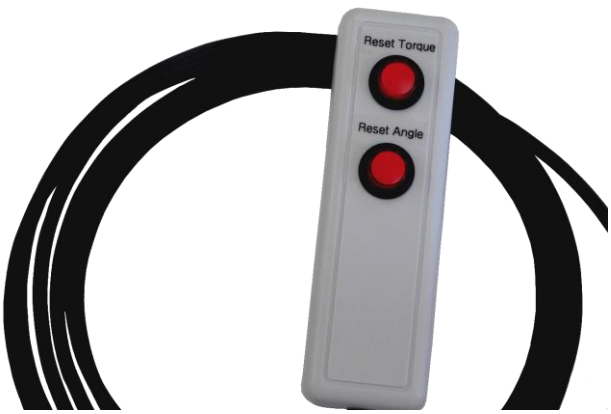


Figure 1 Optional remote control

3 Safety Instructions

Before starting up and maintenance or in case of other operations at the measurement system attention should be paid to the following instructions:

- Follow all safety instructions and directions denoted in the operation manual.
- Make sure that every precaution will be taken. It is a necessity that all safety appliances are functional attached to the measuring device. Only in this way, a safe and successful operation is guaranteed.

Reference to additional standards:

Low Voltage Directive 73/23/EWG, Electromagnetic Compatibility Directive 89/336/EWG and the harmonized standards

DIN EN 292-1 Safety of machinery

DIN EN 292-2 Safety of machinery

Maintenance and inspection on the electrical equipment have to be executed by qualified personnel. Improper use and modifications of the measurement system will annul the EC declaration of conformity.

3.1 Accident prevention

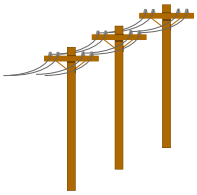
The usage of the equipment assumes keeping the general safety regulations in mind!

ATTENTION!

Application of the VETAS 3 V3 in conjunction with a measuring steering wheel (ML): Read the manual of the measuring steering wheel!

4 Electrical installation

4.1 Mains supply



The measuring system needs to be powered with DC voltage in a range of 9V to 36V. The power input depends on the transmitter system. The power consumption ranges between 12 and 36 watt. The power supply must be protected with a time-lag fuse of 3A against overcurrent.

4.2 Grounding

The housing of the evaluation unit is equipped with an earth connection terminal and must be connected to vehicle ground. The internal ground is separated from that earth. The stator unit must be connected to vehicle ground for proper operation too. The shielding of the connecting cables is connected at both ends.

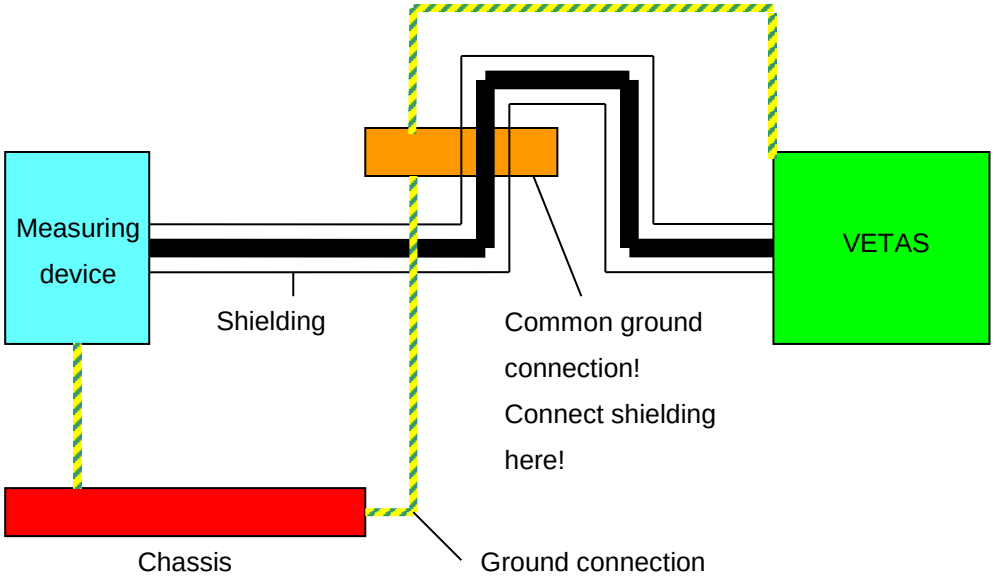


Figure 2 Ground and shielding

5 Plug connections

5.1 Plug connections at front side

The signal transferred by analog voltage outputs or frequency outputs depend on the connected measurement system. Please find information about the signal in the manual of the measurement system.

5.1.1 X920: CAN (9-pole)

D-Sub female connector

Pin	Signal
1	_
2	CANL
3	_
4	_
5	GND
6	GND
7	CANH
8	_
9	_

Table 2 X920 plug

5.1.2 X913: Serial port

Mini USB connector

5.1.3 X956: Analog out 1 (2-pole)

Socket BNC

Pin	Signal	Output range
Inner conductor	Analog out	-10V … +10V
Outer conductor	GND	

Table 3 X956 plug

5.1.4 X957: Analog out 2 (2-pole)

Socket BNC

Pin	Signal	Output range
Inner conductor	Analog out	-10V … +10V
Outer conductor	GND	

Table 4 X957 plug

5.1.5 X958: Frequency out 1 (2-pole)

Socket BNC

Pin	Signal
Inner conductor	Frequency out 5V TTL, 60±20 kHz for IR system, 10±5 kHz for inductive system
Outer conductor	GND

Table 5 X958 plug

5.1.6 X959: Frequency out 2 (2-pole)

Socket BNC

Pin	Signal
Inner conductor	Frequency out 5V TTL, 60±20 kHz for IR system, 10±5 kHz for inductive system
Outer conductor	GND

Table 6 X959 plug

5.2 Plug connections at rear side

5.2.1 X900: On-board vehicle power-supply voltage 12V (2-pole)

Socket LEMO ERA.2S.302.CLL female/male ** Plug LEMO FFP.2S.302.CLAC72

Pin	Signal
1	GND
2	+12V

Table 7 X900 plug

The total power consumption depends on the connected measurement system. The consumption is given on the type label of the connected measurement system.

5.2.2 X930: Supply voltage for power transmission coil (2-pole)

Socket LEMO EGG.1B.302.CLL female ** Plug LEMO FGG.1B.302.CLAD52

Pin	Signal
1	PS1 (X703A)
2	PS2 (X703B)

Table 8 X930 plug

5.2.3 X940: Signal in (Speed sensor / IR torque sensor / IR temperature sensor) (7-pole)

Socket LEMO EGG.1B.307.CLL female ** Plug LEMO FGG.1B.307.CLAD52

Pin	Signal
1	IR+ (X702A Cathode)
2	IR- (X702B Anode)
3	N1 (X701C)
4	N2 (X701D)
5	GND (X701B)
6	+5V (X701A)
7	MDf2

Table 9 X940 plug

5.2.4 X960: Speed in (4-pole)

Socket LEMO EGG.1B.304.CLL female ** Plug LEMO FGG.1B.304 CLAD52

Pin	Signal
1	N1 (0 to 15V; H:>4,2V, L:<1,8V)
2	N2 (0 to 15V; H:>4,2V, L:<1,8V)
3	GND
4	+5V

Table 10 X960 plug

5.2.5 X970: Digital in (reset)

X970 is only equipped if VETAS was ordered with an optional remote control to reset torque and angle. X970 will replace X960. Pin assignment is not published, since X970 is only to be used with the related remote control.

5.3 Connecting VETAS 3 V3 to PC

The evaluation unit VETAS 3 V3 can be connected to a PC via a Mini-USB slave connector socket. With help of VECTO software, the device can be configured. Please refer to the VECTO software manual for further setup instructions.

The availability of the setup options shown in the settings screen of VECTO depends on the connected measurement equipment. Not all options are available for all measurement devices. The available options are described in the settings menu of VECTO.

6 Application cases

6.1 Torque and speed measurement

VETAS sub type ID: VETAS30.

List of available output types:

Signal	Output types
Torque	Frequency, CAN, voltage
Speed	Frequency, CAN, voltage

Table 11 Output type matrix (Torque & speed)

6.2 Torque and speed/angle measurement

VETAS sub type ID: VETAS30.

Application case for usage with measuring steering wheel of ATESTEO.

List of available output types:

Signal	Output types
Torque	Frequency, CAN, voltage
Speed	Frequency, CAN, voltage
Angle	CAN, voltage
Angle speed	CAN, voltage

Table 12 Output type matrix (Torque & speed/angle)

6.3 Torque & temperature measurement (1 channel)

VETAS sub type ID: VETAS31.

Signal	Output types
Torque	Frequency, CAN, voltage
Temperature (internal)	Frequency, CAN, voltage

Table 13 Output type matrix (Torque & 1x Temperature)

6.4 Torque & temperature measurement (2 channels)

VETAS sub type ID: VETAS32.

Signal	Output types
Temperature 1 (Thermocouple type K)	Frequency, CAN, voltage
Temperature 2 (internal)	Frequency, CAN, voltage

Table 14 Output type matrix (2x Temperature)

7 Configuration

7.1 Exchange the VETAS 3

ATTENTION!

If you have purchased a complete torque measurement system consisting of a torquemeter and a corresponding evaluation unit VETAS 3, you may skip the following articles. After connecting the sensor to the VETAS 3, the system is ready for use. All values specified in your test report are preinstalled to the measuring system.

In case of new configuration of the measuring system (e.g. replacement of torquemeter/evaluation unit), the following adjustments of the default settings are absolutely necessary to properly run the system!

For your convenience, the evaluation units VETAS 3 are interchangeable with an already existing torquemeter. All you need is to enter the parameters recorded at the 'Torque Transducer Test Report' by using the terminal program (see VECTO software manual). This test report is delivered in combination with the torquemeter. How to start the terminal is described in 7.2.

7.2 Terminal settings

7.2.1 VECTO Terminal

Please follow the instruction of the separate VECTO Software User Manual for installation of the required software. After installation, please connect the VETAS 3 before the first start of VECTO with your PC by using the USB connecting cable.

Notice: Please connect the VETAS 3 before the first start of VECTO with your PC! This is highly recommended!

First, start VECTO by double click the icon on your desktop. If there is no icon, open the installation path and double click the “VECTO.exe”:

After initialization, all devices are displayed at the main screen:

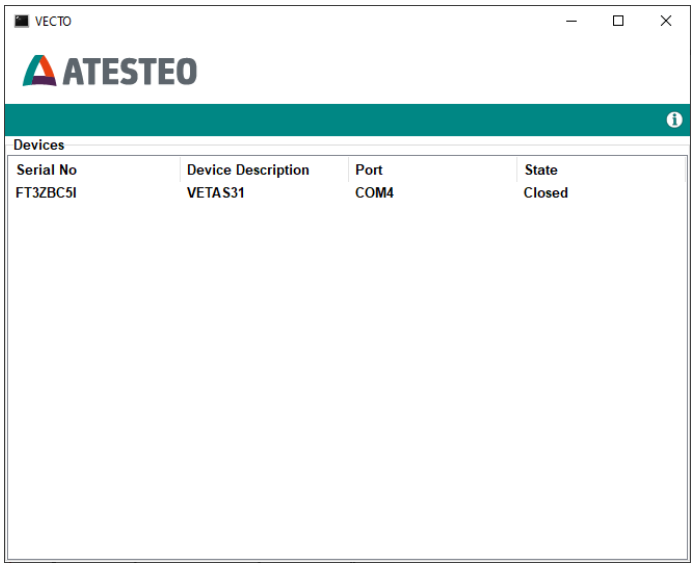


Figure 3 Start-up screen

Please open the desired device by double click.

Now the following selection window will be displayed:

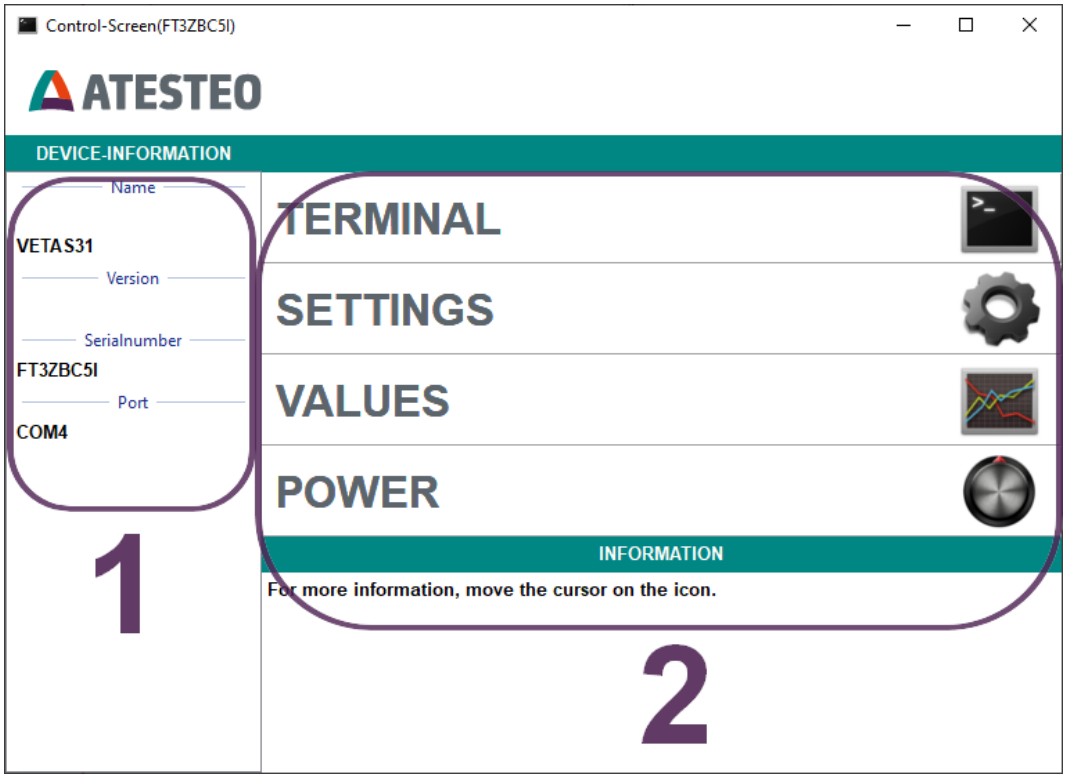


Figure 4 Main screen

1. General information about the connected VETAS
2. Selection area. Move the cursor over the icons to get more information

Click now on the icon “Terminal-screen” to open the terminal screen:

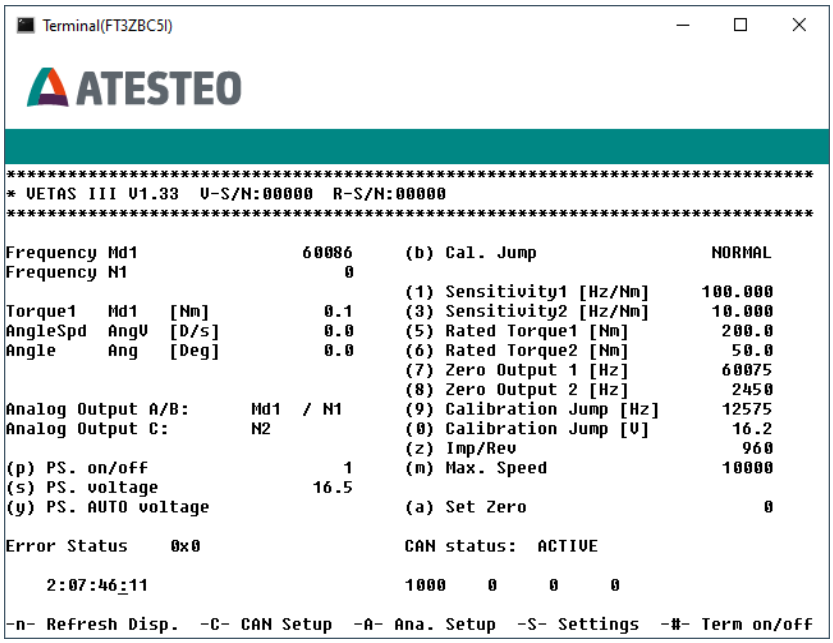


Figure 5 Terminal view (1)

Press the key “#“ to activate the serial interface.

7.3 Setup of calibration parameters

To activate the serial interface press the key '#'.

The terminal will be shut down automatically after 10 minutes of non-use.

Enter the characteristic values (1), (3), (5), (6), (7) and (8) of the connected torque meter via terminal program. These values are written at the delivered calibration protocol or the test report.

The current measured values for torque and speed are displayed on the left side of the terminal screen.

In case of initial operation or new configuration of the measuring system (e.g. replacement of torquemeter/evaluation unit), it is necessary to readjust the power supply voltage for the rotor electronics. The level of supply voltage can be adjusted manually (key “+” (higher voltage) and key “-“ (lower voltage), please look at (s) PS. voltage value) or **automatically** (**recommended**) (press key “y”, →(y) PS. AUTO voltage). Be sure that the power supply voltage is on (→ (p) PS. on/off = 1).

Adjust the power supply voltage at the terminal so that the value V_{Ctrl} at the rotor electronics is at least 13 volts (optimal range: 13 – 16 volts) in any position of the shaft.

INPUT KEY	DESCRIPTION
1	Sensitivity 1+: characteristic value of torque meter for positive torque values
3	Sensitivity 2+ characteristic value of torque meter for positive torque values (optional for double telemetry torque meters)

5	Rated Torque1: nominal torque 1
6	Rated Torque2: nominal torque 2 (optional for double telemetry torque meters)
7	Zero Output 1: frequency defined as zero for torque in effective range 1
8	Zero Output 2: frequency defined as zero for torque in effective range 2 (optional for double telemetry torque meters)
9	Test signal [Hz]: frequency swing of calibration signal in Hz.
0	Test signal [V]: supply voltage amplitude generating test signal
z	Number of pulses per rev: The number of increments provided by the speed sensor need to be entered.
m	Maximum speed: upper limit of speed value for analogue output Maximum permissible value of scaling
a	Zero adjustment: Sets torque := 0; With angle measurement option selected also angle := 0 Caution: permitted only under no-load condition. Also, consider zero position for angle measurement!
p	Power supply voltage: “0” = off “1” = on
s	Value for power supply voltage
y	Automatic setting of power supply voltage
C	Sub menu ’CAN Setup’
A	Sub menu ’Analog Setup’
S	Sub menu ’Settings’

Table 15 Terminal - Main commands

CAN error	“ACTIVE”: no error “ERR pass”: <128 errors/s “ERR act”: >128 errors/s “BUS OFF”: Bus off
Error Status	status and error code

Table 16 Terminal - CAN bus states

7.3.1 Settings

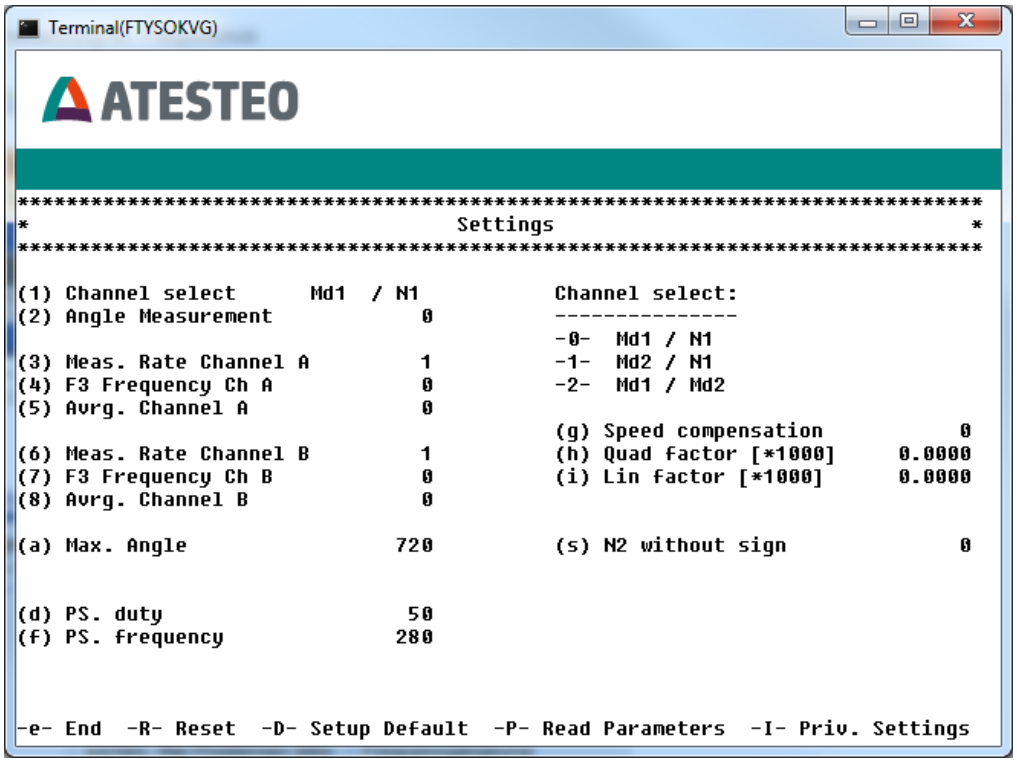


Figure 6 Terminal - Settings screen

INPUT KEY	DESCRIPTION
1	select active channels '0': torque1 / speed1 '1': torque2 / speed1 '2': torque1 / torque2
2	switch angle measuring: '0': off '1': on
3, 6	set up reading rate of channel A and channel B '0': 600 values/s '1': 1000 values/s '2': 2000 values/s
4, 7	IIR filter (analogue output filter) corner frequency (0…500)
5, 8	number of values for average for channel A and channel B (0…199)
a	Maximum angle – reference value for analogue output. ± max. angle = ± 10V
d	Power supply duty (= **50%**)
f	Power supply frequency (= **270**, equates to 27 kHz)

g	Speed compensation of the torque measurement can be optionally selected. Depending on the measured speed, corrective values are calculated by a quadratic expression and added to the torque signal.
h	Coefficient of the quadratic part.
i	Coefficient of the linear part.
s	Speed N2 without sign: “0” = signed “1” = unsigned
R	Reset to rebuild basic state After pressing key ’R’ turn power off and on again. ATTENTION! All settings are reset to basic state! In addition, the calibration data of the sensor will be reset!
D	Reset to default

Table 17 Terminal - Settings commands

7.3.2 CAN Setup

REMARK!

In general, the data transmitted to the VETAS 3 via CAN is INTEL formatted (little endian)!

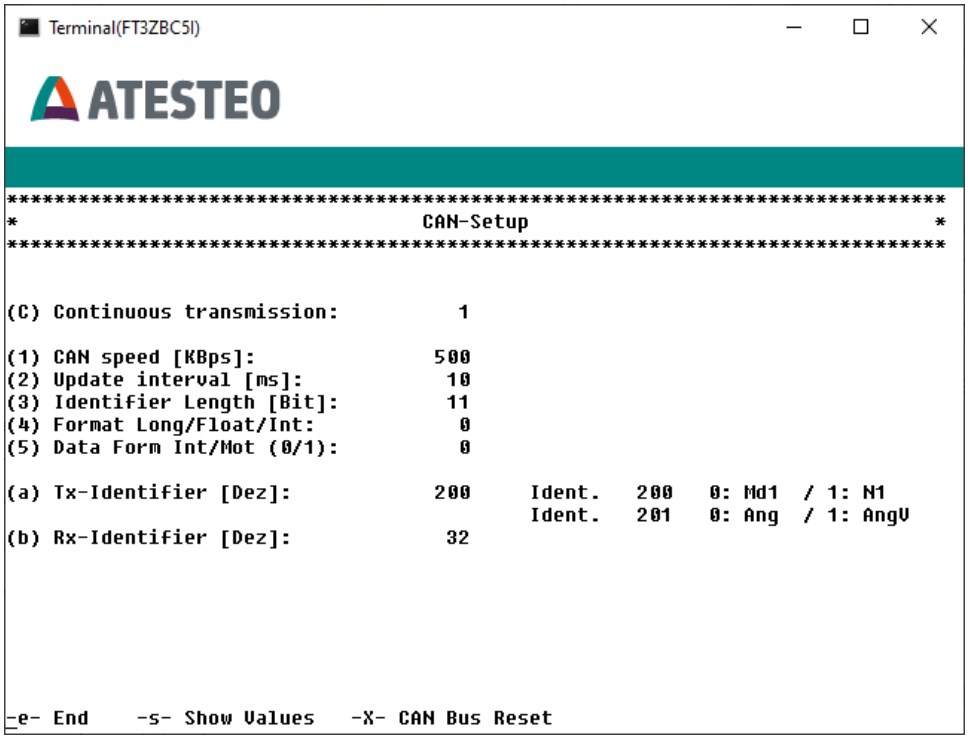


Figure 7 Terminal - CAN setup screen, Value format “long”

INPUT KEY	DESCRIPTION

C	‘1’: all values are continuously sent ‘0’: command mode
1	CAN-Bus internal baud rate ‘1000’: 1MBbit ‘500’: 500 kBit ‘100’: 100 kBit ‘10’: 10 kBit
2	reading rate for CAN-bus actualisation between ‘0’ and ‘1000’ [0.5 … 1000ms]
3	Select to use 11 bit or 29 bit identifier
4	‘0’: LONG (32 bit signed integer) ‘1’: FLOAT (32 bit IEEE754 floating point) ‘2’: INT (16 bit signed integer)
a	Transmit-Identifier, decimal notation
b	Receive-Identifier, decimal notation
X	Reset of CAN module (Stop -> Restart after 1 second)

Table 18 Terminal - CAN setup commands

7.3.2.1 How to receive data from VETAS?

e. g. (a) = 200

Long:

Ident	D7	D6	D5	D4	D3	D2	D1	D0
200	Torque x 1000				Speed x 10			
201	Angle x 10				Angular speed x 10			

Float:

Ident	D7	D6	D5	D4	D3	D2	D1	D0
200	Torque				Speed			
201	Angle				Angular speed			

Int:

Ident	D7	D6	D5	D4	D3	D2	D1	D0
200	Torquex100		Speed x 10		Angle x 10		Angular speed X 10	

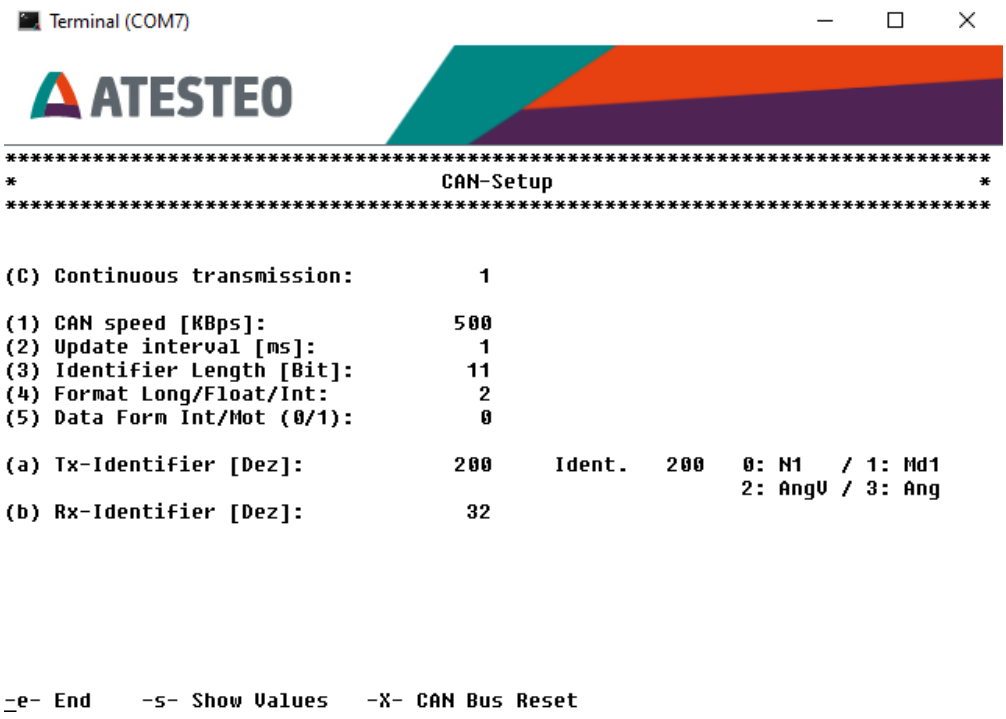


Figure 8 Terminal - CAN setup screen, Value format “int”

7.3.2.2 Command and status interface

Commands can be sent to VETAS via the command message. This command message must have the ID from the “Rx-Identifier” setting. If a command is received correctly by VETAS, the command value will be shown in the terminal page

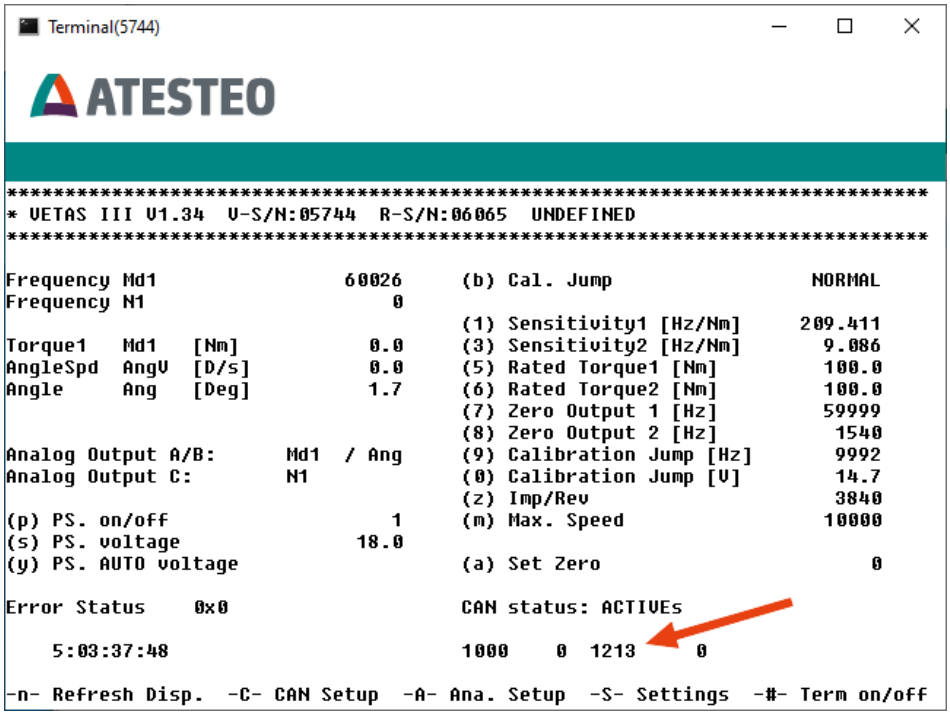


Figure 9 Received command indication

Structure of the command message and its possible commands:

Commands via CAN to VETAS									
identifier: 11Bit / 29 Bit, ID according to Rx-Identifier in settings									
number format: float, long or int **MOTOROLA** (always)									
[3](Hint: in number format int only bytes 0 to 3 of the data-word are used!)									
send options to VETAS 3: (Float / Long / Int[3])									
Float/Long	1				0				
INT	1		0						
Byte	7	6	5	4	3	2	1	0	
Data	1201								zero adjustment of torque
	1202								start test signal
	1203								stop test signal
	1204								zero adjustment of angle
	1205								read Md1 / N1
	1206								read Md2 / N1
	1207								read Md2 / Md1
	1211								reset status
	1212								send status word
	1213								query of serial number
	1214								activate self-testing
	2000								start of sending CAN value
	2001								end of sending CAN value
Response message of VETAS 3: (Float/Long/Int[3]) **Message ID is "Rx-Identifier + 1** **Data format is according to settings**									
Float	1				0				
Int	1		0						
Byte	7	6	5	4	3	2	1	0	
Data	last command				status / serial number				confirmation

Table 19 CAN bus commands

Status 32 Bit Each bit is unsigned int with 1 bit																
	ST Bit 7	ST Bit 6	ST Bit 5	ST Bit 4	ST Bit 3	ST Bit 2	ST Bit 1	ST Bit 0	Self-testing activated	Choice 1	Choice 0	Error 1	Error 0	Overflow	Zero adjustment	Test signal
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Table 20 CAN bus state word

Error 1	Error 0	
0	1	Zero adjustment not possible
1	0	No test signal possible

Table 21 Error bits decoding

Choice 1	Choice 0	
0	0	Md1 / N1
0	1	Md2 / N1
1	0	Md1 / Md2

Table 22 Choice bits decoding

ST Bit 7	ST Bit 6	ST Bit 5	ST Bit 4	ST Bit 3	ST Bit 2	ST Bit 1	ST Bit 0	
							1	SP +0.5V Md1 instable
						1		SP -0.5V Md1 instable
					1			SP Cal no test signal
				1				NC
			1					New supply voltage setup found
		1						Serial number identic Sensitivity dissimilar
	1							Reading-out error
1								NC

Table 23 State bits decoding

7.3.3 Analog Setup

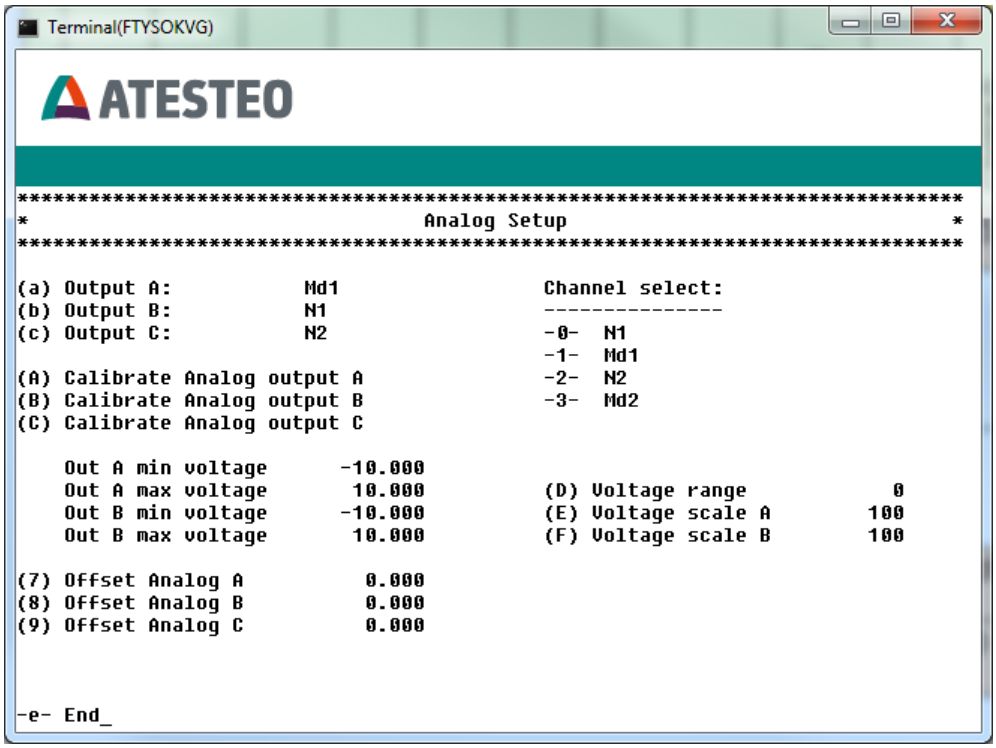


Figure 10 Terminal - Analogue setup screen

INPUT KEY	DESCRIPTION
a, b, c	Reading of analogue output. Available channel connections are shown on the right screen page.
A, B, C	Calibration of analogue output. A precise voltmeter is necessary. **ATTENTION!** **When the calibration routine is started unintentionally, press the <ESC> button to skip the calibration steps. DO NOT ENTER ANY NUMBER!**
D	Output voltage range: ‘0’ = ± 10 V ‘1’ = ± 5V ‘2’ = 0…10 V ‘3’ = 0…5 V
E, F	Voltage scale channel A and channel B “100” : 100 % of rated torque ≙ full scale of analogue output voltage “X” : X % of rated torque ≙ full scale of analogue output voltage
7, 8, 9	Offset-compensation of analogue output. An offset can be caused by long transmission cable.

Table 24 Terminal - Analogue setup commands

8 Miscellaneous

8.1 Overvoltage protection

To avoid damage the transmitter electronics on the rotating side will be switched off in case of overvoltage. As a result, the analog output of the measurement signal displays undefined values. In that case, the amplitude of the supply voltage must be reduced. Sometimes it is required to switch off the measuring system for several seconds to deactivate the overvoltage protection. All outputs are short-circuit-protected.

8.2 Hotline

In case of any trouble, you can contact our service:

Phone: **+49 2404 9870-580**

Email: **service-pm@atesteo.com**

8.3 Flash update

At the evaluation unit, a microcontroller with an internal Flash-ROM is used, so that a firmware update can easily be performed by special software applications via the USB interface.

Flash update:

1. Turn off the evaluation unit (switch off power supply).
2. Connect the evaluation unit via USB with the PC.
3. Run the Flash-programmer software and enter settings as shown below.

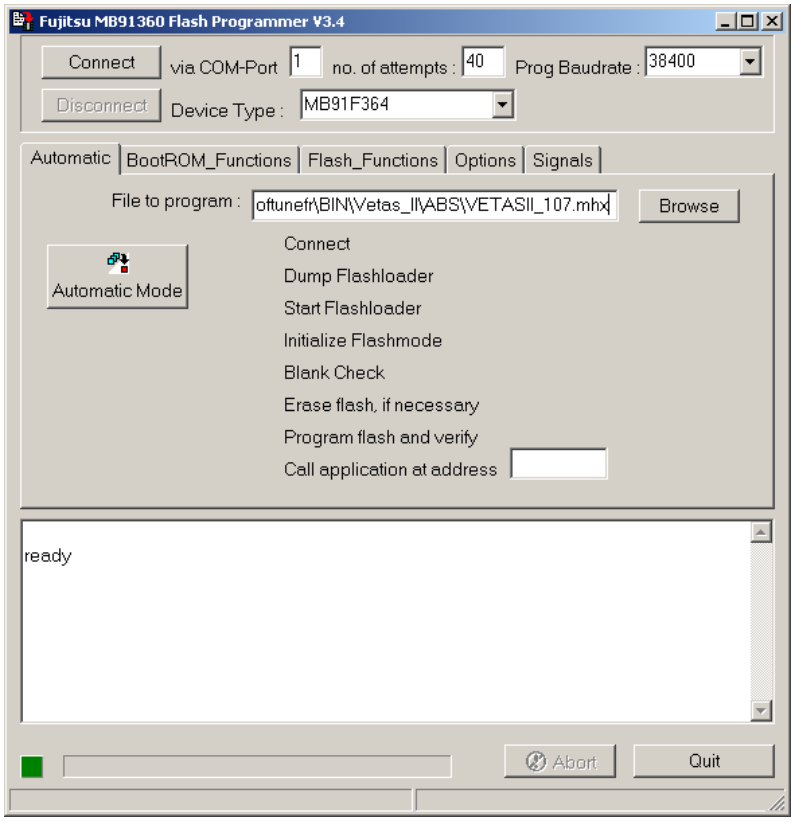


Figure 11 Flash update tool

4. Set Device Type = ‘MB91F364’ and choose the firmware file by pressing the button 'Browse'.
5. Press button 'Automatic Mode’ and turn on the evaluation unit in less than 2 seconds.
6. If the firmware is installed properly, the programmer software displays “ALL OK”.
7. Turn off the unit.
8. Turn on the unit.

The firmware update has been installed correctly.

8.4 List of figures

8.5 List of tables

9 Imprint

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