Operation Manual for USB Autoscope IV

Please read this manual thoroughly before attempting to operate the device.

Contents

1. Purpose

The USB Autoscope IV is used for troubleshooting of various electronic vehicle systems, such as ignition and timing system. The USB Autoscope IV is also very useful for engine mechanical diagnostics. The device is universal in nature and not tied to any particular vehicle system or brand.

The device works in conjunction with the USB Oscilloscope program and connects to any USB 2.0 480 Mbit/s (*HI-SPEED*) port of a Windows laptop or PC. The Windows version should be XP SP2 or higher.

2. Technical characteristics of the USB Autoscope IV

2.1 General

- PC interface type — USB 2.0 480 Mbit/s (*HI-SPEED*)
- Maximum (supported from the device side) data transfer speed — 25 MB/s
- Data FIFO buffer depth — 512 kB
- Device supply source — from USB
- Current consumption from USB

<div align="right">In operating mode – no more than 300 mA</div>

<div align="right">At idle: – no more than 60 mA</div>

- Current consumption of the "12V" input — no more than 1 A
- Device provides uninterrupted (frameless) data transfer of digitized data to the laptop or PC
- The stream of digitized data is stored directly on the hard disk of the laptop or PC in real time

2.2 Analog oscilloscope mode

- Number of analog inputs – 8

- Voltage range (switchable, two ranges)

    analog inputs 1…4 – ±6 / 30 V

    analog inputs 5, 6 – ±60 / 300 V

    analog inputs 7, 8 – ±6 V

- Input impedance – 1 MΩ

- ADC resolution – 12…16 bit [1]

- Maximum sampling frequency for channel:

    in 1 channel sub mode – 12.5 MHz

    in 2 channel sub mode – 5.0 MHz

    in 4 channel sub mode – 2.5 MHz

    in 8 channel sub mode – 1.25 MHz

2.3 Software

- Supported operating systems – Windows XP SP2 / SP3,
  Windows Vista, Windows 7,
  Windows 8 / Windows 8.1 / Windows 10

- Main features – Displaying mode + recording + measuring in real
  time simultaneously.

- Number of channels – Selectable 1, 2, 4, 8

- Scale parameters:

    1 channel sub mode – 2 μS / Div…1 S / Div. with step 1-2-5

    2 channel sub mode – 5 μS / Div…1 S / Div. with step 1-2-5

    4 channel sub mode – 10 μS / Div…1 S / Div. with step 1-2-5

    8 channel sub mode – 20 μS / Div…1 S / Div. with step 1-2-5

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1   The nominal signal digitizing depth is 12 bit, increasing up to 16 bit with slower digitizing speeds.

- Voltage sensitivity setting [2]:

  for input voltage range ± 6 V –   2 mV / Div … 10 V / Div.   with step 1-2-5

  for input voltage range ± 30 V –   10 mV / Div … 50 V / Div.   with step 1-2-5

  for input voltage range ± 60 V –   20 mV / Div…100 V / Div.   with step 1-2-5

  for input voltage range ± 300 V –   0.1 V / Div…100 V / Div.   with step 1-2-5

  when using high voltage probes –   20 V / Div…100 kV / Div. with step 1-2-5

- Trigger modes: – auto

  – normal

  – wait

  – single

  – none

- Trigger parameters: – channel

  – front

  – level

  – level increasing threshold

  – threshold time

  – minimal interval

- Maximum file size depends on the file system:

  FAT32 – 4 GB

  NTFS – 16 TB

2.4 Parameters of the USB port's galvanic isolation

USB Autoscope IV has galvanic isolation of the USB port
(device inputs ground <> PC ground)

- Galvanic isolation resistance   – not less than 20 GΩ
- Galvanic isolation capacitance   – not more than 30 pF
- Galvanic isolation test voltage   – 2 kV for 1 minute

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2   The value of the maximum voltage sensitivity depends on the sampling frequency.

2.5 Front panel elements
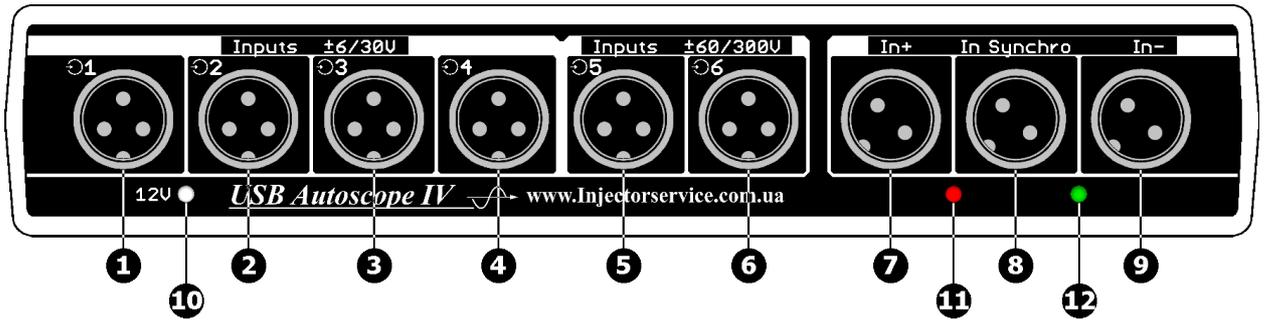
Front panel of the USB Autoscope IV.

1…4 Connections for analog inputs 1…4. Input voltage range ± 6 / 30 V.

5…6 Connections for analog inputs 5…6. Input voltage range ± 60 / 300 V.

7, 9 Connections "In+" and "In–" [3] are used for connection of high voltage probes. The signals from the high voltage probes are inversely summed and go to the analog input 8.

8 Connection "In Synchro" [3] is used for the synchronization (trigger) transducer that is used to detect ignition spark. The signal from the transducer goes to the analog input 7 through a peak detector.

10 Transducers' power indicator.

11, 12 Pulse polarity indicator from synchronization transducer [3].

Connectors of the analog inputs 1…6
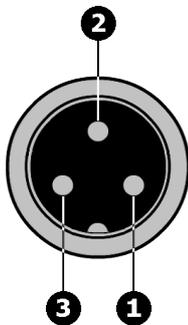
1 Analog input.

2 Device ground.

3 +12 V [3].

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3   Works only when the "12 V" input is powered.

2.6 Back panel elements
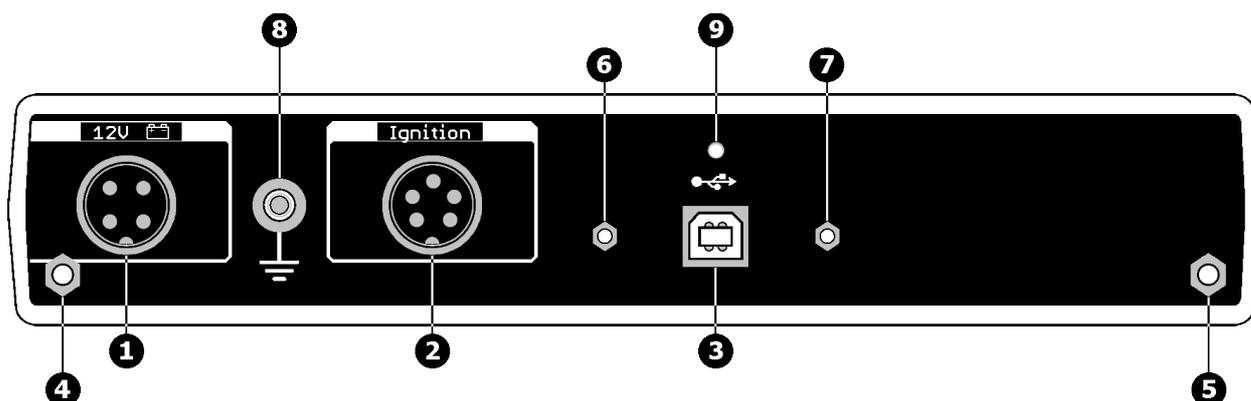
Back panel of the USB Autoscope IV.

1 12 V connection. Used for powering certain transducers that are connected to the inputs. Connects to the diagnosed vehicle battery through the power supply cable.

2 Ignition connection. Analog inputs 7, 8.

3 USB connection. Used for connection of the USB Autoscope IV to USB 2.0 480 Mbit/s (*HI-SPEED*) port of a laptop or PC. The connection uses a USB 2.0 type A-B cable.

4, 5 Spacers for attaching of the device to the Device Holder.

6, 7 Spacers for attaching of USB cable hanger.

8 Device ground terminal.

9 USB status indicator.

Connector "Ignition"
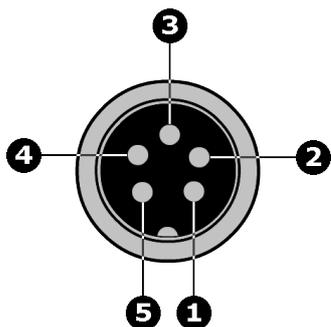
1 Analog input 8.

2 Control output. Normally, analog input number 7 and 8 are used for ignition inputs "In-" and "In+" as well as "In Synchro", however, if pin 2 and 4 on the ignition connector are connected together, an internal switch is engaged with the following result: pin 1 will be connected to analog input number 8 and pin 5 to analog input number 7.

3 +12 V [3].

4 Device ground.

5 Analog input 7.

2.7 Power supply cable

Signal measurements on the analog inputs of the USB Autoscope IV are performed relative to the black alligator clip of the power supply cable. Therefore, before starting the measurement, the cable must be connected to the back of the device connector "12 V" and the black alligator clip must be connected to vehicle ground on the diagnosed vehicle.

The red alligator clip of the power supply cable must be connected to the positive terminal of the vehicle battery. As a result, the corresponded connector pins "Inputs" and "Ignition" will be powered with +12 V, required to power transducers connected to these inputs.

In case of breakage of the cable, it can be repaired or manufactured according to the diagram below.

PIN4 FEMALE

Power supply cable of the USB Autoscope IV.
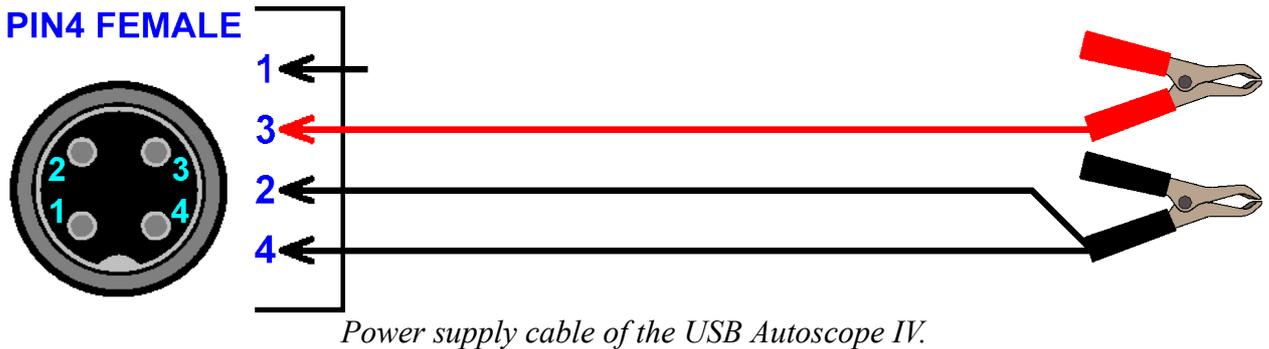
2 Signal ground

3 +12 V

4 Power ground

2.8 Universal cable

Universal cables are used for connection to the inputs 1…6 of the USB Autoscope IV measuring adapters and / or transducers.

In case of breakage of the cable, it can be repaired or manufactured according to the diagram below.

XLR FEMALE   **PIN3 FEMALE**

Universal cable for the USB Autoscope IV.
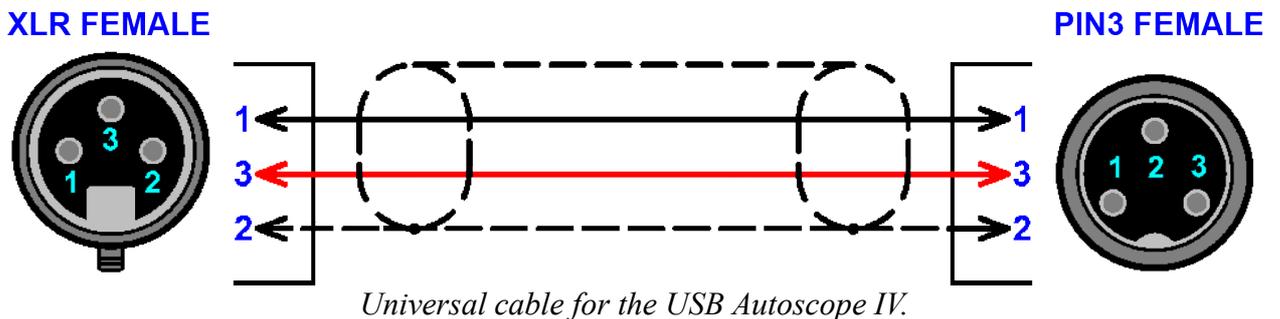
1 «Signal»

2 Device Ground

3 +12 V

3. Preparing the computer for use with the USB Autoscope IV

3.1 Minimum Laptop or PC requirements

- Processor   – Pentium IV 2 GHz

- RAM (random-access memory)   – 1 GB

- Hard disk drive   – 10 GB of free disk space, data-transfer protocol at least UDMA 100

- Optical disc drive   – CD-ROM for software installation

- PC interface   – port USB 2.0 480 Mbit/s (*HI-SPEED*)

- Video adapter   – AGP or PCI Express

- Monitor   – SVGA

- Operating system   – Windows XP SP2 / SP3, Windows Vista, Windows 7, Windows 8 / Windows 8.1 / Windows 10

- Additional requirements   – Any reasonably modern laptop or PC will be adequate

3.2 Installation of the USB Oscilloscope program and utilities

- Insert the installation CD disc in the optical disk drive of the computer.

- If the notification "Tap to choose what happens with this disk" appears, left-click the message screen.
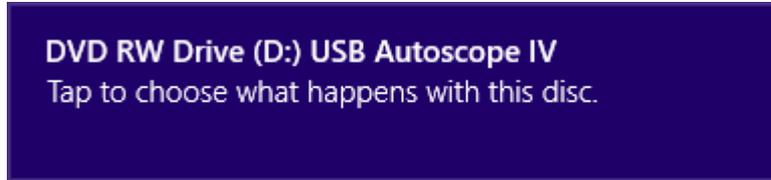
Choose the option "Run setup.exe".
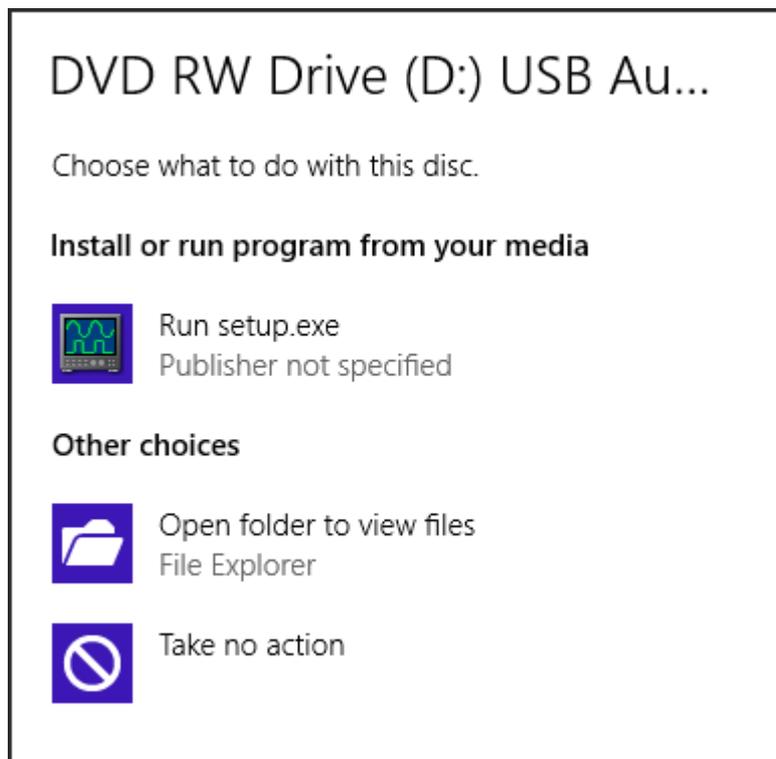
If after inserting installation CD in the optical disk drive of computer nothing happens, browse through the disc and open the program setup file, called "Setup.exe". The drive letter your computer uses for the optical drive, often D:\Setup.exe or E:\Setup.exe

- If a pop up about unknown publisher of "setup.exe" appears, click "Yes".
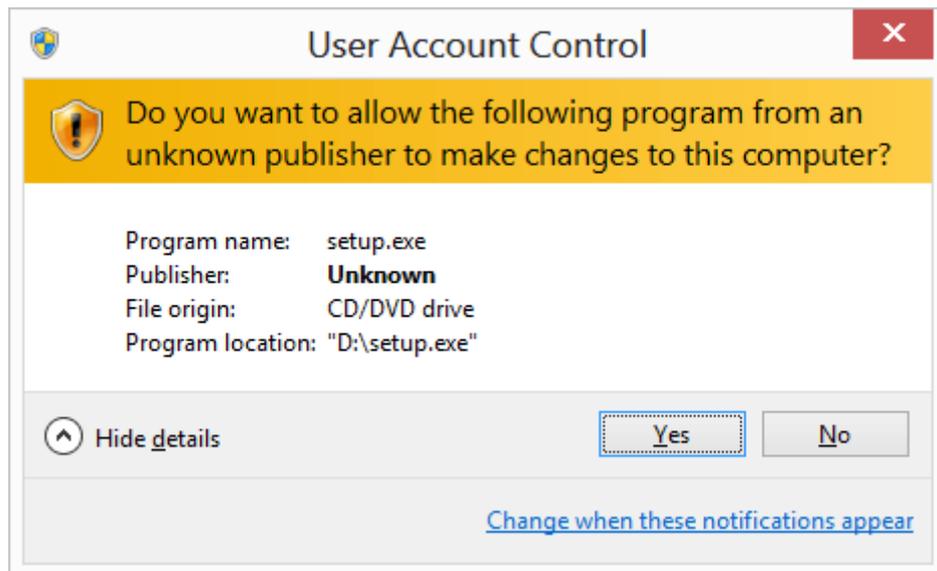
- You may have to wait while the installer verifies.
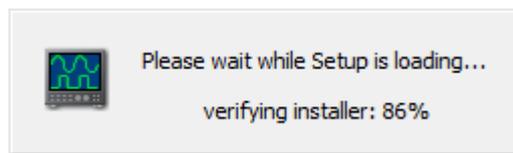
- In the window "Installer Language", change the installation language if desired.
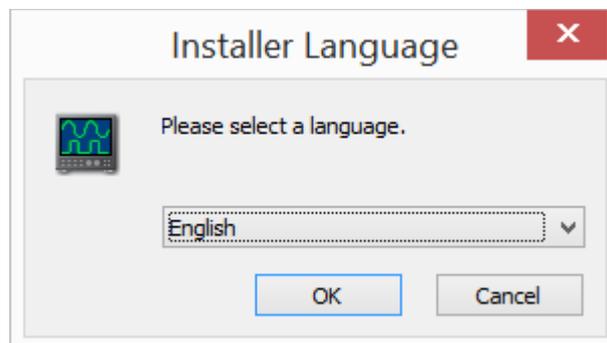
- Then, follow the installation instructions, changing parameters only when required.

- In window "Windows Security" activate option "Always trust software from…" then press button "Install".

- If the message "Windows can't verify the publisher of this driver software" appears, choose the option "Install this driver software anyway".

- If a message about the need to install "Adobe Reader" software appears, agree and install the suggested program.
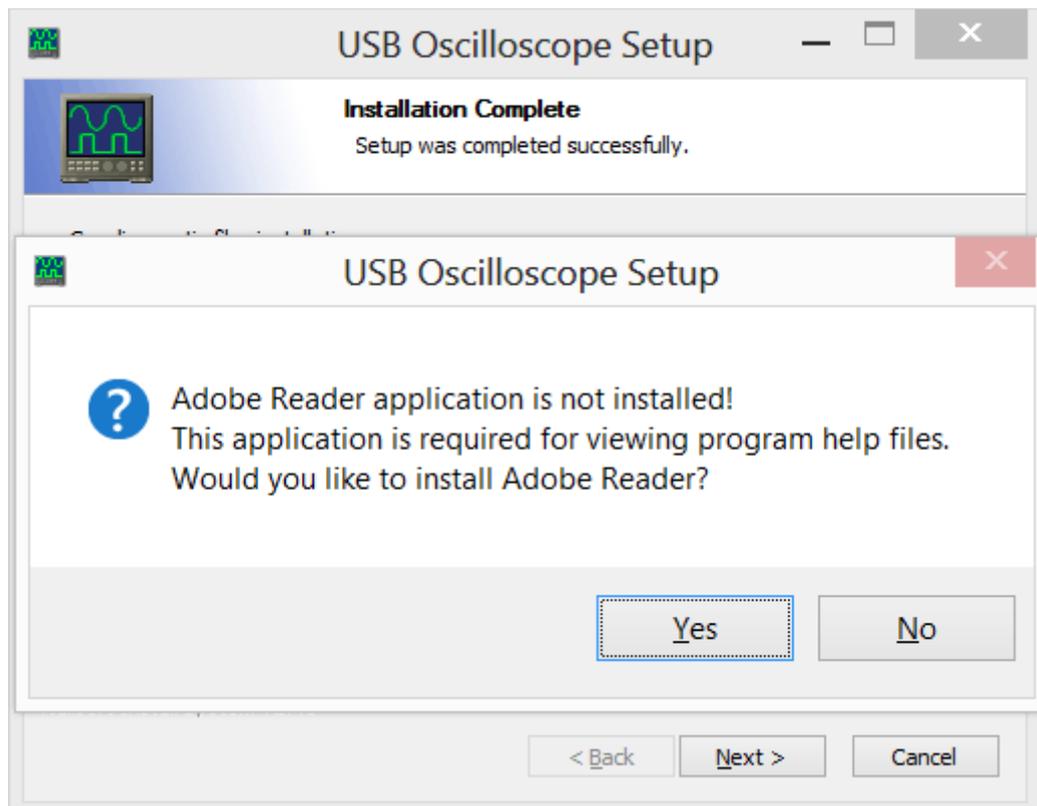
Installation of the "Adobe Reader" program may take several minutes.

- Press the "Finish" button.
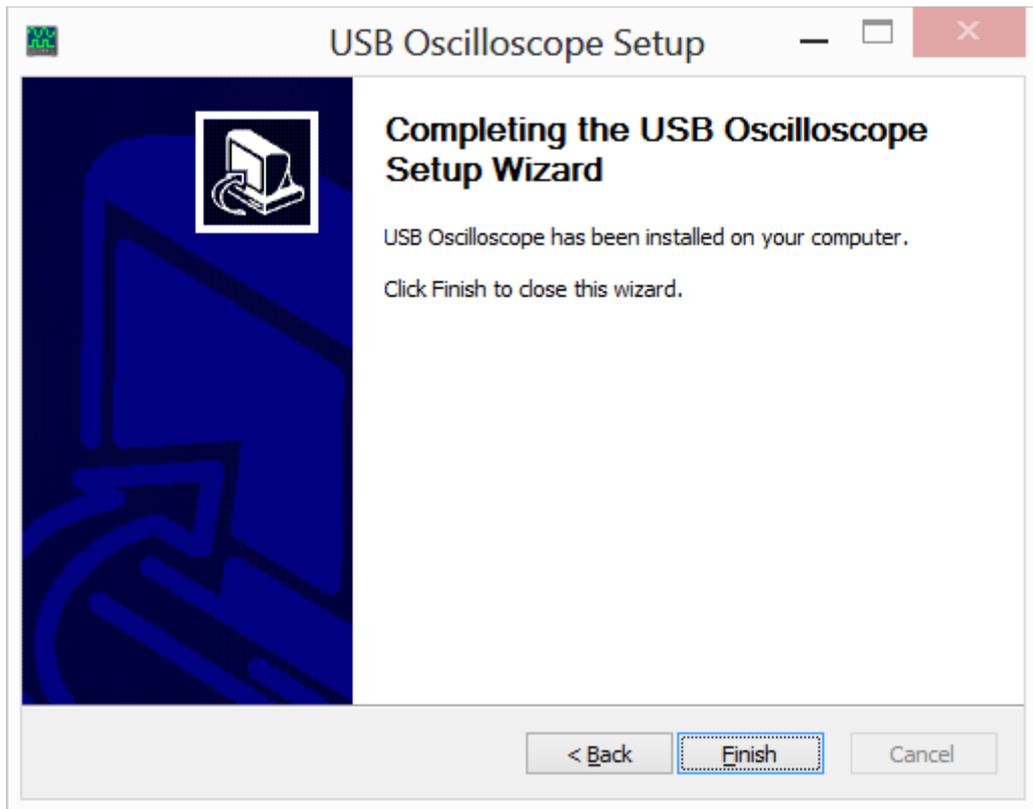
Now the USB Oscilloscope software is installed completely and drivers are presetting.

3.3 Installation of the device drivers

Connect the device to USB 2.0 480 Mbit/s (HI-SPEED) port of the laptop or PC only after installation of USB Oscilloscope software.

- Right after connection of the device to a USB 2.0 480 Mbit/s (*HI-SPEED*) port the installation of drivers will start automatically.
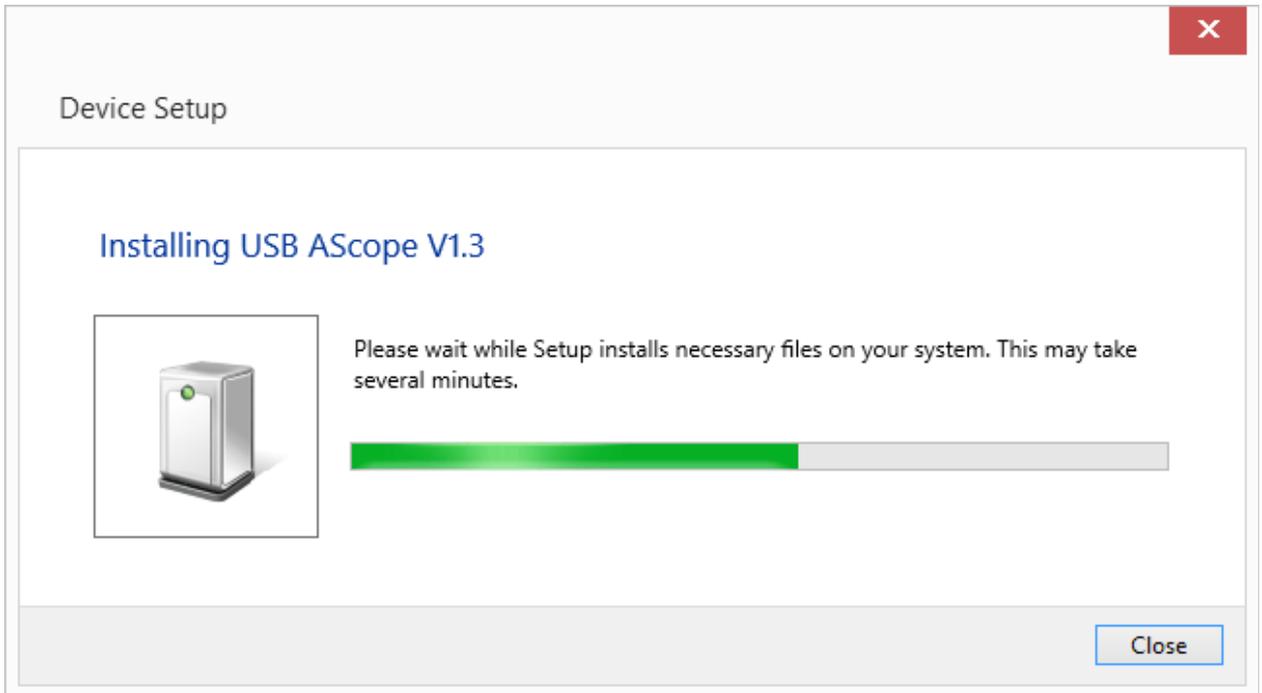
- After successful installation the user will get an installation report.

4. Preparing the device for use

- The device connects to a laptop or PC's USB port using a USB 2.0 A/B interface cable. The computer must have Microsoft Windows XP SP2 or higher operating system and have the USB Oscilloscope software installed.

- Before the measurements, the black alligator clip from the USB Autoscope IV's power supply cable must be connected to vehicle ground on the diagnosed vehicle. The preferred connection point is a vehicle body ground on the diagnosed vehicle. If an older vehicle, use the engine ground. The signal measurements on the analog inputs are relative to vehicle ground, because the vehicle ground is connected to the common ground of the device through the black alligator clip of the power supply cable. Note that in some cases signal ground and ground of vehicle body are not at the same potential. One example would be Lambda or Oxygen sensor ground on GM vehicles. This can skew voltage readings if not taken in to account. In such cases a differential mode can be used, connect one channel to the signal and another channel to the signal ground.

- To provide power for the transducers connected to the inputs of the USB Autoscope IV, the red alligator clip of the power supply cable must be connected to the positive terminal of the vehicle battery.

- The device and it's cables must be placed as far as possible from the high voltage wires of the ignition system, the exhaust manifold, and the cooling system fan.

- The computer itself must be grounded using a separate multi stranded copper wire with a cross section of more than 0.5 mm^2, otherwise a failure of the computer or device is possible. If a laptop running on its internal battery and with the main power supply disconnected is used, this requirement is unnecessary.

- In order to avoid distortion and / or damage to the data that are sent via the USB interface, due to electromagnetic interference from the vehicle's ignition system, it is recommended to ground the USB Autoscope IV using a separate multi stranded copper wire with a cross section of more than 0.5 mm^2.

- To improve the usability of the device it is recommended to use the holder for USB Autoscope IV.

  The device holder comes unassembled.
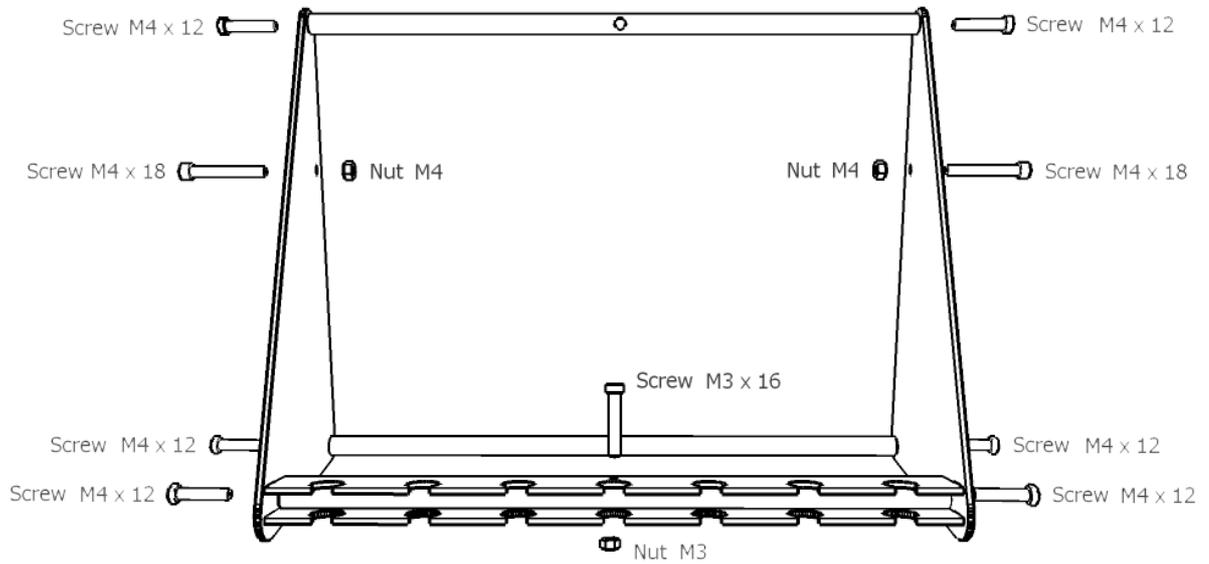
USB Autoscope IV holder assembly instructions.
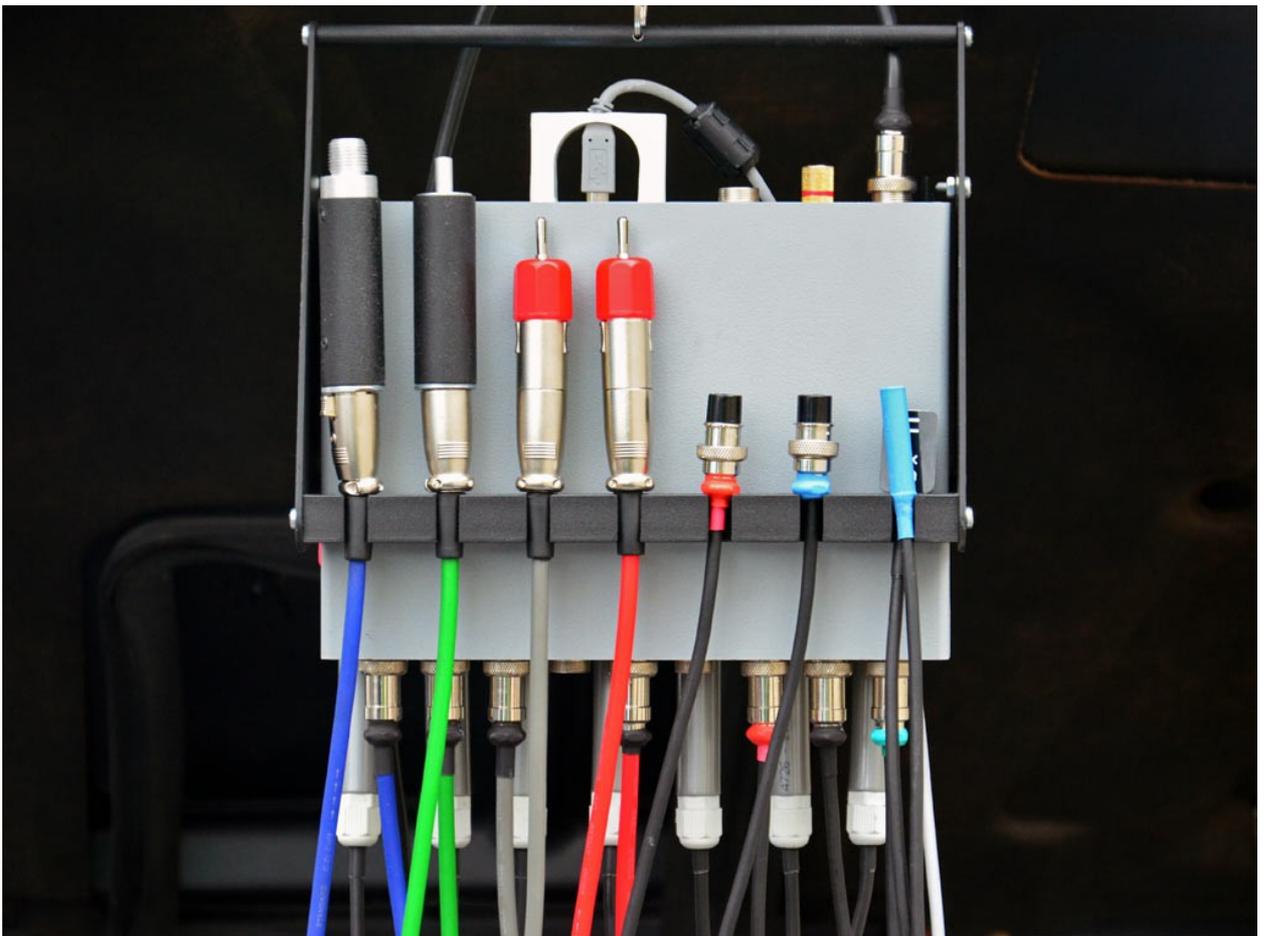
USB Autoscope IV holder full kit.

5. USB Autoscope IV kit description

Name	Appearance
USB Autoscope IV, USB 2.0 A/B interface cable, USB cable hanger, power supply cable, CD with software	

Device holder	
Universal cable, 4 pcs	
Measuring adapter, 4 pcs	
Needle probe, 4 pcs	
Insulation piercing probe, 2 pcs	
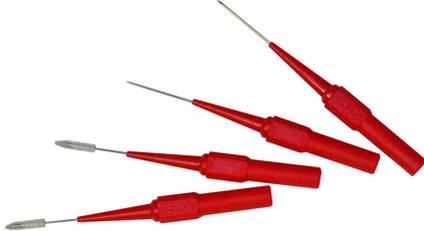
Small alligator clip, 2 pcs	
Probe extension, 4 pcs	
Px35 in cylinder pressure transducer [4]	
PxLonger deep well adapter for high pressure (in cylinder) transducer	
Spark Gap high voltage spark gap tester	
Dx vacuum transducer	
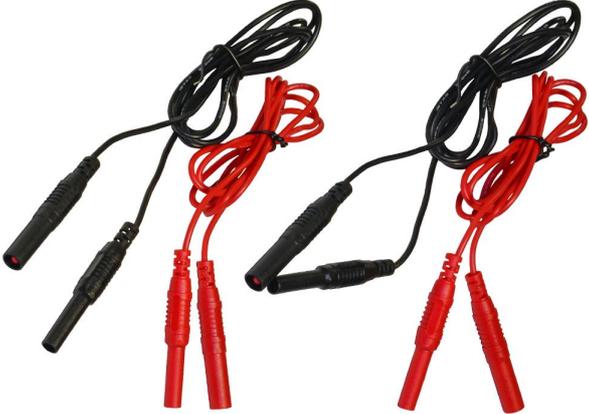
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4   Starting from 01.06.2014 instead of Px (-0.9…+6 Bar) the transducer Px35 (-0.95…+35 Bar) is supplied. If needed, the Px transducer can be purchased in addition to the Px35.

Sync synchronization transducer	
DIS Cx 6 capacitive probes	
Cx-M universal capacitive probe	

Lx-M universal inductive probe	

6. Manufacturer limited warranty

The manufacturer guarantees the performance of components supplied with the USB Autoscope IV during their warranty period.

Warranty period for the main unit USB Autoscope IV is 24 months from the date of sale, for transducers Px and Dx – 12 months.

During the warranty period, the manufacturer will at their discretion, replace or repair components that failed due to a manufacturing defect or during normal use. Failures caused by abuse or neglect, are not covered.

This warranty gives you specific legal rights and you may have other rights that vary, depending on where you reside.

7. Troubleshooting

7.1 The device does not turn on

- The device is not connected to USB 2.0 480 Mbit/s (HI-SPEED) port of the host computer.

  Connect the device to USB 2.0 480 Mbit/s (HI-SPEED) port of the host laptop or PC.

- Faulty, low-speed or too long USB cable.

  Change the USB cable to a quality high-speed USB 2.0 A/B interface cable of no more than 3 meters in length and with a label stating "CERTIFIED HI-SPEED USB".

- The driver for "Universal Serial Bus controller" is not installed.

  Install the drivers for the motherboard that is in your computer.

- The USB 2.0 480 Mbit/s (HI-SPEED) port of the personal computer is broken.

  Try another port or computer.

- The USB 2.0 480 Mbit/s (HI-SPEED) port of the personal computer does not provide enough current.

  While in operate mode the current consumption does not exceed 350 mA which is well below the maximum allowable 500 mA for USB devices. However, some computers does not provide the required current. One of several possible reasons is a malfunction of the USB port's supply circuit. Try another port, or try to connect to a powered USB hub. The PC or laptop's power settings may have been set to limit the current available to the USB port. Try changing power settings, or use a powered hub.

7.2 "USB transfer error"

If in the process of working with the device in the USB Oscilloscope window the message USB transfer error message appears, it indicates distortion and/or damage to the data that are sent via the USB interface.

- The device and / or its USB cable placed too close to the source of electromagnetic interference.

  Ground the device using a separate multi stranded copper wire with a cross section of more than 0.5 mm^2.

- Used faulty, low-speed or too long USB cable.

  Change the USB cable to a quality high-speed USB 2.0 A/B interface cable of no more than 3 meters in length and with a label stating "CERTIFIED HI-SPEED USB".

v4.3.9.5