BRAKESAFE INSTRUCTIONS

GETTING STARTED

The BrakeSafe is operated by a single *Click* control. The central OK button may be *single-clicked*, *double-clicked*, or *held-down*. The surrounding arrow buttons are used to navigate menus by moving a `highlight` bar through a menu of options on the instrument's display screen. Clicking the OK will select the highlighted item. Normally this will be accompanied by a beep from the instrument. The scroll bar on the right hand side indicates the relative position of the item within the menu.

Whenever possible the instrument operates to these simple rules:

- *single-click* to choose a menu item

- *single-click* to return

- *double-click* to enter a 2nd level menu

- *single-click* to return

- *hold-down* (for more than one second) to abandon a course of action

- Use ▲ or ▼ to increase or decrease a value.

- Use the arrow buttons to scroll through a menu

- the last option of a menu will return you to the previous menu, or use the ◄ button.

SWITCHING ON: To power the instrument, *hold-down* OK and then release. The display will appear when OK is released. The instrument will perform a short self-test and display its software version and when calibration is next due. The ***Start Menu*** will then appear.

The self-test will warn if re-calibration is overdue and if more than 80 tests have been stored in memory. Upload or print the tests if the memory is getting full, then erase to create more space. If the SD card is fitted, tests will be backed-up automatically to create space.

Note the instrument has limited functionality if the LOW battery warning shows.

SWITCHING OFF: To manually switch off, *hold-down* OK in the ***Main Menu.*** If the control has not been operated for about 4 minutes, the instrument will switch itself off unless it has been armed for a test. It will also turn off if its battery is very low.

EDITING: A built-in editor allows certain number values, names and software switches to be edited in the instrument. First highlight the item then for:

- numbers, *single-click* to edit
- names in a sub-menu, *single-click* to select or *double-click* to edit.
- software switches, *single-click* to change state

When a number or name is being edited, press the arrows until the pointer is at the required digit or letter and *single-click*. The pointer bounces to indicate the letter has been selected. For text edits, a slider of available characters appears. Use the arrows to change the character as required. Then *single-click* to implement the change and move on to the next digit or letter. Finally *double-click* when finished and then *single-click* to select one of the following options:

- **Continue:** continue editing this item
- **Save and quit:** save the new value and return to the menu.
- **Reset value:** reset to the default value and return to the menu
- **Just quit:** revert to the previous value and return to the previous menu.

STORAGE AND CHARGING: When switched-on, the instrument display's battery icon, on the top right of the *Start* and *Main* menus, will indicate when the charger is connected and the instrument is taking charge. A full battery recharge takes about 12 hours (overnight), the instrument should be given a top-up charge each month. Operating time from full re-charge is normally over 8 hours.

If the instrument is switched-off, the pass and fail lights will flash when the charger is connected.

PRINTING: The BrakeSafe *Printer* requires 58mm width thermal printer paper with a maximum roll diameter of 32mm. No printer ribbon is required. It will switch-on and off automatically as required.

To manually switch the *Printer* on, press the button marked >>. A green light appears while the printer is on. Press >> to feed extra paper. To switch off, press and hold ‖ . Please refer to the Electronic Printer Mechanism (EPM) instruction extracts at the end of this document for more information about the printer and changing paper rolls.

RE-CALIBRATION: Your BrakeSafe is a precision instrument and must be recalibrated annually by an accredited laboratory. This gives you the optimum re-assurance that its measurements will always be accurate and correct, ensuring the safety of your operatives and plant. For a small annual fee, Turnkey offers an **Extended Warranty** for the BrakeSafe which includes annual re-calibrations, all materials and labour costs in the event of breakdown, and an unlimited technical support helpline. Please see our website for more information or call 0800 195 8887.

IN THE EVENT OF A FLAT BATTERY: If your BRAKESAFE has been left neglected and not used for many months its battery may become fully discharged (NiMH batteries typically self-

discharge at about 10% per month) and as a consequence the display will not appear (or disappears immediately) when the instrument is switched-on. If this happens, just connect the charger and wait a 30 minutes before trying to switch on again. If the display now appears correctly, switch off and give the instrument a full re-charge. If no display appears or the instrument does not start correctly or appears to malfunction, the instrument must be reset. Do this by pressing and releasing the RESET button, this is recessed in the small hole just above the charger socket. You may need a ballpoint pen or pencil to depress it properly. Note that if they battery has become discharged, the time and date will have to be re-entered but no results or settings will have been lost. The time and date may be set via the 'Change Settings' menu or with the plant downloader software.

BLUETOOTH: BrakeSafe can be supplied with Bluetooth Pedal Force Transducer (bPFT). This can be connected wirelessly to BrakeSafe at distances of up to 10 metres and allows the instrument to be triggered as the vehicle brake is applied or the force applied to the pedal recorded. To be compatible, your instrument must have the factory fitted Bluetooth option. New instruments are preconfigured to automatically pair with the bPFT supplied. The user can also set BrakeSafe to pair with additional devices (see *Setup Bluetooth* menu). With Bluetooth it is also possible to print to other compatible BlueTooth printers (especially for the printerless *micro*BrakeSafe) or to download results wirelessly to a compatible Bluetooth PC.

When the Bluetooth feature is turned ON, the instrument will pair automatically. The instrument will decide if it needs to pair for *Brake Testing* or for *Printing* and the appropriate warning message will appear on the screen. Preferably, make sure the appropriate remote device is switched on at this time. However, BrakeSafe will continue trying to pair until the device is switched on and pairing is successful. Successful pairing normally takes just a few seconds, although if many discoverable Bluetooth or WiFi devices are in range it may take a little longer. If the device will not pair, just *single click* to try again or *hold down* and release to abandon and investigate.

To pair with the *Bluetooth PFT*, first switch it on by pressing firmly with your foot for about 1 second the releasing. The yellow light on the PFT will turn on when pairing is successful. The PFT will stay active and paired until BrakeSafe is switched-off or is paired with a Bluetooth *Printer*.

To pair with a remote Bluetooth *Printer*, first turn OFF the **Built-in Print** in the *Change Settings* menu, then make sure the remote printer is switched-on by pressing its ▶▶ button, a green light appears on the printer (no green light means its battery is flat). The *Printer* will then stay on and paired until BrakeSafe is switched off or is paired with the *Pedal Pad*. The *Printer* will switch itself off after one minute if it can't pair.

Bluetooth devices are identified by their unique Bluetooth Address (a 12 digit number) and a "Friendly" name. To aid identification, all devices are marked with their Bluetooth friendly names. The friendly name will usually incorporate the serial number of the device.

If Bluetooth is fitted, then at switch-on the instrument will make itself discoverable to other Bluetooth devices, such as a Bluetooth laptop, PC or iPhone, for uploading etc. After printing or brake testing you can make the instrument discoverable again by double clicking on the *Main Menu*. The Bluetooth passcode is 1234.

WIRED OPERATION: If you do not wish to use the Bluetooth features of the Brakesafe, the *Pedal Pad* can be physically connected to the 8 pin DIN connector.

In particular, when the *Pedal-Pad* is connected to the DIN connector with the cable provided, the BrakeSafe will not make any attempt to pair with it using Bluetooth. In this case, after arming for a test, just depress the pedal to trigger the instrument.

Always observe safe working procedures when accelerating and stopping the vehicle.

For brake testing, the instrument should be positioned so the *clickcontrol* is toward the rear of the vehicle. Preferably, it should be placed against a forward bulkhead so that it cannot slide forward under severe braking. Although the tilt of the instrument relative to the ground surface is automatically recorded and used to compensate the results, the very best results will be obtained when the instrument base is parallel to the road surface.

For most situations the internal self-start trigger can be used. However, this does not allow the brake delay time to be determined and the calculated stopping distance will be less accurate as it is evaluated only from the time the brakes start to act rather than when they are applied. A trigger pad is available to fit onto the brake pedal of the vehicle and, when the external trigger option is selected, it will trigger the instrument the moment the brakes are applied. A Pedal Force Transducer (PFT) is also available to measure and record the force applied to the brake pedal.

The **Mean Fully Developed Deceleration** (MFDD) is the mean deceleration recorded between 80% and 10% of the vehicle's velocity when the brakes were applied. This is the preferred measure of brake performance specified in EU and UN Vehicle Regulations. BrakeSafe measures and records MFDD along with the conventional Mean and Peak deceleration between the start and stop thresholds chosen in the *Adjust Settings Menu.* Markers showing the 80%V and 10%V points for the MFDD may be shown on the displayed graphs and prints.

If **Trailer Testing** is selected you can identify the trailer used on the test and if **HGV Trailer Test** is selected the instrument will estimate the trailer brake efficiency based on the respective tractor and trailer weights and the free tractor brake efficiency. You will be prompted to confirm these values when arming for the test. The measured MFDD is used for the trailer brake efficiency calculation (see section on Trailer Brake Testing)).

The instrument is normally set to take 40 measurements per second. This is the NORMAL sampling rate and is good for most situations. The FAST 400 measurement per second sampling rate can be selected in special situations, but be warned calculations take 10 times as long and 10 times the memory is used per test.

The instrument records information for about 2 seconds before the start trigger and up to 6 seconds (as set by the *End Delay)* after the vehicle has stopped. Events in these periods can be seen on the graphs. On the graphs a shaded area means a negative reading.

To accurately determine the speed and stopping distance, the instrument needs to know the gradient of the ground in order to eliminate any static offsets caused by the acceleration due to gravity. You may opt to measure these at the point of arming or at the point of coming to rest. Whichever one is most representative point of the test course should be used. If you choose to measure the gravity offset at the end, you may also elect to pause while the brakes are released to unlock the vehicle's suspension before the offset is measured. If you don't use the pause, make sure you set the End Delay long enough for the suspension to stop bouncing (confirm by looking at graph). The end slope is measured as the Blue arming light goes out.

If the **Auto-Align** feature is selected, the instrument does not have to be accurately aligned with the direction of travel. It will sense which direction the vehicle first accelerates for the test (to 5 kph) and use that as the reference direction. It is important the initial direction coincides with that when the brakes are applied.

Over the years Turnkey has produced many documents about brake testing, please contact our Technical Support Department for further information.

brakesafe.eu

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Start Menu

The top line shows the % of memory used, the present time and a battery condition indicator. The latter shows LOW if recharge is needed right away and CHG while being recharged. The instrument will turn itself off if the battery gets too low. If the battery goes completely flat you will have to reset the clock but the stored results will be preserved.

Test Brakes: *single-click* to proceed straight to brake testing. If fitted, Bluetooth will attempt to pair with the *Pedal Pad*

More… : *single-click* to proceed to the ***Main Menu.***

While this menu is visible the BRAKESAFE can be discovered by other Bluetooth Devices and can thus be connected for downloading to a Bluetooth enabled Windows PC. The screen will briefly show a "Making Discoverable" message.

Main Menu

Double-click to make discoverable if Bluetooth is on. The passcode is 1234.

Examiner Identity: *single-click* to show a list of up to eight examiners names, ▲▼ to highlight then *single-click* to select or *double-click* to edit (see *Editing*).

Plant Identity: *single-click* to show a list of up to 99 plant or vehicle identities. ▲▼ to highlight then *single-click* to select or *double-click* to edit (see *Editing*).

Trailer Identity: *single-click* to show a list of up to 70 trailer identities. ▲▼ to highlight then *single-click* to select or *double-click* to edit (see *Editing*). Only if Trailer Testing .

Site Conditions: *single-click* to show a list of up to 16 site conditions or user notes, ▲▼ to highlight then click again to select or *double-click* to edit.

Measure GRADIENT: *single-click* to measure the slope gradient. The instrument continuously measures and displays the slope gradient in percent. A negative number means a downward gradient. If a very accurate measurement is required, first trim the instrument zeros (see *Trim Zeros* in the **Setup Instrument** menu)**.** The cross slope and temperature are shown at the bottom of the display. Click again to return to the main menu. The maximum slope is limited to 25% (1 in 4).

BRAKE TESTING: *single-click* to arm the instrument for the next brake test. The display shows the examiner, vehicle name, trailer (optional) and site conditions for the test together with the test reference number. Highlight and *single-click* to change any of these (see *Editing*). When ready, *single-click* **Proceed**.

Click again to confirm the vehicle is stationary and you are ready to proceed with the test. The instrument should be properly located in the vehicle and the vehicle should be on a gradient representative of the test course.

All the subsequent calculations of deceleration, speed and distance will be referenced to the gradient measured at this point (i.e. the gradient at arming). Alternatively, if measure slope at stop is selected (see **Change Settings** menu), all calculations will be reference to the gradient measured at stop when the vehicle has come to rest.

To obtain the most accurate results, the instrument should be aligned in the vehicle to move parallel to the ground. If the instrument is misaligned by more than 25%g a warning will be added to the results.

When ready, highlight the type of brake being tested and click.

The instrument is now fully armed for the brake test, accelerate to test speed and apply the brakes. The BLUE armed light will illuminate and the display will show the speed increase when accelerating. Note you must accelerate to 5kph (or mph) before you can trigger the test.

The Test Reference number is shown at the top of the display together with whether the internal or external start trigger will be used (see *Change Settings*). The Test Reference Number will auto increment after each successful test. If the internal self-trigger is selected, you must accelerate to at least 5 kph (or mph) before braking otherwise the instrument will not trigger.

Until you reach a speed of 5 kph (or mph), you may still elect to measure the slope at stop and to pause before doing so, move the highlight and click ON or OFF as required. The instrument will beep as this speed is passed. This is also the speed to which the auto alignment is set If the Speedo Beep feature is enabled, the instrument will instead beep once at 10 kph (or mph), twice at 20 and so on.

To abandon the test, *hold-down* OK.

At the end of the test, a results summary will be displayed. At this stage you can elect to accept or reject the test. If any errors or warnings have been detected, you can elect to view these before accepting or rejecting the test results.

After a successful test the BLUE light will go out, if it flashes it means the instrument has detected potential errors. The GREEN pass or RED fail light indicate whether or not the vehicle has exceeded the chosen pass threshold, if these flash it means that calibration is overdue.

Do not move off until the Pass or Fail light appears.

Once accepted you may either:

- Proceed with another test for that vehicle
- Review the results in more detail
- Change the instrument settings
- Adjust the test parameters
- Finish testing.

A simple ON-OFF Pedal Pad or Hand Switch can be connected to the DIN socket as an external trigger (but see also Bluetooth Pedal Force Transducer).

MOT BRAKE TESTING: the PASS and FAIL lights must NOT be used for MOT brake testing. Before testing beings, disable them by setting their *Lifetime* to 0 hours. The PEAK value of the deceleration MUST be used for the MOT test.

ACCELERATION TEST: this will appear in place of **BRAKE TESTING** when Acceleration Testing has been selected. Move to the start of the test course and stop, then *single-click* to arm the instrument for the next acceleration test. After a short delay, the BLUE armed light will appear. Check the speed indicates 0 and then accelerate to the target speed. As with brake testing, when **Auto-Align** is selected, the direction of travel is determined during the initial acceleration and the orientation of the instrument in the vehicle is not important.

Review Results: *single-click* to review the stored test results. Change the test number to be reviewed by highlighting, clicking and changing to the required test. The display shows the results summaries as you move though the stored tests. *Single-click* when the required test is reached.

Single-click **More** to see more detailed results for the test including the instrument set-up used and any errors or warnings given. The test can also be selected for later printing (**Mark for Print**) or later erasing (**Mark for Erase**). If printing is selected, you may optionally choose to print graphs, either individually or overlaid, and the test settings. Any error report will always be printed.

Single-click **Graph** to display a graph of the test results. Scroll through the graph with ▲▼, or *hold-down* to animate. *Double-click* or ►◄ to change the graph, the *options* to the right of the graph will flash, use ►◄ to scroll between these options:

- *change plot* (e.g. deceleration, distance, speed, etc)
- *change span* (e.g. 0 to 100%, 0 to 50%, etc)
- *change zoom*. (e.g. expand time axis, etc)

Single-Click at the required option. The axis name will then flash, ▲▼ and *single-click* again to select the required axis name, span or zoom.

The fixed solid line on the graph is the time reference line. The dashed lines represent the times of the external start trigger (if enabled), the 10% and 80% V MFDD points, and the start and end of deceleration.

Single-click to close the graph and review other results.

Single-click **Print** to print this test now, regardless of the whether or not the test has been marked for print. The printer will turn on automatically. Printing graphs and settings may be skipped depended on the chosen options. If the graphs are printed, they can be overlaid or printed individually. The solid lines on the graphs correspond, as above, to the external start (if used), the start and end of deceleration and MFDD 80% and 10% V points. Press and hold the OK to abandon a print.

Single-click **Quit** to return to the previous menu

Bluetooth: *single-click* to <u>temporarily</u> switch Bluetooth ON or OFF (only when Bluetooth fitted)

Setup Instrument: *single-click* for the **Set-Up Menu** to change the set-up of the instrument. You may need a PIN number to do so.

Print Selection: *single-click* to print all the tests that have been selected or marked for print during **Review Results**. If *Mark for Print* was the default instrument set-up, all prints will be automatically marked for print when they are accepted. You may choose to print two copies of each test, and deselect or mark for erase after printing. Press and hold to abandon the print.

Erase Selection: *single-click* to erase all those tests that have been marked for erase. Any freed memory space will be recovered; this may take a few seconds depending on how many tests are already stored in memory. You will be prompted to confirm.

SD memory card backup

A 2GByte SD card must be used. High capacity SDHC cards are not compatible.

SD Card Backup: *single-click* to review the memory card Folders. Change the Folder number to be reviewed by highlighting, clicking and changing to the required number between 0 and 999. As you move though the folders, the display shows the time and date the folder was saved and the serial number of the instrument that saved it. *Single-click* when the required Folder is reached.

Single-click **Save** to backup this instrument's entire internal memory to that Folder number. The display first asks you to confirm you wish to erase and overwrite the Folder's current contents. Backing up the entire memory takes about 50 seconds The Folder is given the (un-hidden) name SSSSSnnn.TKI, where SSSSS is a the five character instrument serial number and nnn is folder number between 000 and 999.

Single-click **Load** to retrieve the SD card Folder into the instrument's memory. This will overwrite the instrument's internal memory, but you will be able to append new tests if space allows. Retrieving takes about 50 seconds.

Single-click **Quit** to return to the previous menu

Automatic Backup: if the SD card is fitted, whenever the instrument switches-off with its internal memory more than 80% full or containing more than 75 tests, the internal memory will be automatically backed-up to the next Folder Number on the SD Card. The internal memory will then be erased. This will be repeated when it is next full until all 1000 folders have been used (75,000 tests).

If the automatic backup isn't needed as the instrument switches off, then the internal memory is just backed up in Folder 0 but not erased. Thus after switch-off the SD Card is always ready with the latest results backup.

Automatic backup does not happen if the low battery warning is on.

The contents of the SD card can be imported into the Turnkey Winsim application.

HGV TRAILER BRAKE TESTING

Estimating Trailer Brake Performance using BrakeSafe

When HGV trailer testing is selected the trailer's estimated brake efficiency (based on the measured MFDD) will be shown along with the measured deceleration of the tractor-trailer combination. The calculation is based on the following:

Throughout we assume that brake tests are carried out on the same level test track and that the deceleration is limited by the braking force generated by the brakes and not by the coefficient of friction between the tyres

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and road – in other words the wheels don't lock. For a given tractor or trailer unit, its braking force is assumed to remain the same.

In this case, by Newton's Law, the deceleration of a free tractor unit is:

$$\text{Decel}_{tractor} = \text{Tractor Braking Force / Tractor Mass}$$

If an un-braked trailer is attached to the tractor, then for the same braking force the deceleration of the combination is:

$$\text{Decel.} = \text{Tractor Braking Force / (Tractor Mass + Trailer Mass)}$$

Which, as expected, is less than that of the tractor alone. If the tractor and un-braked trailer had equal masses, the effective deceleration would be halved for the same braking force.

If the trailer has brakes, then the deceleration of the combination is:

$$\text{Decel}_{combo} = \text{(Tractor Braking Force + Trailer Braking Force) / (Tractor Mass + Trailer Mass)}$$

assuming, again, that the wheels don't lock and also ignoring any dynamic weight transfer during braking.

This formula can be re-arranged to estimate the deceleration (or brake efficiency) of the trailer itself:

$$\textbf{Decel}_{trailer} = \textbf{Decel}_{combo} \textbf{ x (1+Mass Ratio)} - \textbf{Decel}_{tractor} \textbf{ x Mass Ratio}$$

In the above, the mass ratio is the ratio of masses:

$$\textbf{Mass Ratio = Mass Tractor / Mass Trailer}$$

In other words, when the decelerations are expressed in % g and knowing the mass ratio, the effective brake efficiency of the trailer unit (in % g) can be estimated from the BrakeSafe brake efficiency measurements of the tractor and tractor-trailer combination. For a given tractor unit, the $\text{Decel}_{tractor}$ should remain fairly constant, hence the brake performance of individual trailers can be obtained from a single measurement.

Always test brakes in a safe area. Turnkey Instruments Ltd accepts no responsibility for the use and interpretation of these equations or their validity

BLUETOOTH PEDAL FORCE TRANSDUCER (OPTION)

The Bluetooth Pedal Force Transducer can be used as either a simple ON/OFF external trigger or as an indicator of the applied pedal force in kgF (1kgF=9.8 Newtons), or both.

When measure Pedal Force is selected, the recorded pedal force will be substituted for the velocity time graph in the results. Don't forget to set *I/O Expansion* on to use the Bluetooth PFT (otherwise the analog port on the DIN connector will be measured). When the *Brake Testing* menu is first selected, the display will indicate that the PFT is being zeroed (click OK to abandon). Do not apply force to the transducer during zeroing, once 'Zeroing PFT' disappears from the display the brake can be applied to hold the vehicle during the remainder of arming, or repeat brake tests.

The PFT is also zeroed when the *Measure Gradient* mode is selected. Again, do not apply force to the transducer during zeroing. After zeroing, the gradient measurement display indicates the force being applied to the PFT. This is a useful check on its calibration which

can be adjusted if required via the **Adjust Values Menu.** The applied force at which the PFT triggers the start of braking is also shown in this menu

To use as a simple ON/OFF trigger pad, just set the measure *Pedal Force* setting off. The PFT will then use a fixed setting of about 5 kgF to trigger the start and the *Gradient Measurement* mode displays 'BRAKE ON' when a force greater than the internal trigger setting is applied.

The instrument will sense if a non-Bluetooth Pedal Pad is connected to the DIN socket. In this case the instrument will use the connected Pedal Pad (and not attempt to pair) either as an analog pedal force transducer or as a simple on/off trigger switch. The *Gradient Measurement* mode will display either the applied pedal force or 'BRAKE ON' as above (providing external trigger is enabled). Note that the instrument will not attempt to zero an analog PFT connected in this manner and you must adjust its zero manually in the **Adjust Values** menu.

Setup Instrument Menu

The Editor PIN may be required to access this menu

Adjust Values: *single-click* to select the **Adjust Values** menu.

Change Settings: *single-click* to select the **Change Settings** menu.

Setup Bluetooth: *single-click* to select the **Setup Bluetooth** menu (Bluetooth must be ON).

Trim Zeros: *single-click* to accurately trim the zero readings of the instrument by following the on screen instructions. Any flat surface may be used, it need not be horizontal.

Erase all Tests: *single-click* to erase all the tests in the instrument's memory, regardless of whether marked for erase or not. You will be prompted to confirm

Set Time and Date: *single-click* to set the time and date by following the on screen instructions

Adjust Contrast: *single-click* and ►◄ to adjust the contrast of the display

Adjust Backlight: *single-click* and ►◄ to adjust the brightness of the backlight. The brighter it is the more battery power will be used. To conserve power, the light turns off if there has been no input for about 2 minutes.

Defragment Memory: *single-click* to confirm that the memory is fully defragmented and all free space is available for use.

Format SD Card: *single-click* to format the SD Card to make it visible to a personal computer (FAT16 file system). Sets all the Folder names to FFFFFnnn.TKI (nnn=000 to 999, hidden file attribute) but does not overwrite previously stored data. Folders are in the BACKUP subdirectory of the TURNKEY root directory

Configure Printer: *single-click* to configure printer fonts and timeouts. Also resets the Bluetooth to its factory defaults in case of problems.

Calibration Report: *single-click* to print calibration report.

User PIN: single-click to change the PIN required to use the instrument. Make a note of it! (5424)

Editor PIN: single-click to change the PIN required to set-up the instrument. Make a note of it! (4748)

Main Menu: *single-click* to return to *Main Menu.*

Adjust Values Menu (Brake Testing Mode)

Use the built-in editor to adjust any of these values. The default values are shown

Test Number: the test reference number between 1 and 30000, it is automatically incremented after each test.

Pass B1 > 25.0 %g: pass threshold for the 1st brake type (normally 'Service')

Pass B1 > 25.0 %g: pass threshold for the 2nd brake type (normally 'Secondary')

Pass B1 > 25.0 %g: pass threshold for the 3rd brake type (normally 'Parking')

Pass B1 > 25.0 %g: pass threshold for the 4th brake type

Trig at 10.0 %g: the deceleration threshold for start of braking

Stop at 10.0 %g: the deceleration threshold for end of braking

Trig hold 0.50 sec: the minimum time the deceleration must be sustained <u>over</u> the start threshold to be a true start of deceleration. The true start time is the start of this time.

Stop hold 0.10 sec: the minimum time the deceleration must be sustained <u>below</u> the stop threshold to be a true end of deceleration. The true stop time is the start of this time.

End Delay 2.5 s: delay before measuring the stop point slope gradient. Only if 'Slope at Stop' has been selected.

Peak over 0.20 sec: the minimum time the peak reading has to be sustained.

Dive 2.5 deg/g: compensation for the tilt of the vehicle (in degrees tilt per g of deceleration) caused by the movement of its suspension as it decelerates

Trailer 100.0 tonne: the trailer weight in tonnes. Only for HGV trailer testing

Trailer 100.0 tonne: the tractor weight in tonnes. Only for HGV trailer testing

Tractor 50.0 %g: the free tractor brake efficiency. Only for HGV trailer testing

PFT trig 20.0 kgF: trigger point for Pedal Force Transducer in kg force. Only if PFT enabled.

2.5V PFT 100.0 kgF: PFT calibration, force required for 2.5 Volts output from PFT

0.0V PFT 0.0 kgF: PFT calibration, force required for 0.0 Volts output from PFT

Card Folder 0: the next SD memory card folder to be used (in range 0 to 999). Only if the SD card feature has been enabled by the factory.

Filter type 2: the amount of smoothing applied to the readings for the graphs. Zero means no smoothing is applied.

Lifetime 24 hr: the length of time from the last brake test that the pass/fail lights will remain illuminated. Set to 0 to disable the pass/fail lights.

- **Save Changes:** save the changes made
- **Reset ALL:** revert to default values (shown above), then need to Save Changes too!
- **No changes:** revert to the previous values

Adjust Values Menu (Acceleration Testing Mode)

Use the built-in editor to adjust any of these values. The default values are shown

Test Number: the test reference number between 1 and 30000, it is automatically incremented after each test.

Peak over 0.20 sec: the minimum time the peak acceleration reading has to be sustained.

Target Time 30 sec: maximum time to reach target speed below. Measurements are curtailed 4 seconds later or when the target speed is reached if before.

to speed 30 kph (mph): target speed that must be reached in target time above.

Rise 3.0 deg/g: compensation for the rise of the vehicle (in degrees tilt per g of acceleration) caused by the movement of its suspension as it accelerates

Card Folder 0: the next SD memory card folder to be used (in range 0 to 999).

Filter type 2: the amount of smoothing applied to the readings for the graphs. Zero means no smoothing is applied.

Lifetime 24 hr: the length of time from the last acceleration/brake test that the pass/fail lights will remain illuminated. Set to 0 to disable the pass/fail lights.

- **Save Changes:** save the changes made.
- **Reset ALL:** revert to default values (shown above), then need to Save Changes too!
- **No changes:** revert to the previous values

Bluetooth is a factory enabled feature and may not be fitted to your instrument. When fitted, you will be able to enable it via the *Change Settings Menus*

BRAKESAFE *maintains two Bluetooth Device Lists of up to 8 Bluetooth devices identified by their Bluetooth Addresses and their Friendly Names*

Bluetooth Search: searches for local Bluetooth devices that are in the discoverable state. This takes about 30 seconds, but click at anytime to terminate. Results are shown as Friendly Names in the **Devices Found** table, see below. To be discovered, Bluetooth devices such as the printer or pedal pad must be switched on first.

Devices found: shows the results of the last search (if available) as Friendly Names. Click on a name to add it to the BlueTooth Device Lists at the location following that of the device currently paired as the printer (see **Warning** below) and set the instrument ready to pair with the new device as the printer. Alternatively, scroll to and click on ***Go back*** the end of the table to do nothing.

Warning:- this will overwrite the existing Bluetooth Device Address and Friendly Name at that location

Make Discoverable: allow the *BRAKESAFE* to be discovered by other Bluetooth devices. The passcode is 1234.

Printing pair: *single-click* on this to pair the printer functions with the following device.

Bluetooth Address: *single-click* to show the Bluetooth Device List as addresses; ▲▼ to highlight then *single-click* to select or *double-click* to edit (see *Editing*). The instrument will automatically try to pair with the chosen device before printing.

Friendly Name: *single-click* to show the Bluetooth Device List as friendly names; ▲▼ to highlight then *single-click* to select or *double-click* to edit (see *Editing*). The instrument will automatically try to pair with the chosen device before printing.

Brake Testing pair: *single-click* on this to pair the pedal pad functions with the following device.

Bluetooth Address: *single-click* to show the Bluetooth Device List as addresses; ▲▼ to highlight then *single-click* to select or *double-click* to edit (see *Editing*). The instrument will automatically try to pair with the chosen device before brake testing.

Friendly Name: *single-click* to show the Bluetooth Device List as friendly names; ▲▼ to highlight then *single-click* to select or *double-click* to edit (see *Editing*). The instrument will automatically try to pair with the chosen device before brake testing.

Go Back: go back to ***Setup Instrument*** Menu

Note if you are experiencing problems with the Bluetooth try using the Configure Printer option in the Setup Instrument Menu to reset it to its factory defaults.

Change Settings Menu

Highlight the item and single-click to change its state. The default states are shown Note some items will only appear conditionally depending on the state of other items.

Bluetooth   **No**
> YES to switch on Bluetooth
> NO to switch off

Built-in print Yes
> YES to use internal printer
> NO to use Bluetooth printer

Swap BT port   **No**
> NO is normal setting
> YES for special versions

I/O expansion   **No**
> YES for input/output expansion
> NO for no expansion

Accel. Testing   **No**
> YES for acceleration testing
> NO for brake testing

Trailer Tests   **No**
> YES to enable trailer testing
> NO to disable

HGV Trailer   **No**
> YES to estimate trailer brake efficiency
> NO to disable

Auto-alignment   **Yes**
> YES to auto-align with direction of travel
> NO for manual alignment

Metric Units   **Yes**
> YES for results in metric units
> NO for imperial units

metre/sec/sec   **No**
> YES for results in metres/sec/sec
> NO for %g or g

Results in %g   **Yes**
> YES for results in units of %g
> NO for units of g

External trig   **Yes**
> YES to start at external trigger
> NO to self-start at deceleration

Delay in Mean   **No**
> YES to include the brake delay in the mean calculation
> NO to exclude (gives higher readings)

Only show MFDD   No
> YES to show MFDD results only
> NO to show MEAN, PEAK, MFDD

MFDD markers   **Yes**
> YES to mark 80% and 10%V on graphs
> NO for no MFDD markers

Calc. Distance   **Yes**
> YES to calculate distance
> NO do not calculated

Slope at stop   **No**
> YES use gradient at stop as reference
> NO use gradient at arming

Pedal Force   **No**
> YES to use pedal force transducer
> NO don't use

Sampling Rate   **NRML**
> NRML=40 samples/sec
> FAST=400 samples/sec

Beeper   **ON**
> ON means beeper is on

Speedo Beep   **ON**
> ON means Speedo Beep is on at 10, 20, 30, and 40 kph/mph

Screen light   **ON**
> ON means screen light is on

PIN for edit   **No**
> YES means PIN number required for changing setup

PIN to use   **No**
> YES means PIN number required to use instrument

Mark for print   **Yes**
> YES to mark all tests for print selection

Print graphs   **Yes**
> YES to print graphs
> NO don't print graphs

Overlay graphs   Yes
>   YES to print graphs overlaid
>   NO print separate graphs

Print settings   Yes
>   YES to print test settings with results
>   NO don't print settings

- **Save Changes:** save the changes made

- **Reset ALL:** revert to default values (shown above), need to Save Changes too!

- **No changes:** revert to the previous values.

NOTES ABOUT SETTINGS

- Inserting a DIN connector with a Pedal Pad or Hand Switch attached will override the Bluetooth settings for brake testing and the instrument will not attempt to pair with a Bluetooth Device when arming for a test. Similarly, it will not make itself discoverable if a DIN USB lead is inserted.

- If you select *Slope at Stop* the instrument will measure the reference ground slope at the end of the test. Use the pause at end feature allows you to release the vehicle's suspension before taking the slope measurement. If you don't use the pause, the slope measurement is made after the End Delay time. The default value is 2.5 seconds but may be increased up to 6 seconds from the stop (to allow time for the suspension to stop bouncing). The end slope measurement is made just after the Blue arming light goes out. Only move off when the pass/fail light appears.

- Note that if *Slope at Stop* is selected, the instrument continues recording during the *End Delay* time. Otherwise it just records for about 1.5 seconds after the stop.

- If *Pedal Force* is selected and *Input/Output Expansion* is off the pedal force is measured via a transducer connected to the analog input on the DIN connector. If I/O Expansion is on the pedal force is measured digitally either via the RS232 port on the DIN connector or wirelessly via Bluetooth. Note that inserting a DIN connector will override the Bluetooth settings and force the RS232 port to be used if *I/O Expansion* is ON, or the analog port if *I/O Expansion* is OFF.

- References to Bluetooth appear only if the instrument so fitted. If the Built-in print is off and Bluetooth is off or not fitted, the instrument will attempt to print via a RS232 port on the DIN connector. The printer must use XON/XOFF protocol.

- *Swap BT Port* does not appear when *Built-in print* is chosen even if Bluetooth is fitted. If the built in printer is not fitted (eg *micro*BrakeSafe), *Swap BT Port* should normally be set to NO for the *micro*Brakesafe.

- Besides the conventional Mean (between the start and stop thresholds) and Peak values of brake effort or deceleration the instrument also measures the Mean Fully Developed Deceleration (MFDD). This is defined as the mean deceleration between 80% and 10% of the test speed and is now used internationally as the standard measure of brake performance. When *MFDD markers* is on, marker lines are placed on the graphs at the 80% V and 10% V

points. These are in addition to the graph marker lines at the start and stop deceleration thresholds and the external trigger point.

- *Swap BT Port* must always be set to NO on Brakesafe.

- **HGV trailer** option is only available if **Trailer Tests** are enabled.

- If **HGV trailer** is YES, the trailer brake efficiency appears prominently at the start of the results printout, followed by the results and settings for the tractor/trailer combination.

- If *Only show MFDD* is YES, the PASS and FAIL warning lights are based on the MFDD reading; if NO, the PASS and FAIL lights are based on the MEAN deceleration between the start and stop thresholds. Similarly if *Only show MFDD* is YES, the MFDD (rather than the MEAN) is shown on the *accept results* and *review results* screens.

- The *brake delay time* and the start and stop transitions, generally speaking, have no effect on the MFDD reading which is the mean deceleration between 80% of the speed at braking and 10% of the speed at braking. If *Only show MFDD* is YES, the *brake delay time* is still the time between the pedal actuation and the start threshold

- If *Only show MFDD* is YES, the MEAN and PEAK readings are excluded from the detailed *more results* screen and from the printout.

- If *Only show MFDD* and **HGV trailer** are both YES, the calculated trailer brake efficiency (as a MFDD) is used to trigger the PASS and FAIL warning lights. In addition, the trailer brake efficiency is shown (instead of the combo MFDD) on the *accept results* and *review results* screens.

Turnkey ID Exporter Program

The **Turnkey ID** program allows plant details, site conditions, operator names and other information to be downloaded to the instrument from a Windows personal computer. The executable program *IDexporter.exe* (supplied on the CD or available from the Turnkey website) should be copied to a convenient directory on your computer. Backup files of the plant names you use etc., will also be created in that directory.

If your PC is equipped with a **Turnkey Bluetooth Adaptor**, the instrument will be discovered by it and a wireless connection made whenever it is switched on and discoverable (e.g. in the *Start Menu* and *Main Menu*).

Alternatively, use a **Turnkey USB Link** to physically connect the instrument's DIN connector to a USB port on your computer. The instrument will sense the DIN connector and override the Bluetooth, if fitted.

Start the *IDexporte*r program and use the radio buttons to select the com port to which the Bluetooth Adaptor or USB link is attached.
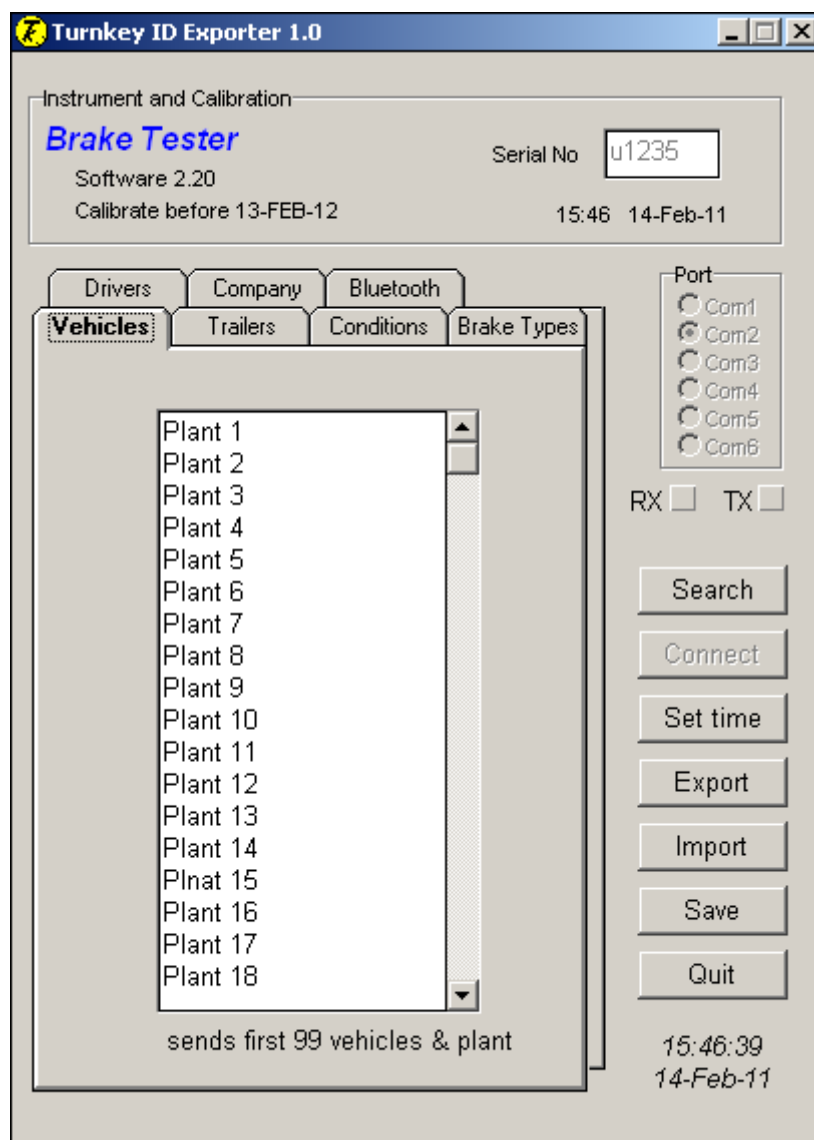
For Bluetooth, click on *Search* and the program will search for available Bluetooth devices and produce lists of available Friendly Names and Bluetooth Addresses. Click on the name of the instrument you wish to connect.

For a wired connection, click on **Connect** button.

If the instrument is switched on and in the *Start Menu or Main Menu*, it will connect automatically and upload its serial number, calibration due date and its local time. It will stay connected and switched-on as long as the program is running.

The information that may be exported to the instrument is shown on seven tabbed pages labelled *Company*, *Examiner*, and so on. Click on a tab to select a page. On the selected page, type in the names or information you wish to download. You are allowed 16 characters per line; the number of lines that will be sent is shown at the bottom of the page.

Click **Export** to download the selected page of information to the instrument. Click **Import** to upload existing information from the instrument. Click **Save** to save the page of information to your Windows directory for future use; for example, if you want to download the same plant list to several instruments. Note that each tabbed page must be exported (or imported) and saved in turn as required.

If you have several different groups of plant names, create copies of the program in different directories to suit.

Click **Set Time** to set the instrument to your PC's time and date.

NOTES

Turnkey® is a trademark registered with the EU, USA and WTO

brakesafe.eu

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Freepost Turnkey

APPENDIX – MOT Testing

The following instructions are reproduced for your convenience from the MOT Inspection Manual, Issue Date: Jan 2005. When in any doubt, always refer to the latest edition of this Manual.

Roads used for decelerometer brake testing

The requirement for a steady road speed during a brake test by decelerometer means that the vehicle must always be driven on a road which

- Has a good surface
- Is suitable for brake tests when wet or dry
- Has a minimum of traffic

A particular public road should not be used for tests so much that it would cause complaints from residents.

Testing transmission handbrakes

When using a decelerometer to test a transmission handbrake, keep the ratchet disengaged for as long as the brake is applied. Take the efficiency reading without the occurrence of transmission snatch or judder.

Vehicles which just pass

With some vehicles the required brake efficiency is just obtained or just exceeded, but the tester knows that a higher performance figure is normally obtained for the type of vehicle.
Although the vehicle has passed the brake performance test, the tester should advise the vehicle presenter that the braking system appears to need adjustment.

Method of Inspection Decelerometer Test

If the vehicle is of a type which cannot be tested on a roller brake tester,

- Set up the decelerometer in the vehicle in accordance with the equipment manufacturer's instructions
- Drive the vehicle on a level road at a steady speed of approximately 20 mph (32 kph) and note the brake efficiency recorded when applying only
  a. the service brake, minimum 50 %
  b. the parking brake, minimum 25 %
  c. while the vehicle is decelerating under the action of the service brake, note if the steering wheel tends to pull or the vehicle tends to swerve.

Reasons for Rejection

  a. the service brake efficiency recorded on the decelerometer does not meet the requirements specified in the Brake Efficiency Table
  b. the parking brake efficiency recorded on the decelerometer does not meet the requirements specified in the Brake Efficiency Table
  c. when the service brake is applied
  - there is severe grab or judder, or
  - there is severe pull one way on the steering wheel, and/or
    the vehicle swerves appreciably