



TECHNICAL GUIDE

Tachograph Explained: Driver Cards, Symbols, Rest Times

How tachographs work in trucks and buses: analogue, digital and smart types, driver and company cards, symbols, download rules and roadside checks.

At a roadside inspection point on the highway, the officer stops a tractor unit and asks the driver for the driver card before asking for the driving license. The card is removed from the tachograph slot, and the device's screen opens the driving and rest record of the last few days. Even if the driver has spent hours behind the wheel, the inspection is over in a few minutes when the records are in order; if there are gaps in the records, a card mismatch, or seal damage, the vehicle can be held at the roadside for hours, or even taken out of service. This guide covers, from a field perspective, what a tachograph does in heavy commercial vehicles, the device types, the card system, the display symbols, the data download obligation, and what inspectors check.

This document was prepared by the VADEN technical team for heavy commercial vehicle tachograph systems. The information here is a general reference; for device-specific technical data, the current OE service manual matching the vehicle's engine and chassis code applies, and for regulatory compliance, the AETR agreement in force and the relevant European Union regulation family apply. Last updated: September 2026.

What Is a Tachograph? Purpose and Working Principle

Tachograph is the legal recording device in heavy commercial vehicles that automatically logs the driver's driving time, speed, distance covered, and rest periods, and that operates with a driver card and a company card. Tachograph records make driving history verifiable for tractor units, trucks, and buses; they are used by inspection authorities and in fleet management for driving safety and regulatory compliance.

The core task of the tachograph is to record three pieces of data simultaneously and in a tamper-proof way: the vehicle's speed, the distance covered, and the driver's activity status at that moment. Activity status falls into one of four modes — driving, other work, availability (standby), and rest/break. The driver switches manually between modes on the tachograph; when the vehicle moves, the device automatically activates driving mode.

What Are the Main Components of a Tachograph?

- **Vehicle unit:** This is the tachograph itself; it sits in the instrument panel or console, processes the signal from the speed sensor, and writes data to its own memory and to the inserted card(s).
- **Speed sensor:** A unit connected to the transmission output or wheel hub that converts rotational movement into an electronic signal; it is paired with the vehicle unit through encryption.
- **Card readers:** The slots where the driver card and, if present, the second driver's card are inserted; if a card is not recognized, the device switches to anonymous recording mode.
- **GNSS antenna (in smart tachographs):** A satellite receiver that determines the vehicle's position at set intervals.
- **Printer (if fitted):** A unit that allows a driving summary to be printed on paper when requested during an inspection; it may not be present on every model.

Why Is a Tachograph Mandatory in Heavy Commercial Vehicles?

Tachograph use in heavy commercial vehicles is governed, for international transport, by the AETR agreement (the European Agreement concerning the Work of Crews of Vehicles Engaged in International Road Transport) and by the European Union's regulation family covering driving and rest time rules and tachograph devices. In Turkey, road transport regulations also impose an obligation to carry and use a tachograph for vehicles above certain weight and passenger capacity thresholds. Which category a vehicle falls into and which regulation applies depends on the type of transport (domestic or international) and the vehicle's registration class; the current regulation in force should be applied in practice.

Physical or electronic tampering with tachograph records (disrupting the signal with a magnet, using a GPS/GNSS signal jammer, sharing a card, breaking a seal) carries a far more serious consequence than simply concealing a driving-time violation; in many countries, an administrative fine is accompanied by the vehicle being taken out of service and a criminal investigation. A vehicle with a broken or damaged tachograph seal is treated as defective at inspection until the seal is renewed and the device is recalibrated.

What Is the Difference Between Analog, Digital, and Smart Tachographs?

An analog tachograph records driving data by tracing it with a stylus onto a one-day paper disc (tachograph disc); the disc is replaced every 24 hours and kept physically by the driver. In an analog system, the data stays on paper, cannot be downloaded electronically, and the disc itself is presented at inspection. It may still be in use on older-generation vehicles, but production has been discontinued for newly type-approved vehicles.

A digital tachograph moves the recording medium from paper disc to electronic memory. Data is written simultaneously to the vehicle unit's own memory and to the chip of the inserted driver card, removing the need to change a disc. In a digital tachograph, records are protected with a digital signature and can only be downloaded with authorized readers; this significantly increases record integrity compared with an analog disc.

The smart tachograph adds satellite positioning (GNSS) and short-range wireless communication capability on top of the digital tachograph. It automatically records the vehicle's position at set intervals and allows inspection teams to access basic data from the roadside over a short range without stopping the vehicle. Smart tachograph use in newly type-approved heavy commercial vehicles has become mandatory in stages in the European market; which generation applies to which vehicle depends on the vehicle's first registration date.

What Do the Driver Card and Company Card Do?

The tachograph system works with four different card types, and each card represents a different authorization:

- **Driver card:** Assigned personally to the driver, it stores identity information and the driving/rest history of recent days. When no card is inserted, the tachograph records the driver's activity anonymously; this is separately queried during inspection.
- **Company card:** Belongs to the transport company and allows downloading data from company vehicles and locking/unlocking the downloaded records on the company's behalf. The company card is not used for driving, only for data access and management.
- **Workshop (service) card:** Assigned to authorized calibration workshops; tachograph calibration, parameter entry, and sealing can only be performed with this card.
- **Control (inspection) card:** Belongs to officials carrying out roadside and company inspections; it is used to read, download, and view data from the vehicle unit and the driver card.

A renewal application must be filed before the driver card's validity period expires, within the period the regulations require; driving with an expired card or with no card at all is not accepted. Under the limited-duration exception that applies only when the card is lost, stolen, damaged or malfunctioning, a printout must be taken from the tachograph at the start and at the end of the drive and signed by the driver; for the exact periods and conditions, the regulation in force applies. On long routes, marking the card's expiry date on the calendar prevents running into a card-renewal requirement mid-route.

What Do Tachograph Display Symbols and Warning Lights Mean?

The tachograph screen and display panel show driver activity modes and system status through standard symbols. Driving mode is generally represented by a steering wheel or vehicle symbol, rest/break by a bed symbol, availability by a horizontal rectangle symbol, and other work by two crossed hammers. The driver is required to select the relevant symbol manually on the tachograph at the start of a shift and whenever the mode changes; when the vehicle moves, the system activates the driving symbol on its own.

Alongside the symbols, the device reports the result of its self-monitoring through warning icons. The table below summarizes the tachograph warnings commonly encountered in the field, their likely causes, and the check that should be carried out.

Tachograph warning symbols and their likely causes

Warning / symptom	Likely cause	Check / verification
Card warning (card symbol flashing)	Driver card not inserted, inserted backwards, or the card chip is damaged	Check that the card is inserted the right way round and fully seated; clean the card chip and test it in a different reader
Power interruption warning	The electrical supply to the tachograph has been cut or tampered with	Check the fuse and supply line; if repeated interruption events are logged, report it to an authorized workshop
Speed sensor warning	Sensor signal interrupted, sensor cable damaged, or the sensor-to-vehicle-unit pairing is broken	Check the sensor connection and wiring harness; pairing issues can only be resolved by an authorized workshop

Warning / symptom	Likely cause	Check / verification
Motion detection warning (movement without a card)	The vehicle has moved without the driver card inserted	Make sure the card is inserted at the start of the shift; if this recurs, the card reader may be faulty
Seal / security warning	The tachograph seal is broken or the device has been tampered with	Take the vehicle to an authorized workshop immediately; driving should not continue with an unsealed device
Memory full / data download warning	The vehicle unit's memory is approaching the legal retention period	Plan a data download with the company card; undownloaded old records may be overwritten

Power interruption and seal warnings point more toward possible tampering with the device than toward driver error, and they are separately queried during inspection. As soon as a warning appears on screen, it should not be left to be resolved on its own; it should be logged and reported to an authorized workshop as soon as possible.

Standards and further reading

For the regulatory background on this subject, see [Regulation \(EU\) No 165/2014 \(tachographs\)](#). Always confirm specific figures and procedures against the current regulation and the vehicle manufacturer service data.

How Are Driving and Rest Periods Recorded?

The tachograph continuously records the driver's activity across the four modes described above, and the record is written simultaneously to both the driver card and the vehicle unit's memory. Driving time is the time the vehicle spends in motion; break and rest periods cover the time the driver actually stays away from the wheel, set aside for rest. Taking a break after a defined continuous driving period, and observing daily and weekly rest periods over consecutive driving days, are set out as a general rule in the AETR agreement and the European Union's driving and rest time regulation; since exact durations and exception rules can vary by type of transport, the current regulation in force should be applied.

The tachograph does not prevent time violations on its own; it only records them and warns the driver with the remaining time shown on screen. The final assessment of whether a violation has occurred rests with the inspection authority or the company's compliance officer. In fleet operations, regularly analyzing tachograph records makes it possible to spot a violation trend before it is fed back to the driver.

When Should Tachograph Data Be Downloaded? Data Download Obligation

Downloading tachograph data at regular intervals is both a legal obligation and a maintenance practice that prevents record loss. The commonly accepted approach in European practice is to

download driver card data within a set number of days (a common reference is around 28 days) and vehicle unit (mass memory) data over a longer interval (a common reference is around 90 days). These intervals can vary according to the regulation in force and the type of transport; the current regulation should be applied for the exact interval a company must follow.

If the memory fills up before data is downloaded, new records risk being written over old ones; in that case, historical data requested during an inspection cannot be produced. The download performed with the company card is carried out separately for the vehicle unit and the driver card, and the downloaded data is retained in a secure environment defined by the company for the period required by regulation.

Checking the last data download date for both the driver card and the vehicle unit before setting out on a long route prevents running into a memory-full warning mid-route. In fleet management, tying data downloads to a calendar gives a far more reliable result than tracking vehicles one by one.

How Is Tachograph Data Downloaded? Step by Step

- 1 Stop the vehicle on safe, level ground, keep the ignition on, and make sure the tachograph is in working condition.
- 2 Insert the company card into the appropriate tachograph card slot. Wait until the card is recognized; the company name or card information should appear on screen.
- 3 Select "data download" or the equivalent function from the device menu; on many models, this step requires connecting an external USB memory stick or download device.
- 4 Select the scope of data to download: the vehicle unit memory, the inserted driver card, or both.
- 5 Start the download and do not remove the card or the USB memory until it is complete; if the process is interrupted midway, data integrity may be compromised.
- 6 When the download finishes, check the confirmation notice on screen or on the connected device; if a failed-download message appears, repeat the process.
- 7 Transfer the downloaded file into the company's data management system, matched to the date and the vehicle's license plate.
- 8 If the driver card also needs to be downloaded, repeat the same steps for the driver card; vehicle unit data and driver card data are saved as separate files.
- 9 Before removing the company card, make sure the download is complete and that the card's lock/unlock status is set correctly.
- 10 Archive the downloaded data in an unalterable form for the period required by regulation, and keep it accessible so it can be presented to the inspection authority when needed.

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If analysis software is in use, review the downloaded data for time violations, missing records, or card mismatches, and discuss any deviation with the relevant driver.

Things to Watch Out For (Common Mistakes)

- **Driving without a card:** Driving done without the driver card inserted is recorded anonymously and requires an explanation at inspection; even simple forgetfulness can be assessed as a violation.
- **Not switching modes manually:** Failing to manually set the mode to "other work" or "availability" for non-driving activities (loading, waiting, maintenance) causes that time to be automatically recorded as driving time.
- **Delaying data downloads:** When the set interval is exceeded, the memory fills up and old records get overwritten, causing historical data to be lost irretrievably.
- **Sharing a card:** Using a driver card that belongs to another driver both compromises record integrity and is a violation that carries a severe penalty at inspection.
- **Ignoring seal damage:** Continuing to drive with a broken or damaged seal makes the validity of the records questionable, even if the device is technically still working.
- **Using a signal jammer or magnetic interference:** Any interference aimed at disrupting the speed sensor signal is treated as an aggravating factor in accident liability and criminal proceedings.
- **Setting the tachograph clock incorrectly:** Failing to update the clock during time-zone changes or daylight-saving transitions creates a mismatch between the records and actual time, and requires an explanation at inspection.

What Is Checked on the Tachograph During Inspection?

At a roadside inspection, the officer first checks that the driver card matches the vehicle and the driver, then checks the current activity status on the tachograph screen. Using the control card, data covering a defined past period is downloaded from the vehicle unit and the driver card to examine whether there is a driving-rest time violation, a card mismatch, or a gap in the records. The soundness of the seals, the legibility of the calibration plate on the device, and whether the information on the plate matches the vehicle data are also a standard part of the inspection.

The scope is broader in a company inspection: the company's data download and archiving arrangements, the consistency between driver work schedules and tachograph records, and the card management processes are examined. On vehicles suspected of tampering, the speed sensor signal, GNSS data (on a smart tachograph), and the vehicle unit's event log are cross-checked to look for signs of interference.

In these same inspections, vehicles carrying dangerous goods are asked for a separate set of documents and equipment alongside the tachograph records; that framework is set out in the [ADR rules](#) guide.

Violations found during a tachograph inspection can hold not only the driver but also the company owner liable; in many countries, a company's failure to supervise driver work arrangements is a separate administrative sanction matter. Checking card validity, seal integrity, and an up-to-date data download before an inspection significantly reduces the time lost at the roadside.

Tachograph Technical Values and Check Points (General Reference)

The table below summarizes, as a general reference, the main values most often checked in the field for the tachograph system. Exact values vary by device model, vehicle type, and the regulation in force; the vehicle's OE service manual and the current regulation should be applied in practice.

Tachograph system check points (general reference)

Check point	General reference	What a deviation indicates
Calibration interval	General reference: every few years (OE / regulation governs)	If the interval is exceeded, the device may be treated as defective at inspection
Driver card validity period	On the order of years, printed on the card	If expired, the card is invalid and must be renewed
Driver card data download interval	Common reference: around 28 days (varies by regulation)	If exceeded, memory can fill up and the risk of data loss increases
Vehicle unit data download interval	Common reference: around 90 days (varies by regulation)	If exceeded, old records may be overwritten
Vehicle unit memory retention period	On the order of at least one year (varies by device type)	A short retention period leads to a data gap in retrospective inspection
Number and location of seals	Varies by vehicle and sensor connection point	Missing or damaged seal: suspected unauthorized tampering
Speed sensor signal (w-value)	Written on the calibration plate, specific to the vehicle	A value that does not match the plate: pairing or sensor fault

What Is Tachograph Maintenance and the Calibration Interval?

The most important factor determining a tachograph's reliability is periodic calibration. Calibration ensures that the speed and distance data the device records stays consistent with the vehicle's actual wheel revolution; calibration must be renewed after a tire size change, an axle ratio change, or a speed sensor replacement. Calibration can only be carried out at services holding an authorized workshop card, and the device is resealed once the process is complete.

Seal integrity is as important as calibration; a broken seal is the only concrete evidence of whether the device has been opened since the last authorized intervention. During electrical and chassis work on the vehicle, not disturbing tachograph-sealed points (the speed sensor connector, the vehicle unit housing) avoids an unnecessary repeat calibration.

Software updates are also part of maintenance; the manufacturer periodically updates the vehicle unit software to keep pace with regulatory changes. In fleet operations, keeping the tachograph clock accurate, the screen legible, and the printer function (if fitted) working are practical checks that should be added to the periodic maintenance list.

Where Does the Tachograph Stand in a Heavy Commercial Vehicle's Compliance and Safety Chain?

The tachograph operates independently of the vehicle's mechanical systems, but in terms of fleet safety it is a layer as critical as the brake, engine, and load systems: it keeps a visible record of driver fatigue, excessive driving time, and work patterns that run against regulation. VADEN ORIGINAL has prepared this guide as part of its technical knowledge library so that heavy commercial vehicle operators and service teams understand the tachograph system correctly and build card management and data download discipline into their operating routine. The VADEN technical guide library also includes separate fault, replacement, and maintenance guides for the air brake system, ABS/EBS, and engine and transmission components; tachograph records can also be regarded as a complementary source of information for making sense of how intensively those mechanical systems are used and of driving patterns.

This document is for information only; in practice the vehicle manufacturer's current service manual and safety instructions apply. Values are general references for common heavy-duty systems; use the relevant OE service document for model-specific figures. © VADEN Otomotiv San. Tic. A.Ş. · vadenoriginal.com