

# In-Vehicle Monitoring Systems (IVMS) and Data Analytics SOP

## Road Safety Related SOP

---

Author	Sameh Eisa
Owner	Sameh Eisa
Approver	Paulo Conceicao
Organization	PS&S Health & Safety Central Team
Document type	Internal
Document version	Version 1.0
Document ID	44ISPA3ISPS4-1013285096-210009
Document location	PS&S SharePoint

---

# Contents

1.	Introduction .....	3
2.	Key Definitions and Acronyms.....	4
3.	Road Safety Standard.....	5
4.	In-Vehicle Monitoring Systems.....	6
5.	IVMS / Data Analytics Technical Requirements.....	8
6.	Data Collection and Access.....	11
6.	Change history.....	13

# 1. Introduction

Nokia always works to ensure its operations are carried out safely. To achieve this goal, Nokia is continually exploring new ways to improve the Health and Safety of its employees and partners.

Nokia's statistics, show that Road Traffic Incidents are a major contributor to Fatal, Critical and Hi-Potential Incidents. Road related incidents come second after Working at Height related activities in terms of incidents. The use of 'In-Vehicle Monitoring Systems' (IVMS) or 'Telematics' are essential tools for improving driver behaviour and safety on the roads in addition to improving organizational awareness for addressing factors such as fatigue and extended working hours at times when personnel should be resting.

The purpose of this document is to describe the minimum requirements that should be applied when implementing IVMS and it addresses concerns regarding how the data from Telematics Service Providers (TSPs) should be used to reduce the risk associated with road safety.

## 2. Key Definitions and Acronyms

- **ABCS** - Acceleration, Braking, Cornering and Speeding.
- **Data Analytics Provider** - Is the data analytics service provider that help Nokia collecting, see and understand the IVMS data.
- **In Vehicle Monitoring System** - An electronic device installed in a vehicle to monitor driver activities which helps identify behaviours such as speed, harsh braking, rapid acceleration, deceleration, driver fatigue and driver attentiveness. IVMS also monitors the vehicle location and the vehicle idle and fuel consumption.
- **Portable IVMS system** – An electronic device that provides most of the functionality of a fixed IVMS system but has the added benefits of being easily installed, used, and subsequently removed in cases where vehicles might be used for short periods (i.e., for short-term leases or vehicles which are regularly swapped between taskings). These devices report their removal from a vehicle and therefore misuse can be detected. They may also include items such as dashboard-mounted cameras.
- **Project Vehicle** - A leased or owned vehicle that is used for the sole purpose of project-related transportation. This is not an employee benefit car.
- **Telematics Service Provider** – Companies which offer services to fleet operators enabling them to monitor their vehicles and drivers. The TSPs use telecommunication devices in conjunction with GPS and cellular networks to send, receive and store information related to driver and vehicle behaviour.

## 3. Road Safety Standard

Global Standard and the Guidance documents are to be consulted for any further information beyond the scope of this document:

- [Road Safety Standard.](#)
- [Road Safety Guidance.](#)
- [Journey Management Guide.](#)
- [Drive Test Procedure \(Automatic field performance validation\).](#)
- [Consequence Management Standard.](#)

## 4. In-Vehicle Monitoring Systems

- Nokia requires suppliers to have an operational IVMS system affixed to their vehicles while working on Nokia operations. Vehicles include supplier vehicles whether owned or leased for project-related purposes. When selecting the appropriate system to use, it must be legally approved for use in the specific country.
- Where IVMS systems have been installed, the system must be able to record and provide data for, at a minimum, the following parameters:
  - Real-time GPS location of the vehicle.
  - Prior GPS locations of the vehicle (At least six months record keeping), allowing for the journey and routing to be recorded including speed, harsh braking, rapid acceleration, driver fatigue, driver attentiveness, vehicle idle and fuel consumption.
  - Fitted in such a way that it cannot be easily removed from the vehicle or disabled.
  - Provide data that can be uploaded to give visibility of a continuous history of the vehicle's use and driver behaviour.
  - Allow all relevant data, to be extracted (preferably remotely) and held securely.
  - All suppliers must on request, make any monitoring data available to Nokia as per contractual agreement. This information is used for achieving a safer work environment through setting a threshold for various parameters that are widely accepted. Foremost among these are preserving the lives and wellbeing of persons.
  - Manipulating or erasing data is prohibited due to the fact that it jeopardizes the safety of persons involved in Nokia's operations and could ultimately lead to death or serious injury. Instances of data manipulation or deletions will lead to Nokia standard consequence management, up to and including terminating the supplier relationship.
- To meet the appropriate usage of the Vehicle Tracking System, the following process must be implemented:
  - The parameters that are measured are clearly defined.
  - Its presence and use are made clear to all the users via an in-vehicle Privacy Notice.
  - Users are required to provide their consent, if they don't wish to provide consent then they will not be allowed to use vehicles on Nokia operations.
  - Regular reporting of data is established against set parameters, and the data is used proactively to monitor and enforce positive driver behavior.
  - A process of review and management is implemented to ensure that where driver behavior is not compliant, action is taken to address the situation. Preferably this should be done through positive re-education of the driver

with the expectation of positive change thereafter. If this fails to achieve the necessary improvement, then the disciplinary process route shall be implemented.

- Nokia requires that the Telemetry Service Provider (TSP) system is able to provide the following fields (The system can provide these Actions/Reports):
  - Detailed trip Report.
  - Detailed speed Report.
  - Detailed events Report.
  - All vehicles selection on system.
  - CSV or useable Excel exports.

## 5. IVMS / Data Analytics Technical Requirements

- The aim of the IVMS solution is to set a standard for compliance regarding the management of on-road risk in vehicles, aligned with the Nokia Standards and the governing road legislation. The fundamentals can be referred to as the ABC (Acceleration, Braking and Cornering) of on-road risk management based on g-force, km/h/s, k m/s<sup>2</sup> or m/s<sup>2</sup> values, GPS (Global Positioning System) or OBDII (On-board diagnostics) speeds and other measurable **risk factors**.
- As an example, the following values align the different measurements for standardization in MEA:

km/h/s	km/s <sup>2</sup>	m/s <sup>2</sup>	g-force
5	0.001389	1.388889	0.141627
6	0.001667	1.666667	0.169953
7	0.001944	1.944444	0.198278
8	0.002222	2.222222	0.226604
9	0.002500	2.500000	0.254929
10	0.002778	2.777778	0.283255
11	0.003056	3.055556	0.311580
12	0.003333	3.333333	0.339905

### ABCS – Acceleration

- The acceleration calculation is in G-force, km/h. s, k m/s<sup>2</sup> or m/s<sup>2</sup> value set on the telemetry hardware. Should the unit experience specified values during acceleration, the system should trigger an ‘above unit acceleration threshold limit’ and log the value that is detected within the device.
- For example, these average values per vehicle type for acceleration calculation is used in MEA:

km/h/s	km/s <sup>2</sup>	m/s <sup>2</sup>	g-force	Acceleration
6	0.001667	1.666667	0.169953	C, EC & EC1
7	0.001944	1.944444	0.198278	EB & C1
8	0.002222	2.222222	0.226604	B

- For each event, an x-amount of percentage is deducted per 100 km travelled, which means the further a driver travels without incident the better their score will become.



## ABCS – Braking (aka Deceleration)

- The deceleration calculation is a G-force, km/h/s, km/s<sup>2</sup> or m/s<sup>2</sup> value set on the telemetry hardware.
- Should the unit experience specified values during deceleration, the system should trigger an ‘above unit deceleration threshold limit’ and log the value that is detected within the device.
- For example, these average values per vehicle type for deceleration calculation is used in MEA:

km/h/s	km/s <sup>2</sup>	m/s <sup>2</sup>	g-force	Braking
7	0.001944	1.944444	0.198278	-
8	0.002222	2.222222	0.226604	C, EC & EC1
9	0.002500	2.500000	0.254929	EB & C1
10	0.002778	2.777778	0.283255	B

For each event, an x-amount of percentage is deducted per 100 km travelled, which means the further a driver travels without incident the better the drivers score will become.

## ABCS – Cornering (aka Turning, Swerving)

- The excessive cornering calculation is a G-force value set on the telemetry hardware. Should the unit experience specified values during cornering, the system should trigger an ‘above unit cornering threshold limit’ and log the value as experienced on the device.
- For example, these average values per vehicle type for cornering calculation is used in MEA:

g-force	Cornering
0.4	C, EC & EC1
0.45	EB & C1
0.5	B

- For each event an x-amount of percentage is deducted per 100 km travelled which means the further a driver travels without incident the better the drivers score will become.

## ABCS – Speeding

- Speeding risk is determined by two measurements: road and maximum speed violations.

- Road overspeed violations are determined by referencing the GPS or OBDII speeds of a GPS position to the speed limit of the road.
- An example here from what is used in MEA - a filter of 5 km/h (3 mi/h) is applied to all limits to allow overtaking and a 10 second filter is applied to allow deceleration to the indicated speed after passing a speed limit sign board.

KM/H			MI/H		
Speed Limit	Allowed	Penalty Start	Speed Limit	Allowed	Penalty Start
60	65	66	30	33	34
80	85	85	50	53	54
100	105	106	60	63	64
120	125	126	70	73	74

- Max overspeed violations are determined by referencing the GPS or OBDII speeds to the maximum set allowed speed per vehicle type based on country restrictions per vehicle type.
- By default, a filter of 5 km/h (3 mi/h) is applied to all limits to allow overtaking and a 10 second filter is applied to allow deceleration to the indicated speed after passing a sign board.

## Fatigue Risk Measurement

Fatigue is measured in various ways and is dependent on local legislation, Nokia Standards, and transport types, namely:

- **Continuous Driving** – This is measured by looking at the duration of the trip itself and benchmarking it against safe limits. The default value is 120 minutes of driving with a tolerance of 15 minutes.
- **After Hours** – It is advised that drivers do not travel between 20:00 and 04:00 at night as this is statistically the most frequent time that drivers fall asleep behind the wheel. Rules governing After Hours driving and the distance for night driving should be contained in a countries localised Road Safety Standard considering Nokia Journey Management Guide. However, the overarching expectation is that the country/project Special Approval process must be followed. Nokia teams must do all they can to avoid After Hours and nighttime travelling.
- **Working Hours** – Total working hours for a driver must comply with the Nokia Road Safety Standard and the Journey Management Plan Guide. It should be noted that the Journey Management Plan (JMP) process is a useful aid in determining the total working hours for a driver taking into consideration what it is mandated by Nokia Road safety standard and subsequent localization in certain situations defined locally.

## Scorecard and Weighting

- All aforementioned risk factors and their events/duration are scored against the distance travelled, which means if a driver has an event he will be scored heavily, but the further the vehicle travels without incident the better the score will become.
- These events can then be weighed equally or can be customized through a consulting workshop.

## 6. Data Collection and Access

**Purpose:** In Vehicle Monitoring System (IVMS)/ GPS tracker data is collected to:

- Ensure legal compliance.
- Help prevent accidents and support driver safety.
- Identify instances of dangerous driving.
- Nokia will have access to IVMS data in an aggregated format and may request and access personal data of an individual driver where concerns about their driving have been identified.
- IVMS data may in exceptional circumstances be used for disciplinary investigation and hearing purposes and in such circumstances the employee and their representative will be given access to such material in accordance with normal disclosure protocols. Such exceptional circumstances will be determined on a case-by-case basis and will in any event not be prejudicial to the rights and freedoms of employees.
- Nokia will obtain prior written consent from Nokia employees when travelling in or driving cars leased by Nokia for project proposes that have IVMS implemented solutions fitted.

### Data Retention

- The collected data from various TSPs will be stored on Nokia SharePoint for future analysis. Data is retained for the purposes of ensuring:
  - Compliance with the Road Safety Standard.
  - Continuous improvement of Road Safety controls.
  - The compiling of Road Safety Key Performance Indicators.
- The data will be retained anonymously for 7 years and thereafter it will be deleted.
- In order to allow the Data Analytics Provider to manage and analyze data from various TSPs, a request for access to the TSPs dashboards is made. This enables the extraction of data and the subsequent application of the analytics regime.
- To enable this, the following information is required to be provided by field suppliers to the Data Analytics Provider:
  - Supplier Name:
  - Fleet List (Vehicle Information – Example Sheet):
  - URL:
  - Username:
  - Password:
- Data Privacy is paramount to Nokia and been examined closely in relation to the IVMS topic. For Nokia to ensure our position related to data access and to preserve our legal compliance to privacy requirements, the following has to be observed whenever an IVMS system is implemented:

- Suppliers will have their own contracts with TSPs and will seek consent from their employees, or via another legally compliant mechanism, to ensure compliance. Nokia will not be responsible for obtaining Supplier driver consent or information of the Supplier's employees.
- The Data Analytics Provider will ask for a written consent from Nokia suppliers upon their agreement to provide access credentials to the TSPs systems. No data shall be provided to the Data Analytics Provider without this written consent.
- The Nokia project H&S team will monitor supplier implementation process for usage of IVMS to ensure the active management of driver behavior.
- Nokia suppliers must respond within one working day to provide explanation of the data after request for information is made from Nokia regarding any breach to Road Safety performance indicators or an incident regarding Nighttime Movement, Fatigue, Braking, Cornering, Speeding, continuous driving, after hours.
- If an IVMS device is offline for any technical fault, the supplier must immediately inform the Nokia project H&S team and ensure necessary risk management.
- The connection between the TSPs which the suppliers have selected, and the data analytics provider will be assured by the supplier.

## Consequence Management

- Nokia Health, Safety & Child Labor Consequence Management is a standard for suppliers and Nokia Internal employees who do not meet Nokia's Health & Safety (H&S) and child labor related requirements.
- In case of breaches to Nokia Road Safety Standard and the related SOPs, Nokia will perform an investigation on the cases with the cooperation of Nokia internal teams and if required the supplier teams. Consequences will be defined in accordance with the Nokia [Consequence Management Standard](#).
- Nokia will only require personal information from a driver when disciplinary measurements must be applied as part of Nokia's duty of care.
- Recognition for positive safety behaviour can also be applicable through the consequence management committee by the issuance of green cards or any other way of recognition defined by Nokia local or global programs.

## 6. Change history

Ver	Status	Date	Author	Owner	Reviewed by	Reviewed date	Approver	Approval date	Description of changes
0.1	Draft	2023.04.14	Sameh Eisa	Sameh Eisa	Agata Morais – Alex Beart – Mohsin Zaki - Rodney Van Wyk	2023.04.14			IVMS and Data Analytics 1 <sup>st</sup> Draft.
0.2	Draft	2023.05.24	Sameh Eisa	Sameh Eisa	Agata Morais – Alex Beart – Mohsin Zaki - Rodney Van Wyk	2023.05.24			Modifications across the document.
0.3	Draft	2023.06.14	Sameh Eisa	Sameh Eisa	Agata Morais – Alex Beart – Mohsin Zaki - Rodney Van Wyk	2023.06.14			Minor modifications and clarifications.
0.4	Draft	2023.08.14	Sameh Eisa	Sameh Eisa	Joe Alessia	2023.08.14			Making changes following the legal review.
0.5	Draft	2023.09.27	Sameh Eisa	Sameh Eisa	Rosemary Ayomanor	2023.09.27			Making changes following the Privacy review.
0.6	Draft	2023.10.12	Sameh Eisa	Sameh Eisa	Agata Morais – Alex Beart – Mohsin Zaki - Rodney Van Wyk - Silvia Di Gia - Tayyaba Rehman	2023.10.12			Making minor changes.
0.7	Draft	2023.10.20	Sameh Eisa	Sameh Eisa	Rosemary Ayomanor	2023.09.27			Privacy review.
0.8	Draft	2023.11.17	Sameh Eisa	Sameh Eisa	Paulo Conceicao and	2023.11.17			Paulo Conceicao and Marcus

Ver	Status	Date	Author	Owner	Reviewed by	Reviewed date	Approver	Approval date	Description of changes
					Marcus Parry				Parry review notes
0.9	Draft	2023.11.24	Sameh Eisa	Sameh Eisa	Rosemary Ayomanor	2023.11.24			Legal and Privacy Review with few changes across the documents.
1	Approved	2023.11.27	Sameh Eisa	Sameh Eisa	Paulo Conceicao	2023.11.24	Paulo Conceicao	2023.11.24	First Issuance.