

The logo for GlobalLogic, featuring the company name in a white, sans-serif font with a registered trademark symbol (®) to the upper right of the 'c'. The logo is centered on a dark blue background that features a faint, repeating pattern of light blue icons, including a person, a gear, and a network diagram. In the background, a blurred office scene is visible with people working at computers.

# GlobalLogic®



# GlobalLogic<sup>®</sup>

## Automotive Diagnostics

Patryk Pankiewicz  
Consultant

The most important question.

How to make an ISO norm sound interesting?



Hahahaha

Source: <https://loveforquotes.com/i/google-facebook-mechanic-108410>



Meet our Speaker: [Patryk Pankiewicz](#)

He is an automotive software architect that really likes AUTOS&PI

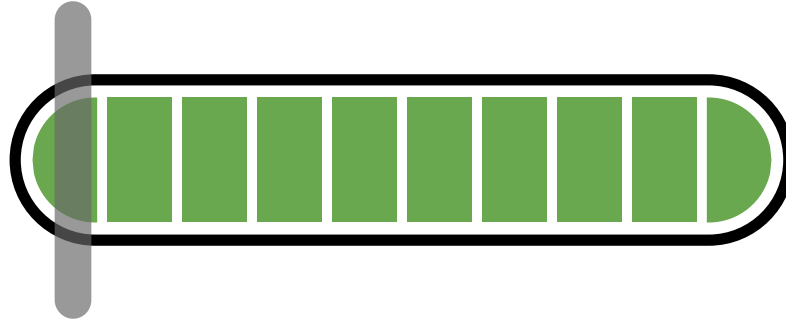


Source: GlobalLogic Krakow

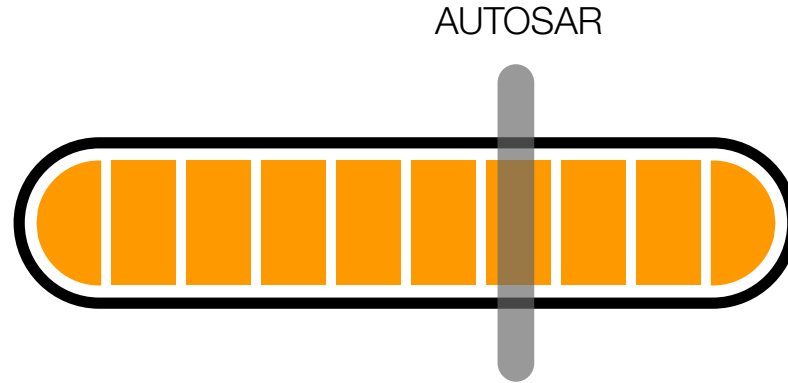


## Geek-o-meter

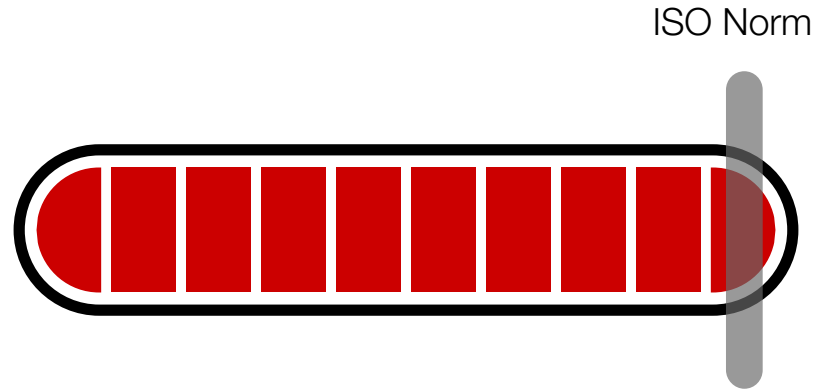
Funny Story



## Geek-o-meter

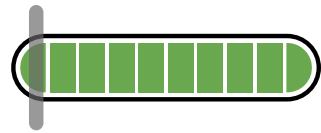


## Geek-o-meter

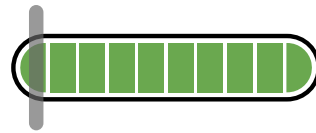




Cars' software is complicated.

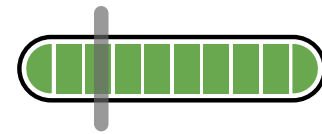
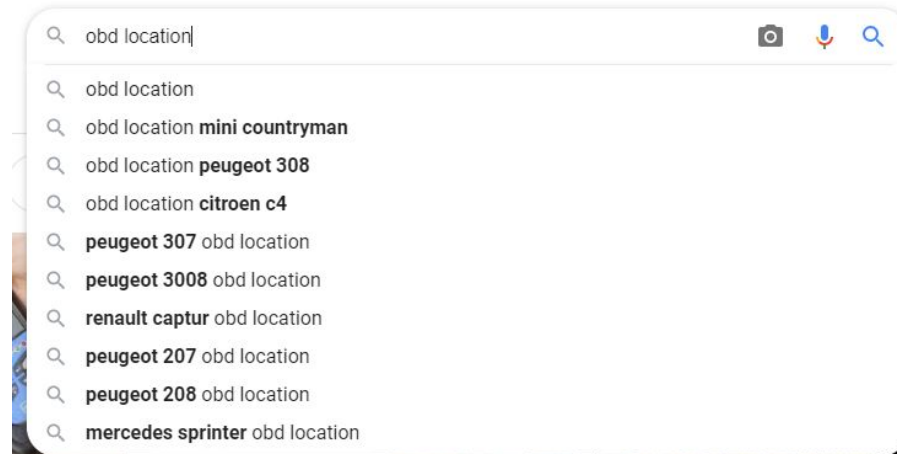


So, what “automotive diagnostics” actually means?

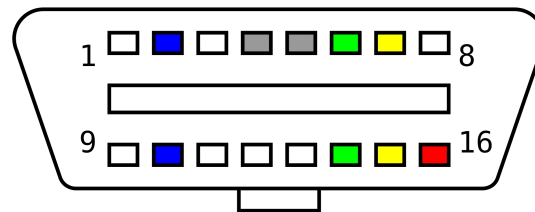


## OBD-II

Has to be within 60cm from the steering wheel.  
All currently produced cars have it.

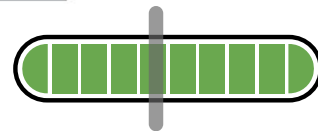


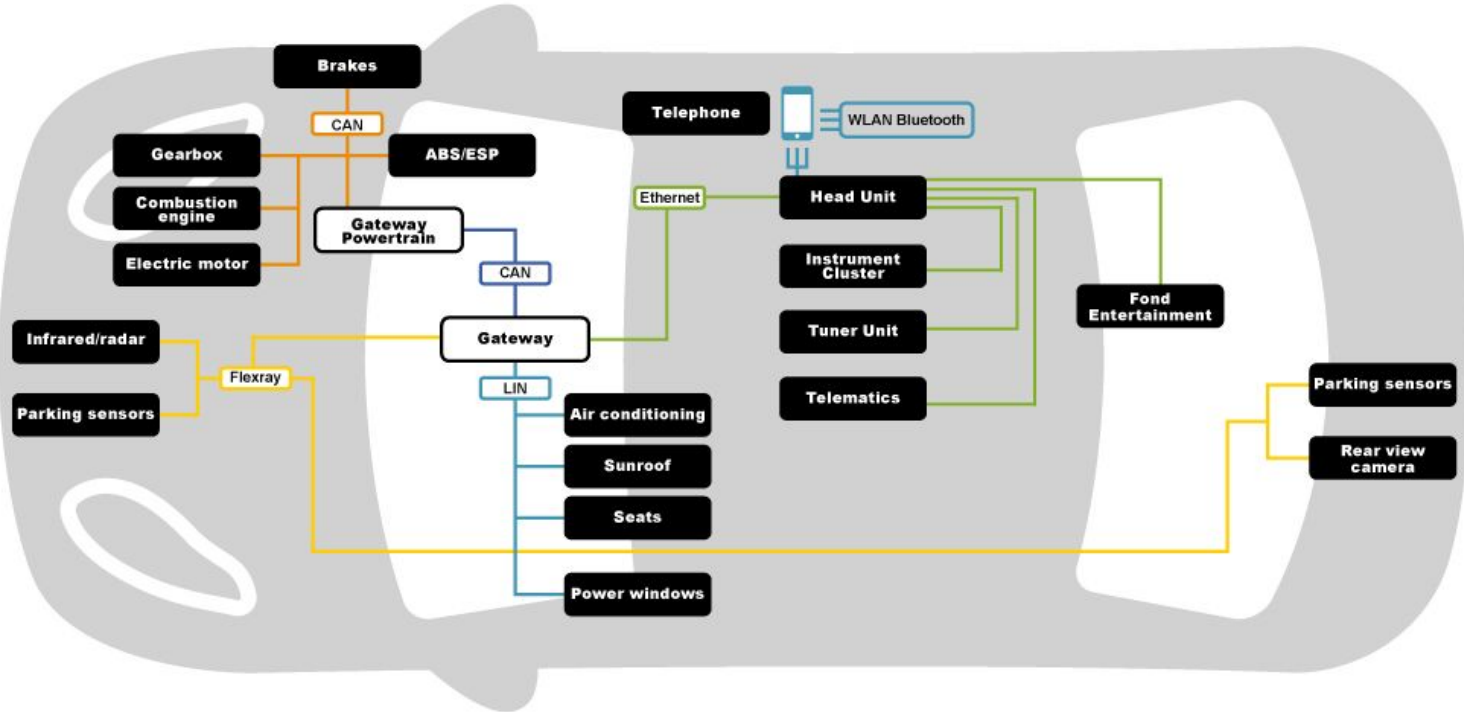
# OBD-II



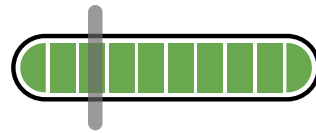
1	Manufacturer discretion. GM: J2411 GMLAN/SWC/Single-Wire CAN. VW/Audi: Switched +12 to tell a scan tool whether the ignition is on.	9	Manufacturer discretion. GM: 8192 baud ALDL where fitted. BMW: RPM signal.
2	Bus positive Line of SAE J1850 PWM and VPW	10	Bus negative Line of SAE J1850 PWM only (not SAE 1850 VPW)
3	Manufacturer discretion. Ford DCL(+) Argentina, Brazil (pre OBD-II) 1997–2000, USA, Europe, etc. Chrysler CCD Bus(+) Ethernet TX+ (Diagnostics over IP)	11	Manufacturer discretion. Ford DCL(-) Argentina, Brazil (pre OBD-II) 1997–2000, USA, Europe, etc. Chrysler CCD Bus(-) Ethernet TX- (Diagnostics over IP)
4	Chassis ground	12	Not connected Manufacturer discretion: Ethernet RX+ (Diagnostics over IP)
5	Signal ground	13	Manufacturer discretion. Ford: FEPS - Programming PCM voltage Ethernet RX- (Diagnostics over IP)
6	CAN high (ISO 15765-4 and SAE J2284)	14	CAN low (ISO 15765-4 and SAE J2284)
7	K-line of ISO 9141-2 and ISO 14230-4	15	L-line of ISO 9141-2 and ISO 14230-4
8	Manufacturer discretion. Many BMWs: A second K-line for non OBD-II (Body/Chassis/Infotainment) systems. Activate Ethernet (Diagnostics over IP)	16	Battery voltage

By Xoneca - Own work, CC0, <https://commons.wikimedia.org/w/index.php?curid=30884736>

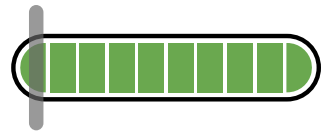




Source: <https://www.telemotive.de/en/engineering/expertise/bus-systems/>



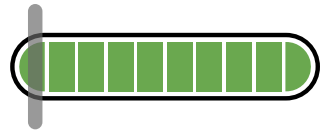
Ultimate Question of Life, Automotive and  
Everything.



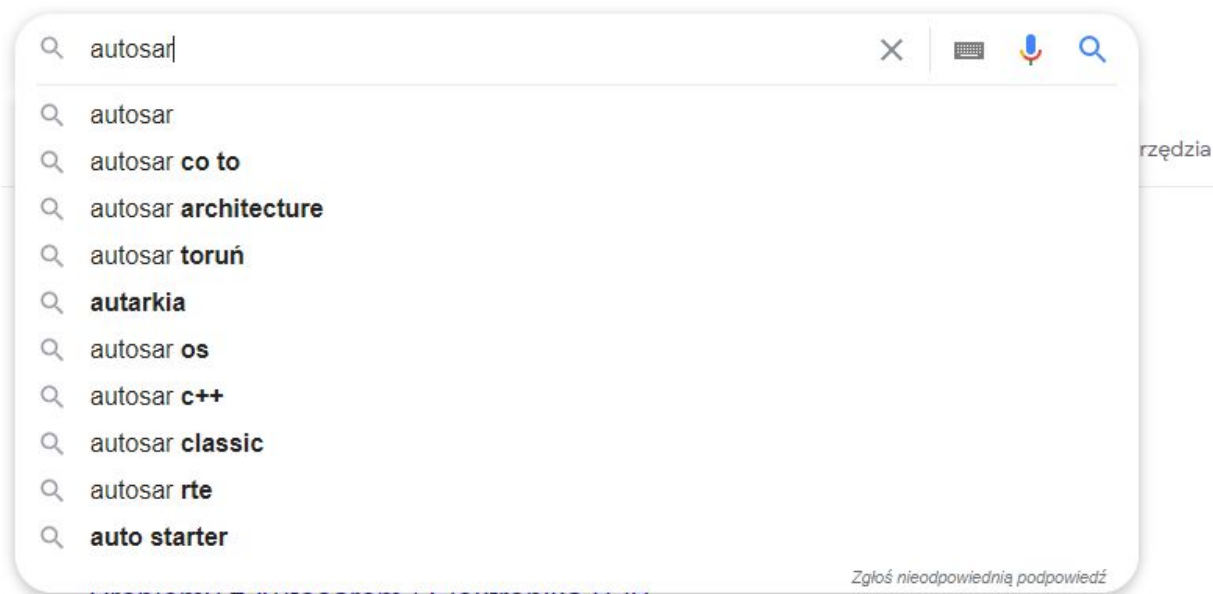
4.4.0.

...

obviously

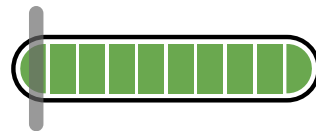


# AUTOSAR Diagnostics



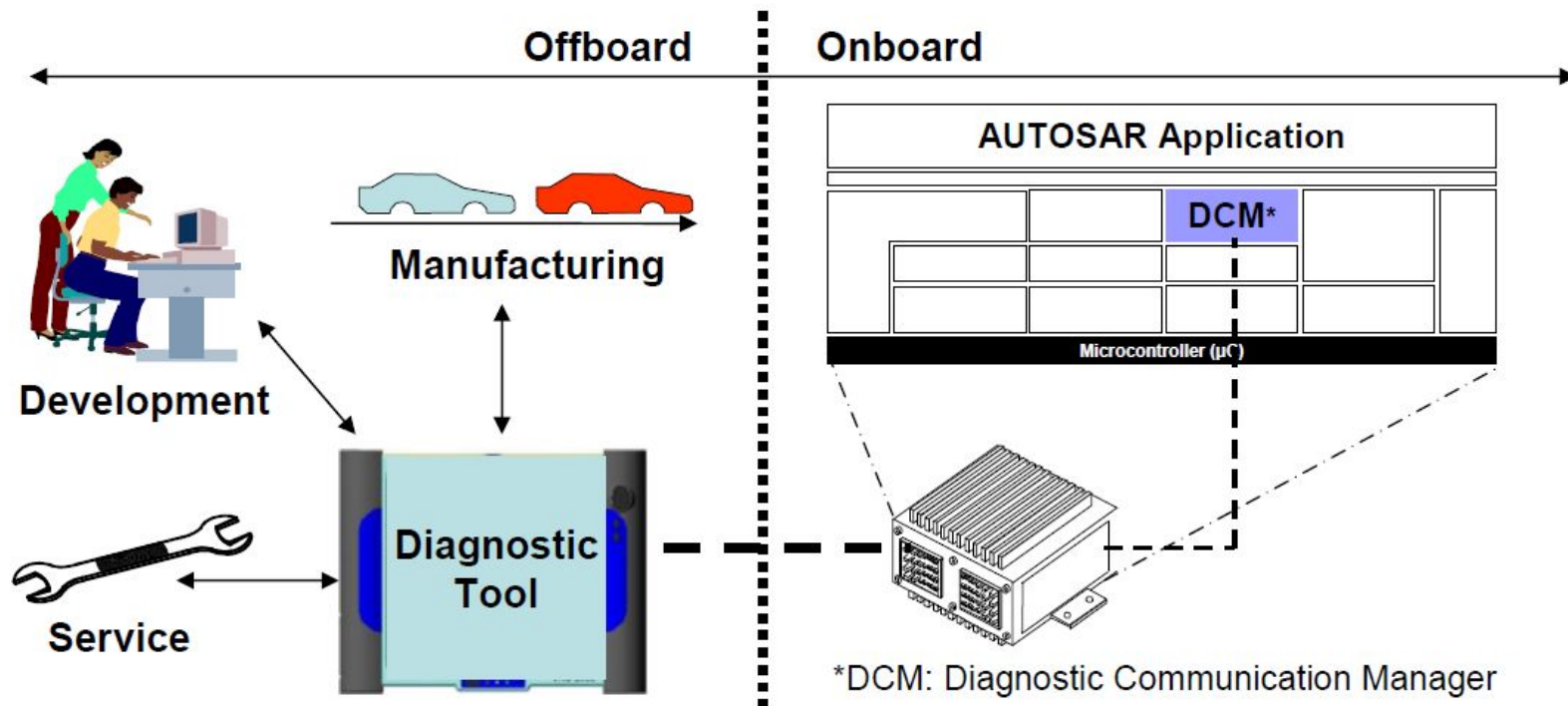
Problemy z Autosarem | Elektronika B2B

Informacje o fragmentach z odpowiedzią • Prześlij opinię



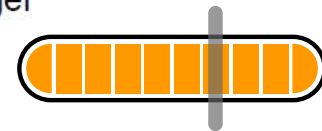


# AUTOSAR Diagnostics - DCM

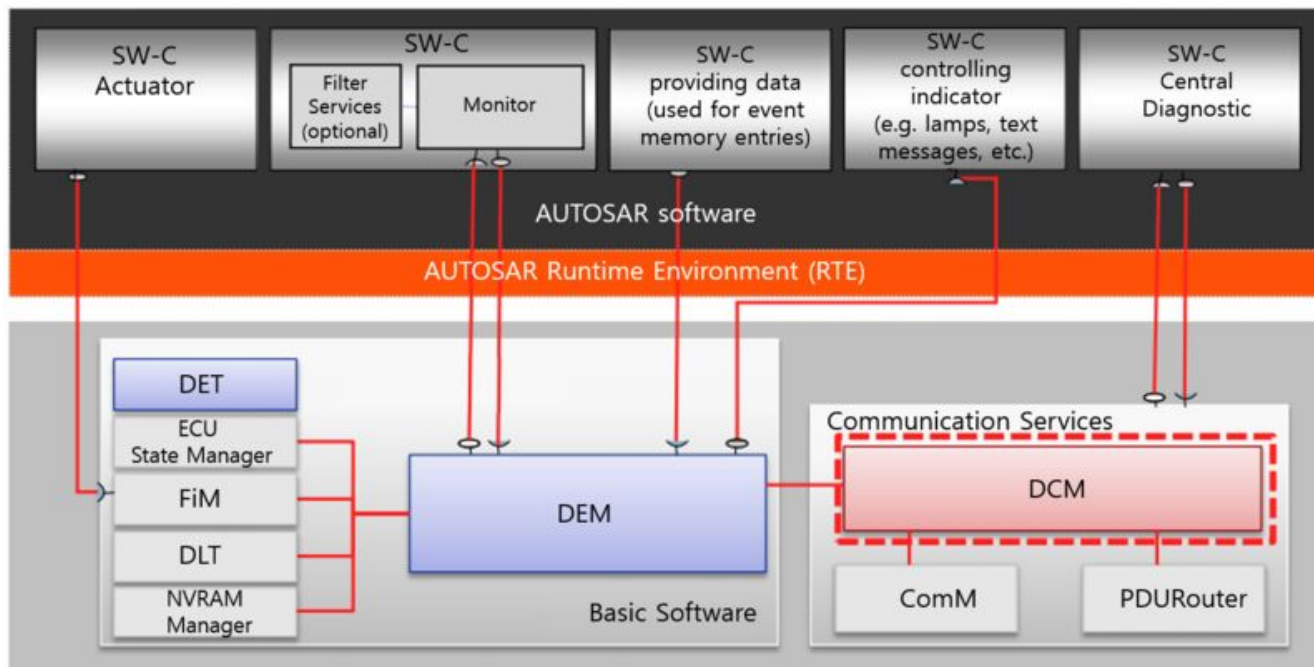


\*DCM: Diagnostic Communication Manager

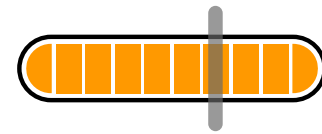
Source: <https://www.vtronics.in/2019/11/autosar-for-dummies-vehicle-diagnostics.html>



# AUTOSAR Diagnostics - DCM



Source: <https://www.vtronics.in/2019/11/autosar-for-dummies-vehicle-diagnostics.html>



# Diagnostics in AUTOSAR - Process

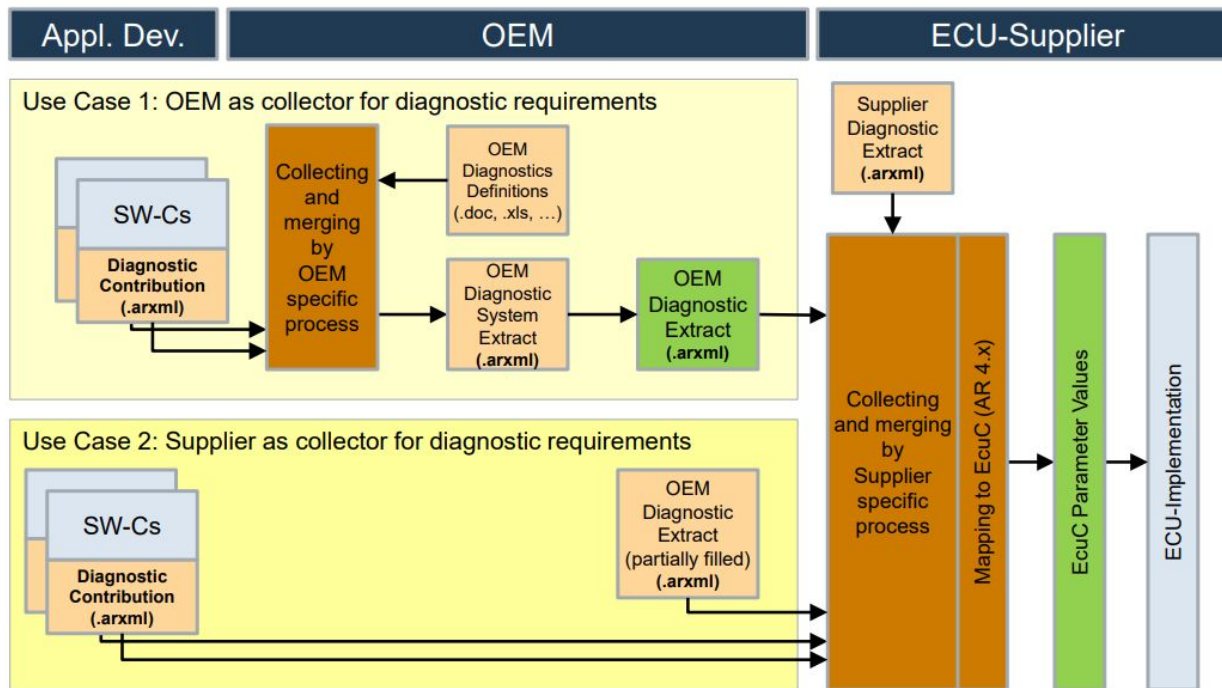
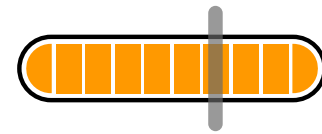
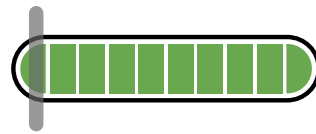


Figure 1.1: Scope of this document in the ECU Development work-flow



# Diagnostics I

## Telling your car, what it is.

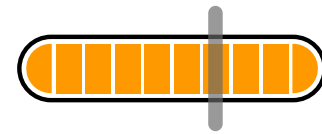


# RIDs/DIDs - Routine and Data Identifiers

*Table 1903-03: Examples of Data Identifier (DID) - Examples*

DID	Description
0xF180	Boot software identification
0xF18C	ECU serial number
0xF190	Vehicle Identification Number (VIN)

Source: [https://www.dgtech.com/wp-content/uploads/2019/08/WP1903\\_UDS\\_V01.pdf](https://www.dgtech.com/wp-content/uploads/2019/08/WP1903_UDS_V01.pdf)




# RIDs/DIDs - Routine and Data Identifiers

× ⌨ 🎤 🔍


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Okolo 388 000 wyników (0,55 s)


📺 Wideo



[Korekta/cofanie licznika AUDI,VW,SEAT,SKODA](#)  
YouTube · AUDI Napraw to sam  
5 sty 2017



[„KOREKTA” LICZNIKA](#)  
YouTube · TELEWIZJA KOPERNIK kopernik.tv  
1 mar 2018



[WIĘZIENIE ZA COFANIE LICZNIKA !!! Patologia Polskich ...](#)  
YouTube · Miłośnicy czterech kółek -zrób to sam  
28 wrz 2018

[→](#) Wyświetl wszystkie

Public



Source: <https://youtu.be/CLGYIrPWesM>



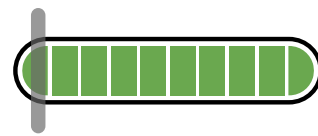
source: <https://autofakty.pl/autoencyklopedia/tester-diagnostyczny/>

10k\$



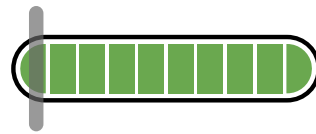
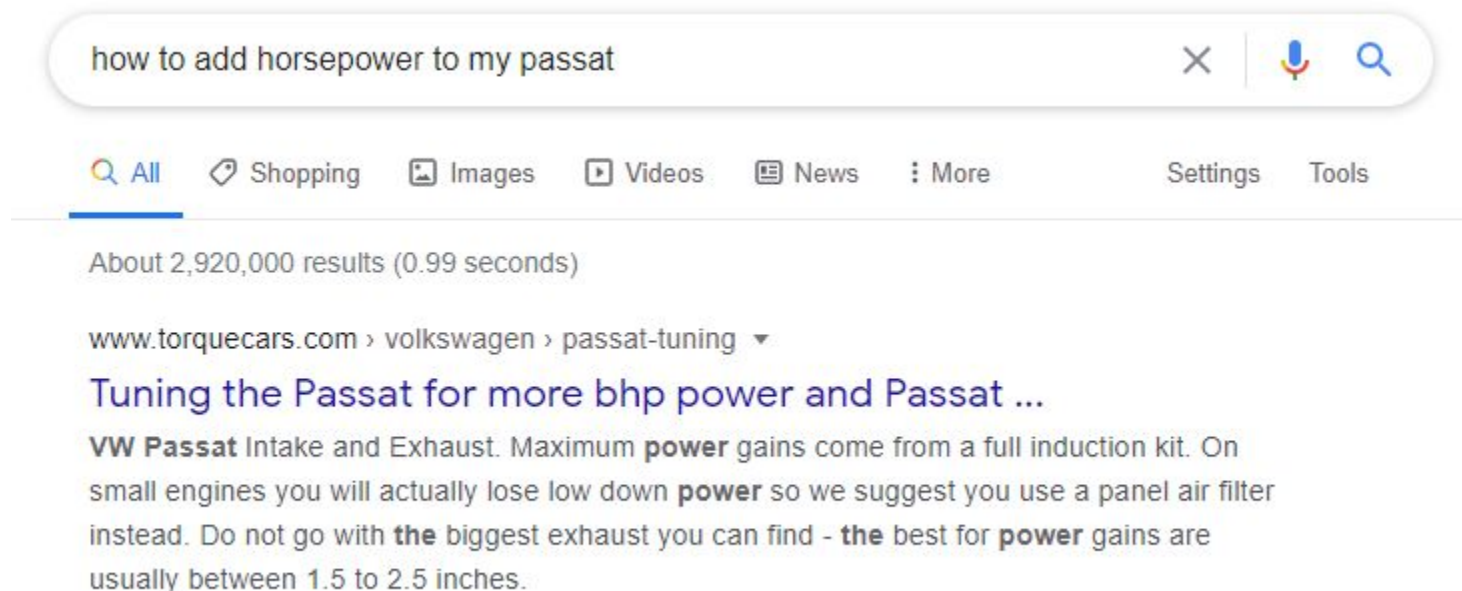
source: <https://pl.aliexpress.com/item/32371696141.html>

3\$





# UDS - practical approach



# UDS - Unified diagnostic services

Service	Service Id
Diagnostic Session Control	0x10
ECU Reset	0x11
Security Access	0x27
Clear Diagnostic Information	0x14
Read DTC Information	0x19
Write/Read Data By Identifier	0x2E / 0x22
Routine Control	0x31
Request Download	0x34
Transfer Data	0x36

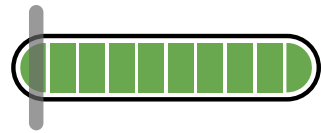
**ISO 14229-1** Road vehicles — Unified diagnostic services (UDS)

<https://www.iso.org/standard/72439.html>

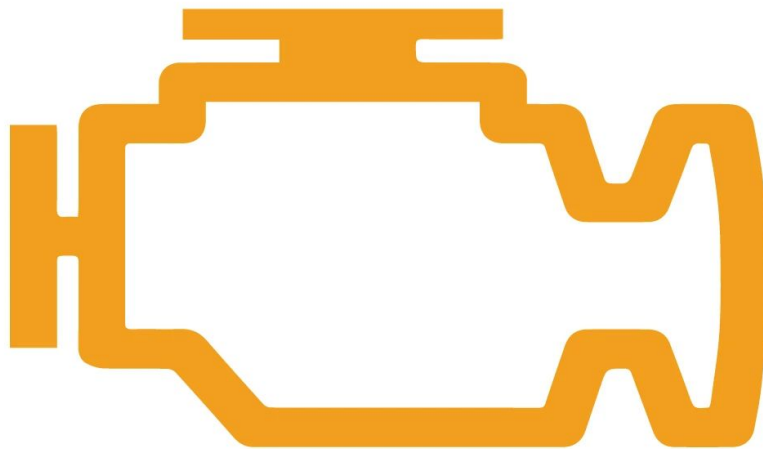


# Diagnostics II

## Errors

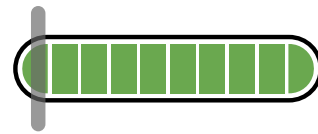


**This little light of mine**



**I'm gonna let it shine**


source: <https://www.topleft.shop/products/this-little-light-of-mine-check-engine-light-cel-meme-vinyl-decal-sticker>





# DTC - practical approach


why does my bmw show error code


×








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About 18,100,000 results (0.77 seconds)

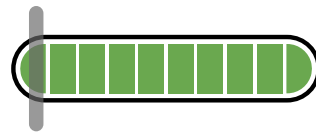


Videos



READING BMW CODES WITHOUT A CODE READER! (2006 ...

YouTube · Nour Hummadi  
Jun 5, 2018





# DTCs - Diagnostic Trouble Codes - Status

## DTC Status Byte


bit #	hex	state	description
0	0x01	testFailed	DTC failed at the time of the request
1	0x02	testFailedThisOperationCycle	DTC failed on the current operation cycle
2	0x04	pendingDTC	DTC failed on the current or previous operation cycle
3	0x08	confirmedDTC	DTC is confirmed at the time of the request
4	0x10	testNotCompletedSinceLastClear	DTC test not completed since the last code clear
5	0x20	testFailedSinceLastClear	DTC test failed at least once since last code clear
6	0x40	testNotCompletedThisOperationCycle	DTC test not completed this operation cycle
7	0x80	warningIndicatorRequested	Server is requesting warningIndicator to be active


source: [https://automotive.wiki/index.php/ISO\\_14229#DTC\\_Status\\_Byte](https://automotive.wiki/index.php/ISO_14229#DTC_Status_Byte)





# DTCs - Snapshots (Freeze frames) & Extended Data


×








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About 1,460,000,000 results (0.80 seconds)


The **check engine** light illuminates when your vehicle's computer believes there is a problem that could affect — or is affecting — your car's emissions control system. When the light comes on, one or more diagnostic trouble codes are stored in the car's computer. ... These lights illuminate when a routine service is due.

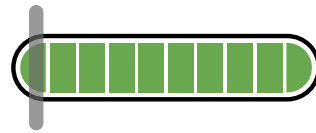


[www.autoselectonline.com](http://www.autoselectonline.com) › article › is-your-check-engin...

## Is Your Check Engine Light On? What does that really mean?

?

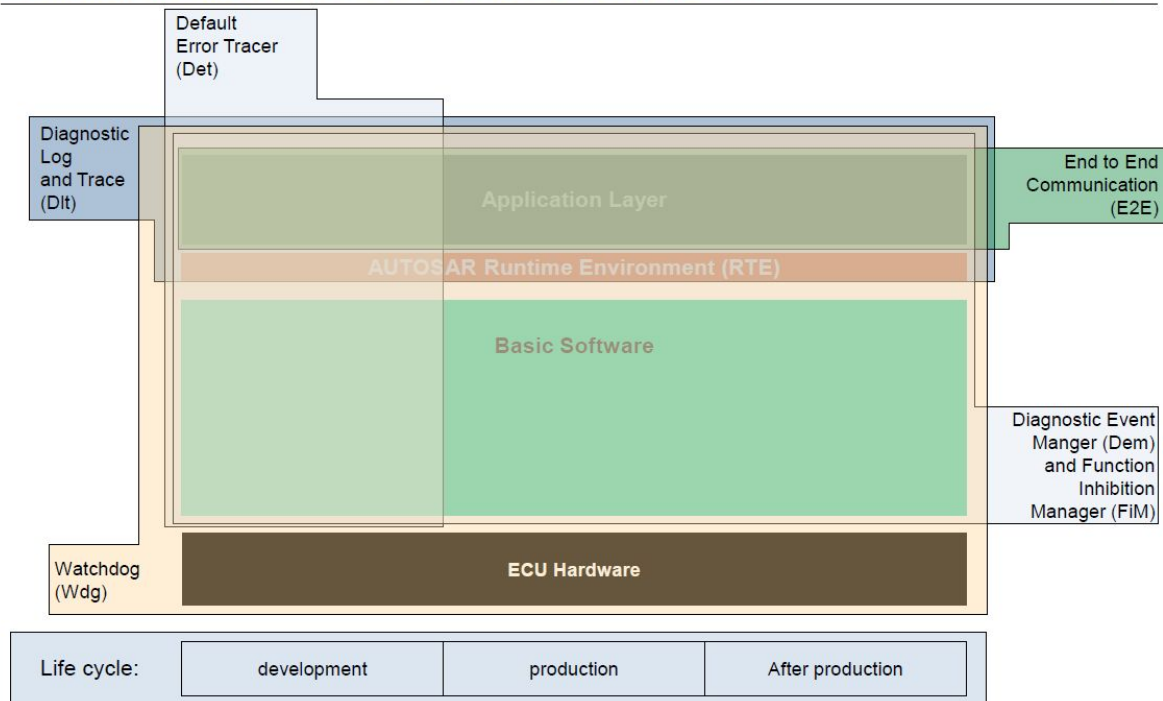
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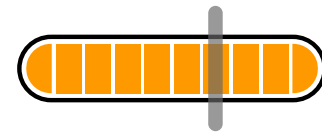


# AUTOSAR Diagnostics - Errors

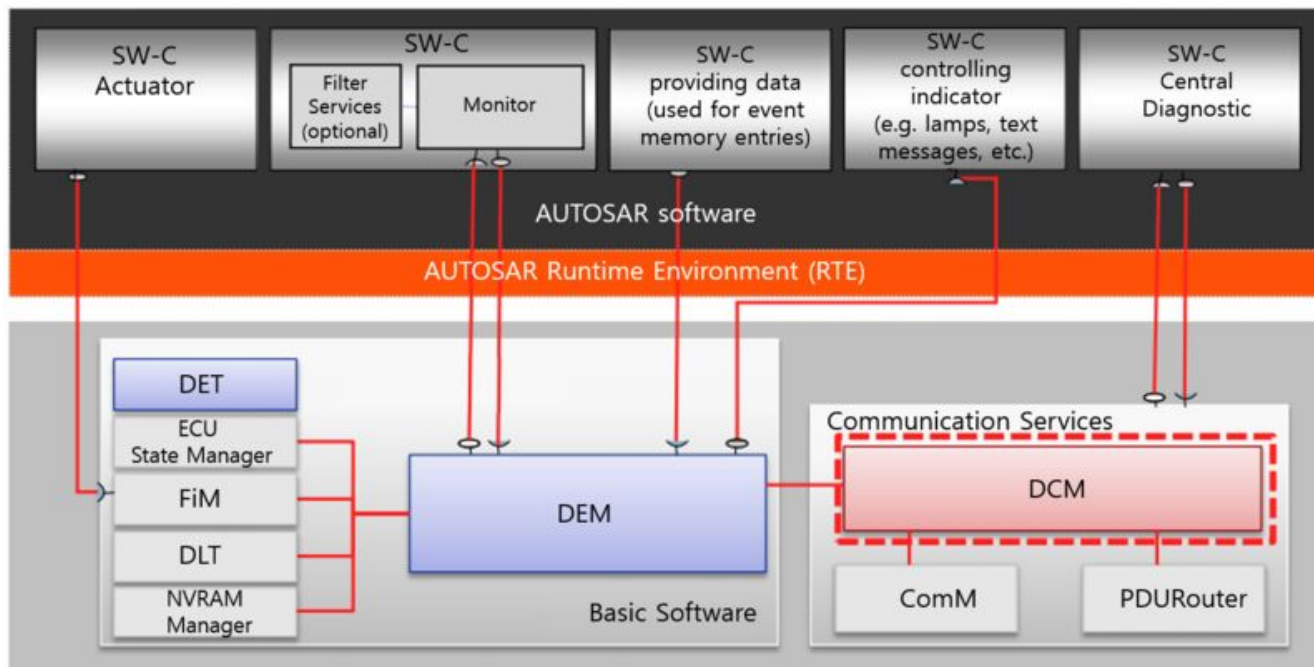
*Integration and Runtime Aspects - Error Handling, Reporting and Diagnostic Mechanism in relation to AUTOSAR layers and system life time*



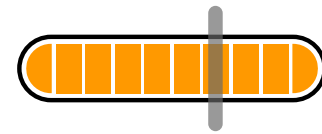
Source: AUTOSAR General Specification



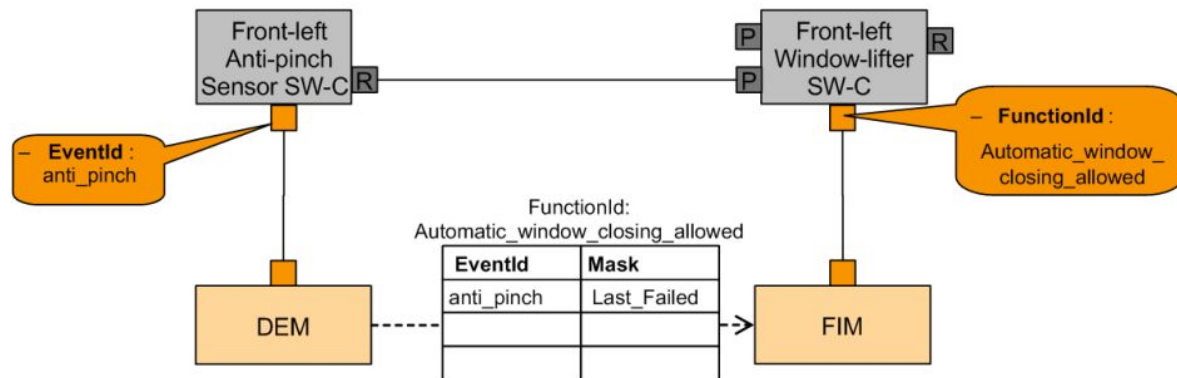
# AUTOSAR Diagnostics - DEM



Source: <https://www.vtronics.in/2019/11/autosar-for-dummies-vehicle-diagnostics.html>

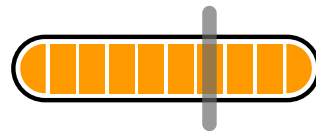


# Diagnostics in AUTOSAR - FiM



**Figure 7.4: FiM usage**

Source: AUTOSAR FiM Specification

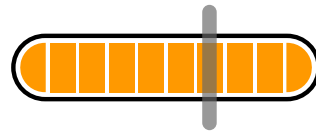


## Diagnostics in AUTOSAR - DET

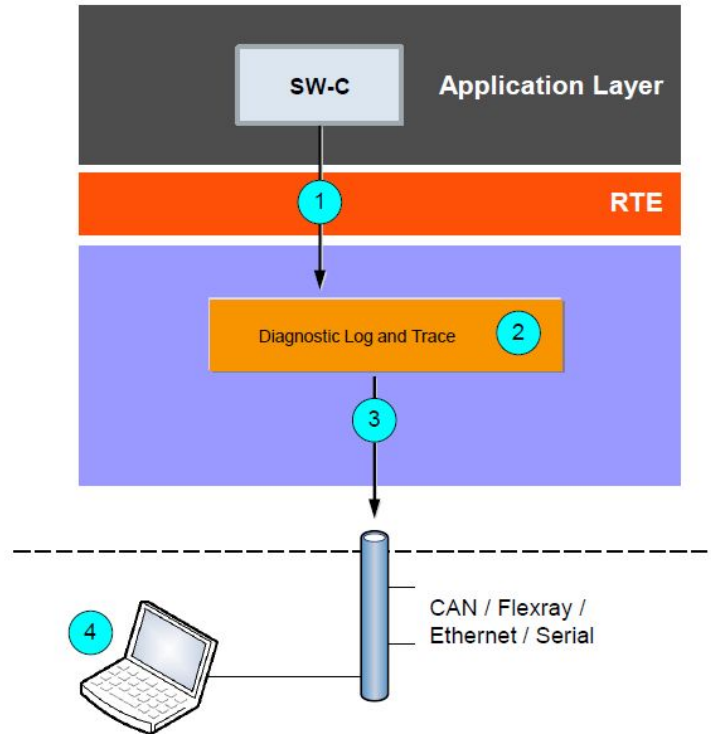
Due to the always specific (non generic!) requirements regarding functionality in error cases there is no explicit specification of the DET implementation, except:

- Configurable lists of error hooks will be executed in case of an error report.
- Interfaces will be provided to report errors, allow optional error recovery after reset, to handle optional error recovery information and to retrieve version information.

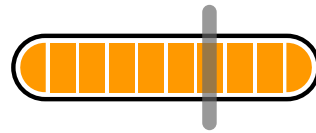
Source: AUTOSAR DET Specification



# Diagnostics in AUTOSAR - DLT



Source: AUTOSAR DLT Specification



Dr. Robert Ford, Bernard  
Lowe, Westworld,  
Westworld The Original,  
Westworld 1x01,  
Westworld S01E01,  
Season 1, HBO  
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HBO





Thank You