



***DENSO***

DENSO Manufacturing Hungary Ltd.





# TECHNOLOGY

## Continuous innovation to build a sustainable automotive society

*At DENSO, we work to improve the three basic functions of the automobile: moving, turning and stopping. But that's not all. We also strive to enhance the driving experience and to advance all aspects of the automobile society for drivers, pedestrians and the global environment. To make this happen, we have become a leader among automobile part makers in R&D investment. In the areas of environment, safety, comfort and convenience, our technical innovation continues non-stop.*

## ENVIRONMENT

A society where the environmental burden of the automobile is as close to zero as possible over the entire product lifespan.

## SAFETY

A society without traffic accidents, in which drivers, passengers and pedestrians can feel safe.

## COMFORT

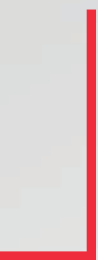
A society in which everyone can enjoy the space in which they move and the time they spend doing so.

## CONVENIENCE

A prosperous automobile society where everyone arrives at their destination smoothly and stress-free.



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# THE DENSO PHILOSOPHY

All of our activities, everything we do is based on the DENSO Philosophy:  
*Contributing to a better world by creating value together with a vision for the future.*

The slogan that describes our long-term policy 2020 is:  
*“Protecting Lives, Preserving the Planet, and Preparing a Bright Future for Generations to Come.”*

DENSO’s values and principles are known as the DENSO Spirit. It is a guiding principles for all employees around the world.



## OUR LONG-TERM MISSION

Deliver convenience and joy of driving to the people all over the world

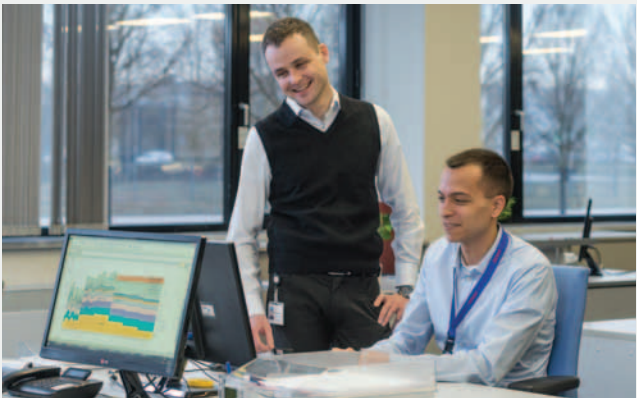
Maximize positive value

**DENSO’s commitment to automotive society**

Minimize negative impact

Preserve the planet

Security & Safety



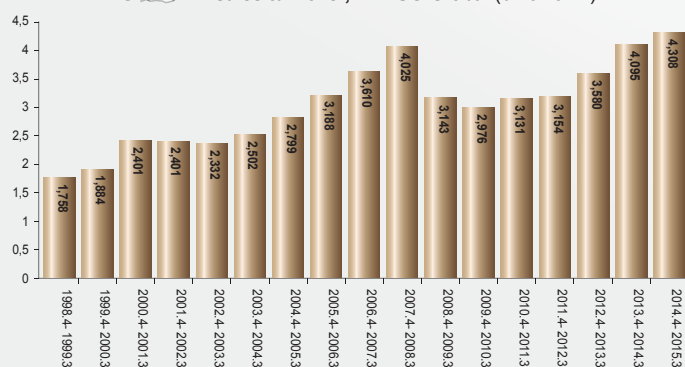
# GLOBAL NETWORK

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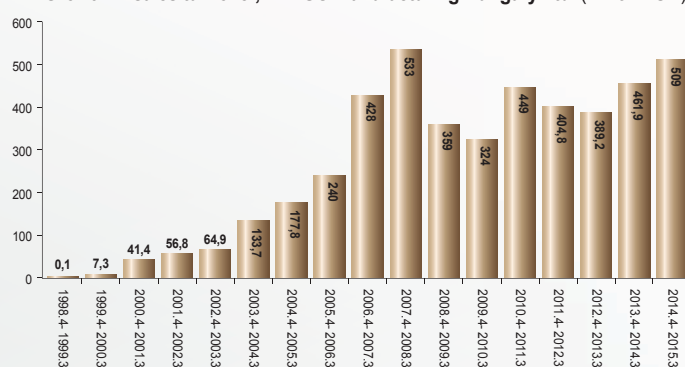
## SUBSIDIARIES

Japan:	63
Asia & Oceania:	56
Europe:	35
North-America:	26
South-America:	6

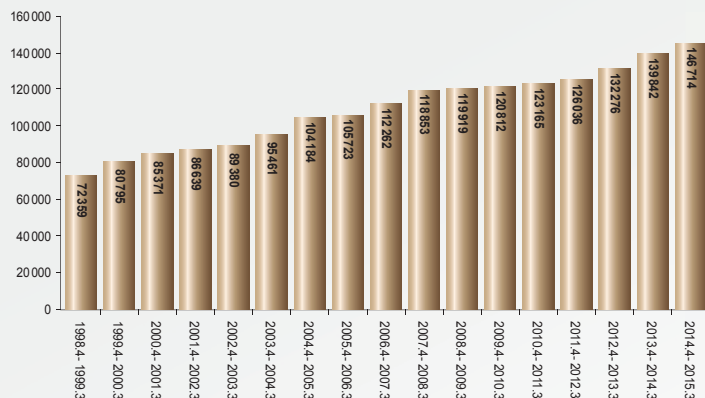
Growth in sales turnover, DENSO Global (billion JPY)



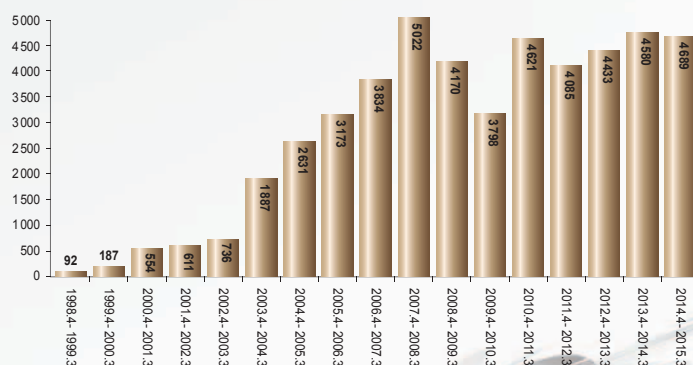
Growth in sales turnover, DENSO Manufacturing Hungary Ltd. (million EUR)



Number of employees, DENSO Global

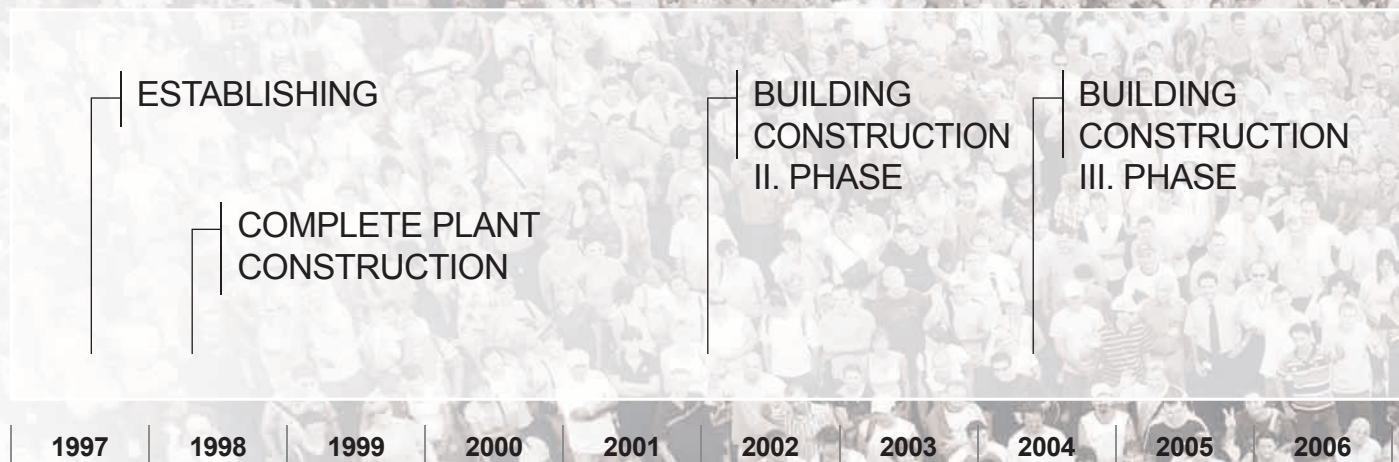


Number of employees, DENSO Manufacturing Hungary Ltd. (including rented associates)

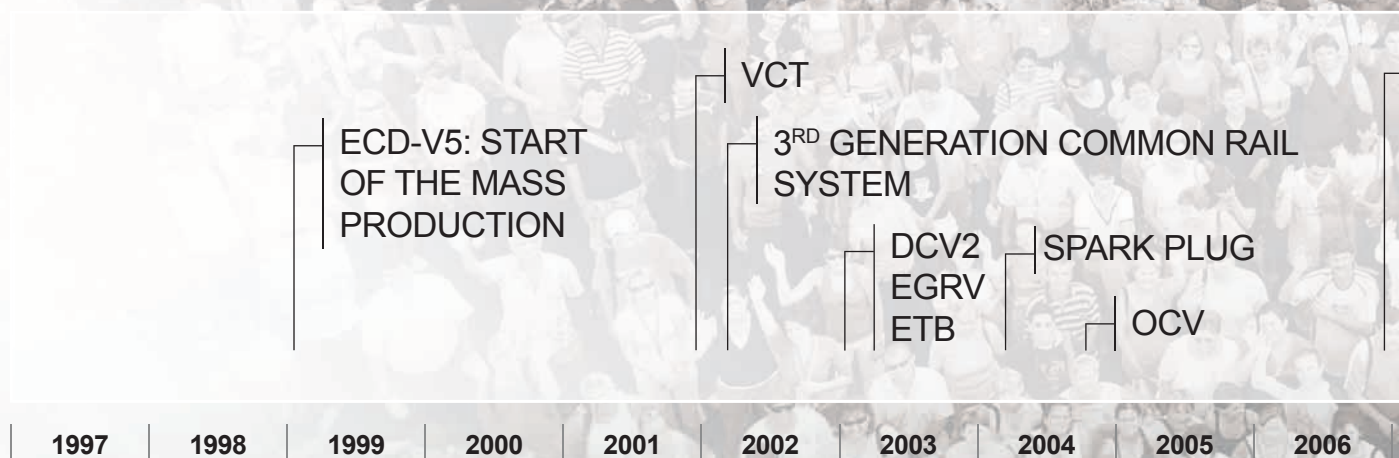


# DENSO Manufacturing Hungary Ltd.

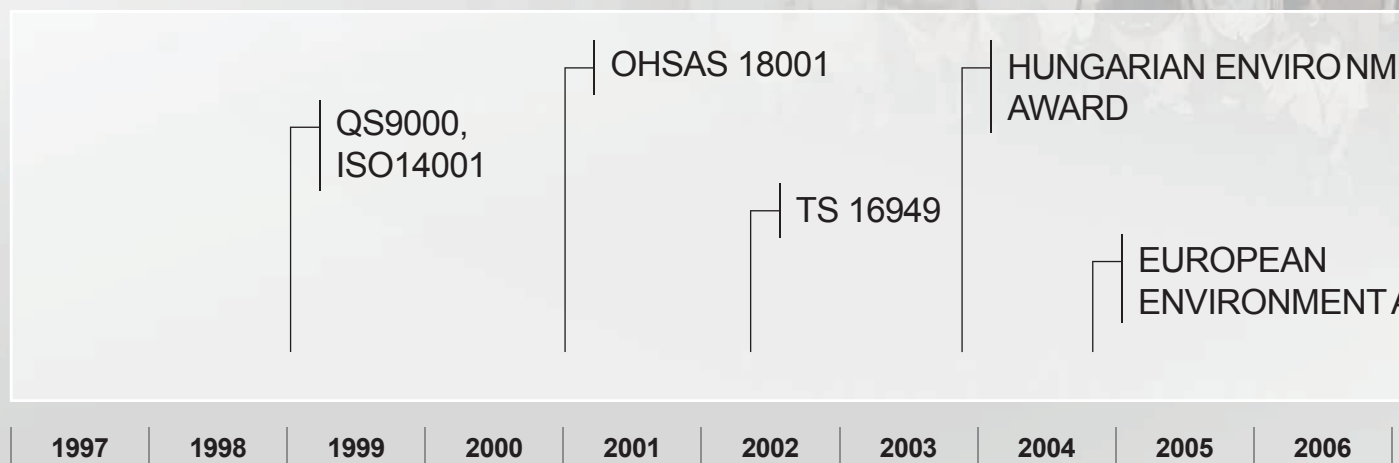
## HISTORY



## PRODUCT



## AWARD CERTIFICATE





BUILDING  
CONSTRUCTION  
IV. PHASE

2007 2008 2009 2010 2011 2012 2013 2014 2015

GASOLINE INJECTOR

EGTS  
DC-EGRV

4<sup>TH</sup> GENERATION COMMON  
RAIL SYSTEM  
EGR UNIT

AV SENSOR  
DIESEL FUEL FILTER

2007 2008 2009 2010 2011 2012 2013 2014 2015

MENTAL

STRATEGIC PARTNERSHIP  
AGREEMENT WITH HUNGARIAN  
GOVERNMENT

INVESTOR OF THE YEAR AWARD

MOST EXCELLENT CSR  
SOLUTION OF 2015 AWARD

2007 2008 2009 2010 2011 2012 2013 2014 2015

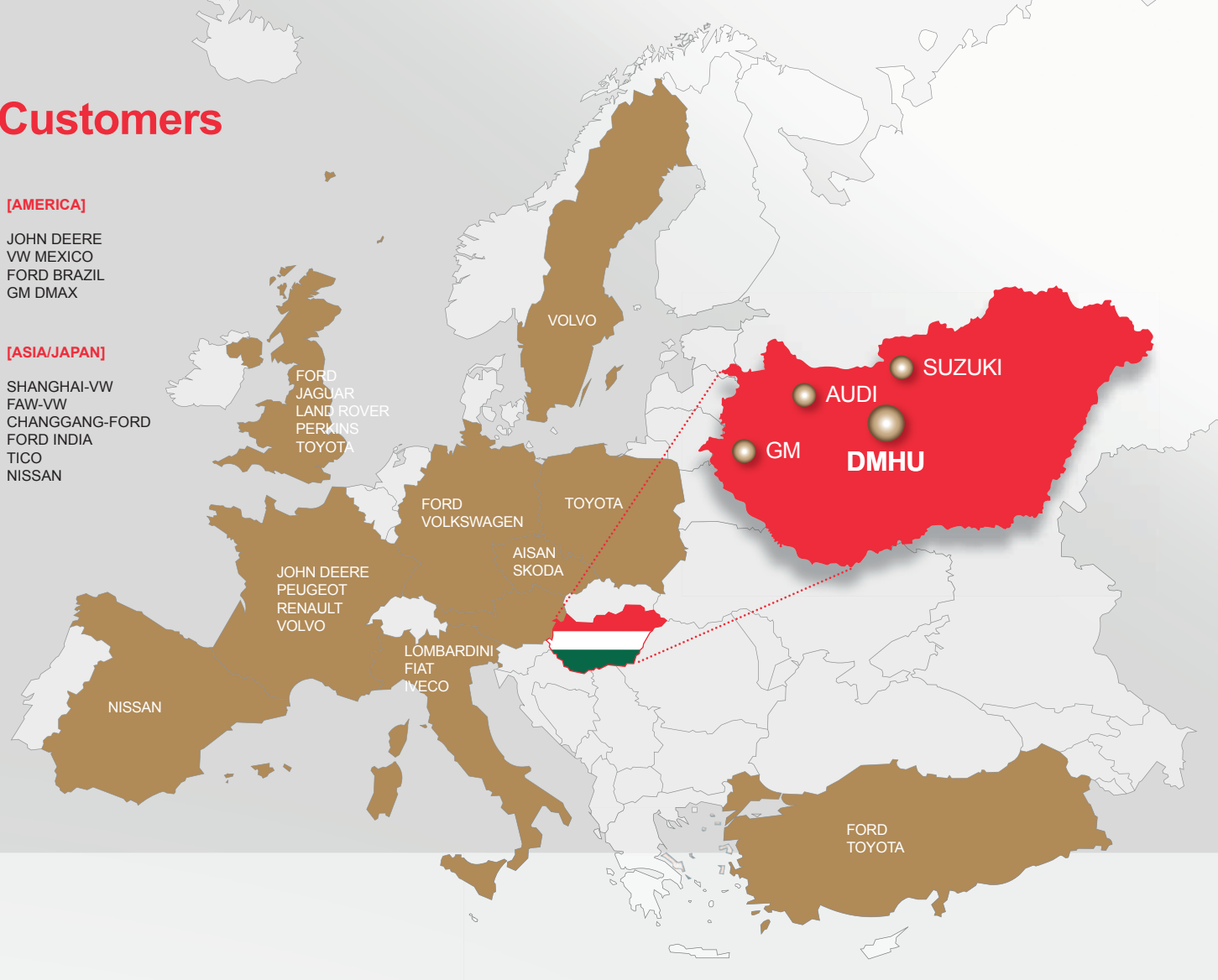
# Customers

## [AMERICA]

JOHN DEERE  
VW MEXICO  
FORD BRAZIL  
GM DMAX

## [ASIA/JAPAN]

SHANGHAI-VW  
FAW-VW  
CHANGGANG-FORD  
FORD INDIA  
TICO  
NISSAN



# DMHU Products

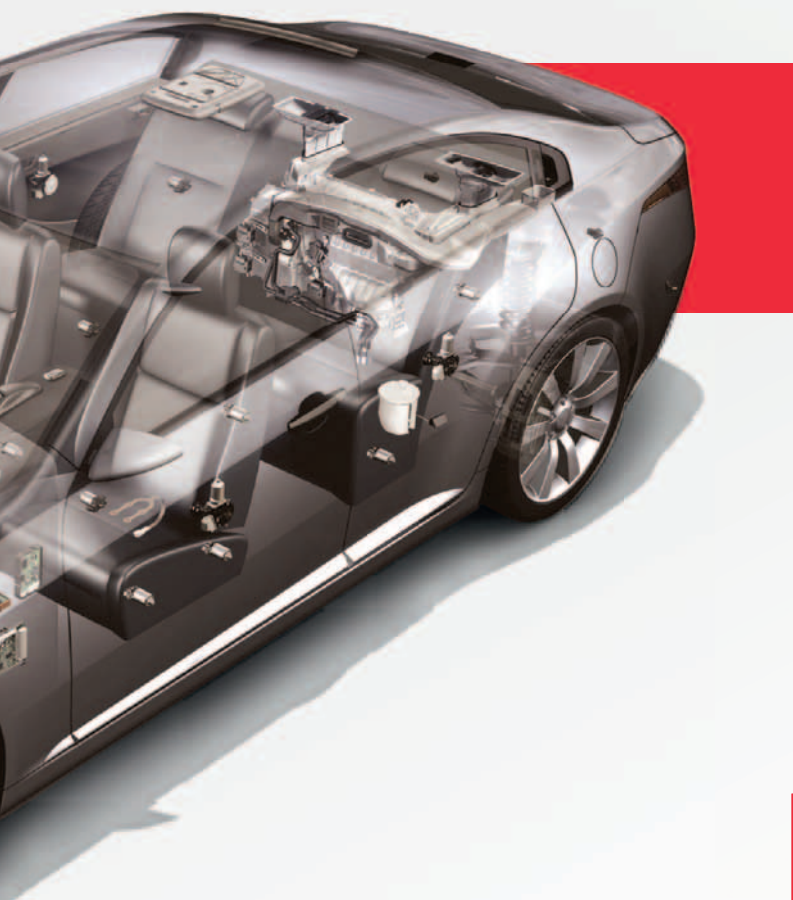
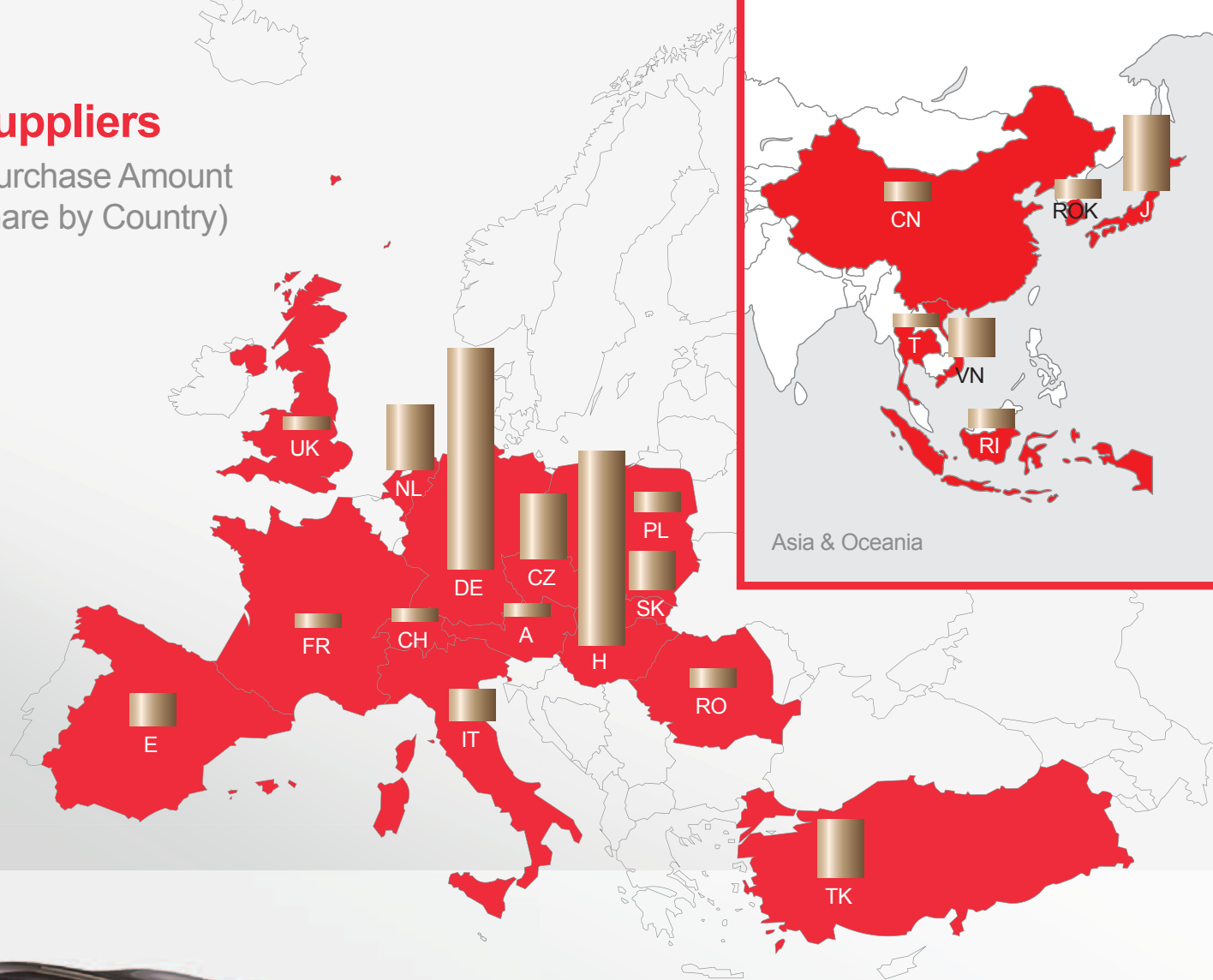
## Diesel Common Rail System

1. Supply Pump
2. Rail
3. Injector



## Suppliers

(Purchase Amount  
Share by Country)



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## Other Engine Related Products

4. VCT (Variable Cam Timing)
5. OCV (Oil-flow Control Valve)
6. ETB (Electronic Throttle Body)
7. EGTS (Exhaust Gas Temperature Sensor)
8. DC-EGRV (Direct current - Exhaust Gas Recirculation Valve)
9. A/F Sensor (Air/Fuel Sensor)
10. EGR Unit (Exhaust Gas Recirculation Unit)
11. Gasoline injector
12. Diesel fuel filter

## Diesel Common Rail System

The high pressure pump supplies up to 2500 bar pressure to the rail. Vaporization to the combustion chamber is made by the injector, which ensures that fuel is supplied in proper quantities and at an appropriate time and rate for perfect combustion.

### Advantages of the system:

- Reduced emission ( $\text{NO}_x$ , particles)
- Simplified supply pump
- Enhanced injection pressure
- Enhanced engine performance
- Reduced fuel consumption
- Long lifetime
- Noise- and vibration-proof operation of the engine



### EGR unit

The product integrates the features of ETB (Electronic Throttle Body) and DC-EGRV (DC Current Exhaust Gas Recirculation Valve): it simultaneously controls the amount of intake air and the amount of exhaust gas to be recirculated into the engine.



### Supply pump

The light weight - aluminium housing - pump pressures the fuel (up to 2500 bar) upon fluid-pressure principle and it regularizes the injection volume with electrical control.



### Common rail

Rail stores the supply pump created high pressure and distributes it to the injectors.

### Injector

The electronically controlled injector atomizes the high-pressure fuel through precision hole in order to provide perfect combustion and directly injects the fuel into the combustion chamber.



### Gasoline injector

The electronically controlled injector atomizes a predetermined amount of fuel towards the intake valve.



### Diesel fuel filter

This part filters the fuel coming from the tank and transmits it towards the supply pump.



# PRODUCTS

## DIESEL ENGINE RELATED PRODUCTS

*These products make possible the perfect engine fuelling and smooth and efficient operation of the diesel engine by controlling the injection time, fuel pressure and engine speed.*



## System Control Components and other products

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### VCT (variable cam timing)

VCT controls the operation of the intake and exhaust valves and with this ensures the proper performance (torque), fuel economy in the engine and the minimal emission.



### OCV (oil control valve)

Electro-hydraulic valve, conducts the operation of the VCT.



### ETB (electronic throttle body)

ETB makes the electronic control of intake air possible.



### A/F sensor

The sensor detects the amount of the oxygen in the exhaust gas. Using this information, air-fuel mixture burnt in the engine can be optimized.



### EGTS (exhaust gas temperature sensor)

EGTS is to measure exhaust gas temperature.



### DC-EGRV (direct current - exhaust gas recirculation valve)

Decreases the amount of the fresh intake air with tracing back the exhaust gas into the intake side in order to optimize the amount of nitrogen oxide (NO<sub>x</sub>) emission.



## INCOMING INSPECTION

Incoming parts are checked with sampling, while checking main parameters of the parts with the following processes:

- visual inspection
- simple geometric measurements
- precise measuring by 3D machines
- contour and surface roughness check
- laboratory check (hardness, microstructure)



# PRODUCTION PROCESS

## Production flow

INCOMING INSPECTION ► DIE CASTING / FORGING / HEAT TR



## DIE CASTING / FORGING / HEAT TREATMENT

The fully automatic technology (vacuum squeezing aluminium casting) allows low porosity cast parts to be manufactured at a high production rate. The forging process shapes the metal into the required shape by taking advantage of the plasticity and applying pressure to force it into the dies with press. In order to increase their durability and wear resistance, steel basic materials are subject to a computer-controlled heat treatment process.

## MACHINING

The majority of our high precision machines are controlled by CNC technology. Applying the most recent grinding process keeps the concentricity of the pieces within a tolerance of less than 0.5 micrometers. With the multi-spindle and multi-axis high precision machines more operations can be made on one piece at one time. Machines are controlled by CNC technology. After the finishing cut the surfaces are grinded into the required size with the most recent grinding process keeps the roughness of the pieces within a tolerance of less than 0.5 micrometers.



## ASSEMBLING

The semi-automated final assembly lines can be found in air conditioned rooms. Each important part runs through a „foolproof“ system to eliminate any human error and it is continuously gauged in order to ensure perfect quality. Assembly robots and visual recognition systems are also used in this area.



## MEASURING

In the precision measuring room where the constant temperature and humidity assures the standard size of the parts, technicians use high accuracy (0.1 micrometer) coordinate measuring machines to check the quality of the production processes. These measuring and testing routines ensure that even the smallest deviation in quality is recognized and corrected.



EATMENT ► MACHINING ► ASSEMBLY ► MEASURING ► PERFORMANCE TEST ► FINAL INSPECTION

## PERFORMANCE TEST

During the test the individual operating parameters of the fuel pumps and injectors are metered and encoded in each product at different rotational speeds and pressures during a computer controlled process. Using these parameters, the electronic engine controller adjusts the injected fuel volume and timing optimally for engine performance and European environmental standards.



## FINAL INSPECTION

High qualified inspectors carry out 100% visual check. Beside this they inspect the threads and positions that are important for the customer with gauges. Finally with the matching of the QR codes of the finished products, the process control card and the box, what ensures to prevent type mixing or mislabeling, they forward the finished parts to the warehouse.



# SAFETY & ENVIRONMENT

Safety and environmental protection has a special role at DENSO Manufacturing Hungary Ltd., we have an independent department for these tasks.

Our company policy is 'Safety and quality first'. To fulfill the policy we issue annual safety and environmental plan based on the past years trends and also including DENSO corporation requirements. This plan is evaluated on a monthly base. We carry out regular risk assessment, safety inspections and safety training in all levels. We have implemented monthly Top Management safety patrol since 2010.

We operate occupational health service and we carry out regular working environmental measuring to protect our associates' health. We have elected safety committee since 2004.

Regarding environmental protection, we pay special attention to the selective waste handling, to decrease emission and to the energy saving.



# CORPORATE SOCIAL RESPONSIBILITY

*At DENSO we think that it's really important to contribute to the sustainable development of our environment and society. In order to realize this we strive to contribute to the harmonic development with our active environmental and donation programs beside our fair and transparent business activity.*



One main element of our CSR activity is the active relationship with high schools and universities. It's really important to help the future generation and to contribute to their development. Beside our university trainee program, we take part in the dual education system for vocational school students as company for professional practice. In the frame of plant tours and professional presentations we regularly provide opportunity to the professionals of the future to get knowledge about our company's processes.

It's an emphasized aim of our CSR policy to create lasting values in our nearer environment while we contribute the satisfaction of our interested parties. We strive to find partners regarding our initiatives. Among other things **KÉPES CSR Program** was created also this way. This program was started upon DENSO's initiatives in 2013 with the cooperation of local companies and the local government. Our aim is to realize aims that serve the development and satisfaction of the society of the city and the region.



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We not only pay attention to the satisfaction of our external parties but our employees' happiness and development is also really important. In order to realize this, **DENSO Foundation** operates since 2011. Aim of the Foundation is to give financial support to our associates in such cases when they involuntarily and suddenly get into a serious life situation.



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Published in 2015

Design by BRANDCONTROL

