A Methodology to Assess Cost Implications of Automotive Customization

by

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Submitted to the Engineering Systems Division in Partial Fulfillment of the Requirements for the Degree of

Master of Science in Technology and Policy

at the

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Abstract

This thesis focuses on determining the cost of customization for different components or groups of components of a car. It offers a methodology to estimate the manufacturing cost of a complex system such as a car. This methodology includes specific consideration of how costs change as customized variants of each component or grouping of parts are included. The central conclusion of the thesis is some recommendations for the automakers when they are facing customization decisions.

The automotive industry has reached a mature state, as is evidenced by its growth and by the nature of competition and industry consolidation. Consumers are no longer satisfied with the models that are not individualized and demand a greater variety and individuality. Consequently the automakers are moving towards custom-made cars by customizing the shape and style of components; and this at a certain price. While product variety enables the firm to charge higher prices, automotive customization means also producing at lower production volumes, thereby increasing manufacturing costs and eroding profits.

Understanding the cost of customization depends heavily on component cost structures. It is considered that this cost is equal to the difference between the price of a baseline and customized product. A methodology, called Systems Cost Modeling (SCM), is developed in the thesis to build cost structures when estimates for a large number of components have to be considered. After gathering detailed empirical data and considering the eventual changes in the processing conditions of all parts due to customization, the tooling and equipment investment as well as the labor and energy cost are estimated for both the standard and customized car. After determining the drivers of the customization cost, a sensitivity analysis is done to understand the variations of this cost under different operating conditions. Finally these results explain that the cost of customization is very sensitive to part and process characteristics.

Thesis supervisor: Richard Roth

Thesis Supervisor's Title: Director, Materials Systems Laboratory

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1 Introduction

1.1 Background of the automotive industry

1.1.1 The state of the U.S automotive industry

The global automotive light vehicle assembly grew by 2% in 2004, to a total of 1,082,374 units [1] (1,061,735 units in 2003). However, this growth was anything but uniform across regions. Positive contributors included East Europe and Asia Pacific, which increased 4%. Negative contributors to growth included North America, off 2% and West Europe, down a slight 0.2%.

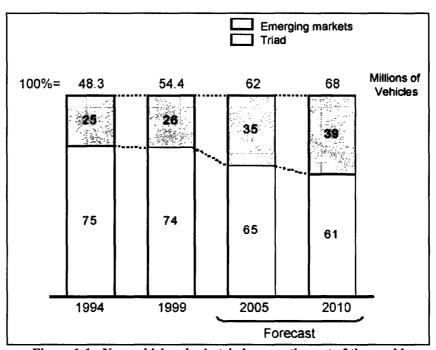


Figure 1-1: New vehicle sales in triad versus the rest of the world (Source: Automotive News McKinsey)

In any of the Triad regions (Western Europe, Japan and the US) Original Equipment Manufacturers (OEMs) have been facing a mature market for the past 10 years, with stagnant demand, product proliferation and stiff price competition. A flat demand is aggravated by increased competition in the product market. During the past two decades, most OEMs have invested heavily in plants outside their home base to better reach local consumers. As a result, market shares of incumbent players have become thinner. In the

US, domestic automakers have lost more 20% market share to Japanese and Korean automakers in the past two decades (see figure 1-2 for the trend). In 2003 North American carmakers accounted for 75 percent of the business of their North American suppliers, which now plan to reduce that level to less than 60 percent by 2008. European OEMs have experienced a similar trend, although ameliorated by the stricter regulations on the participation of Japanese OEMs that were in place until recently. Sales growth is now coming from developing regions, with South America, India, China and Eastern Europe leading this trend (see figure 1-1). To summarize, three factors are putting pressure on the OEMS:

- Increasing heterogeneity in the targeted market place
- Wider income distribution within the market
- Slower growth within the market.

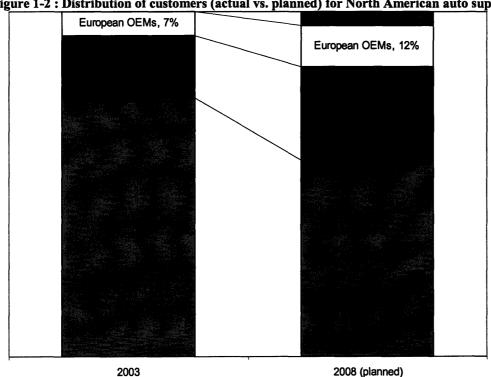


Figure 1-2: Distribution of customers (actual vs. planned) for North American auto suppliers, %

Faced with this changing face of competition in the automotive industry, the automakers have tried to reduce drastically development and manufacturing costs to remain competitive. Consequently they have for decades attempted to develop and produce "world cars" for the mass market that can be sold around the world with only minimal modifications. This strategy would result in tremendous economies of scale for the automotive industry. Despite the substantial benefits that could be gained from such products, past attempts at world cars have been failures. For example during the 1990's, three noticeable attempts were made at producing a world car. Honda made an attempt with its Accord model, Ford with its Mondeo/Contour models, and General Motors with its Cadillac Catera/Opel Omega models. All three of these models fell far short of their goals of achieving global success in the European, North American, and Asian markets for many reasons. The major theme in the failures of these world cars is the trade-offs in their development that were needed to satisfy the disparate preferences of the consumers in these different geographic markets. Here is a list of the failures:

• Different tastes:

Even in our increasingly globalized world, significant differences in tastes in automobiles still exist between the people in the different geographic markets. Among these differences in tastes are preferences in automobile size, design, and aesthetics. The most noticeable reason for failure of the world cars of the 1990's was the interior size of the cockpits of these automobiles. For example, the Ford Mondeo/Contour was well accepted in the European market, while the North American market found the interior of this automobile too cramped leading to its failure in this market. Another taste disparity between the North American and European markets exists in material preference for automobile construction. Both Europeans and Americans perceive an automobile construction of steel panels to be of superior construction to automobiles constructed of plastic panels. However Americans are more willing to accept plastic panels, while Europeans insist on steel. Consequently plastic construction is a growing trend in North America for cost and performance reasons. This taste discrepancy created issues for the GM subsidiary Saturn in its attempt to launch a world car during the late 1990's.

• Different infrastructures and economics:

The disparities in the infrastructures present in the different regions of the world create another challenge for the success of a world car. For example, a major hurdle in developing a world car that will satisfy the preferences of consumers in North America and Asia is created by the differences in the road infrastructures between these two regions. North Americans prefer large roomy cars as opposed to Asians who prefer a car small enough to squeeze through their crowded city streets. Honda designed its Accord model to meet the large car preference of the North American market, which led to its demise in Asia. Economics create another major challenge in developing a world car. For example, the disparities in the price of gasoline in the different regions of the world create another major hurdle. Europeans are obsessed with fuel economy in contrast to Americans who for the most part are more concerned about acceleration and performance.

Different rules and regulations

Safety and emissions regulations vary significantly across national markets. In less developed countries such as those of Southeast Asia, regulations are more lax compared with the developed countries of Europe and North America. Even between Europe and North America, significant differences exist in safety and emissions regulations. As a consequence of these discrepancies, automotive OEMs have found tailoring their products to the specific requirements of these markets to be the most cost effective way to compete.

These failures show that today many influential factors affect decisions made in the automotive world. Consumer preferences determine the current styles, reliability, and performance standards of vehicles. Government trade, safety, and environmental regulations establish incentives and requirements for modernization and change in design or production.

1.1.2 The era of customization

As seen in the previous paragraph all automakers are under pressure to identify consumer preferences, national biases, and new market segments where they can sell vehicles and gain market share. As many markets become saturated, automakers tend to fracture the

large mass automotive markets into smaller "niche" markets. They are trying to match their product to the particular customers' needs. To make customers feel special, they are moving towards custom-made cars by customizing the shape and style of components. This trend toward customization not only affects the automobile industry but also some other industries. For example, a mobile telephone manufacturer aware of the mass customization potential allows the customers to define their own shape of the telephone and the materials to be used for its production, adjust the shape and size of the keys, select the color of display illumination and choose optional telephone functionality, such as voice dialing. So just as consumers purchase such items as sandwiches, jeans, sofas and computers made-to-order, they expect to have the possibility to individually define a car to be purchased on the basis of a set of available engine types, transmission mechanism types, security device types, sunroofs of adjustable dimensions, seat types with a set of different seating surfaces materials in various colors, and others.

To a small extent, the customization effort is more and more intense in the auto industry. For every combination of make and model (e.g. Honda Accord, Toyota Camry), there is a variety of body type (e.g. convertible, coupe, hatchback, sport utility), doors (e.g. 2 door, 4 door, 4D Ext Cab), trim level (for Honda Accord, e.g. DX, EX, LX etc.), drive train type (e.g. 2WD, 4WD), transmission type (automatic, manual), cylinders (e.g. 4 Cyl, 6 Cyl), displacement (e.g. 3.0 liters,3.3 liters). In addition some companies like Mercedes, BMW and Porsche offer a variety of custom interior choices in European vehicles. Another example is the 2005 Audi A8, which will offer exclusive, luxury trim packages that feature more unique color choices and wood trims for roughly an extra \$10,000 [2]. The options offered in a customized car concern not only the auto interior but sometimes also the engine. For example Perkins, a world-leader in the production of purpose-built diesel engines offers seven engines, each of which can be modified to fit customer requirements. The customer can modify oil filters and coolers, manifolds, alternators, flywheel housings, flywheels, oil pumps, fans and extensions, fan drives, exhaust outlets, starter motors, etc. [3]

Today, the Internet opens new channels for customization; indeed many automobile manufacturers have websites that allow users to "build your own" car. In addition to being able to simply view a particular model, a user could choose various packages and get updated information on pricing as options are selected. For example for the small car segment, the sites of Chevrolet, Honda, Nissan, and Toyota [4], contained customizable sections entitled "build your own" or "customize". The customization process typically consists of the following steps:

- Select a model
- Select an exterior color
- Select an interior color
- Select packages and options.

All these examples of customization show that today consumers have compelled the automotive industry to 'rethink' its strategy on the production of automobiles. As shown in figure 1-3, the customization process starts from the customer preferences and then implies some production modifications.

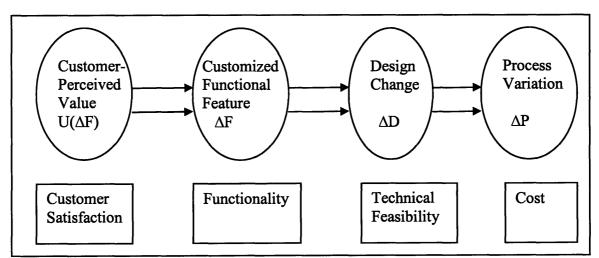


Figure 1-3: The customization process- from the customer preferences to the manufacturing variations

A product is characterized by a set of design parameters (noted D), which suppose to meet certain customer needs characterized by a set of functional requirements (noted as F). The manufacturing process can be characterized by a set of process variables (noted as P). A customized product is the result of making changes to F, D and P. A

customization requirement, ΔF is manifested by the customer's choice of customizable functional features. The customer-perceived value of each customization requirement indicated customer satisfaction in the customer domain and can be measured as a utility, $U(\Delta F)$. To deliver the expected ΔF , the product needs to be modified to a certain extent, resulting in some design changes, ΔD . Similarly the manufacturing process needs to be adjusted (e.g. different set-ups, tool modification) referred to as process variations, ΔP , representing the costs of fulfilling the customization. As a result, the customization decisions depend on the justification of cost-effectiveness around two pillars: the added value of customer satisfaction and the costs of customization.

1.2 Manufacturing costing in the automotive industry

1.2.1 The pressure for manufacturing costing in the automotive industry

Over the last couple of decades the increasing competition in most markets has increased the cost pressure for most firms. As a result costing approaches have been developed to reflect these changes and to support manufacturing managers to quickly make production decision making. First some "scientific management techniques" attempted to relate labor and operations' time measurement and work schedule controls to financial and cost Then different costing approaches have emerged from rules of thumb or generally accepted accounting principles to process based cost models. These models estimate the cost of production by analyzing the various cost components of a production process. They aim at finding and specifying the relationship between product features, process characteristics, production conditions and cost. Managers, academia, and the trade press are all seeking new approaches which provide a more valid and accurate definition of manufacturing costs and a sound basis for product cost engineering and production estimating. Many articles [6] have been written which criticize past and present methods. While the initial methods were rather crude and served mainly to provide rough orders of magnitude, the recent ones become more and more accurate and thus can be largely used by managers for projecting the impacts of production decisions

before critical financial resources are committed. The automotive industry is an example of market, where the automakers have to control their cost for surviving in the competitive environment. Customers will not accept higher prices, so price reductions within the automotive industry have become a norm and OEMs recognize the need to be low cost producers. Manufacturing an automobile is extremely complex, and decision makers have to evaluate design alternatives based on technical and non-technical performance. Projections of performance and cost can be highly uncertain, especially for technologies that are substantially different from current vehicle technologies and for those that are in a fairly early stage of development. Consequently these costing approaches are needed in the automotive industry to draw some preliminary conclusions, to identify the cost drivers, and to obtain a rough idea of what might be on the future automobile market.

1.2.2 The cost of customization

Although customization increases the customer satisfaction, it challenges the ability to maintain the cost of the product, thereby to offer a competitive product. Given the competitive environment of the auto industry, the OEMs should seriously evaluate the profitability of offering customized products and analyze the trade-offs between the benefits and the drawbacks of customization.

The benefits of the customization are easily perceived: customer satisfaction and market share increases. Some studies have identified customization as a means of improving customer satisfaction [7]. It is said that there is a growing demand for customized products and they are perceived as a status symbol [8]. Consumers are willing to pay a premium for customization to reflect the added value of customer satisfaction due to an individualized solution, i.e. the increment of utility customers gain from a product that better fits their needs than the best standard product attainable [9]. Thus sellers can price discriminatorily and charge a price premium since personalized product features better comply with buyers' tastes. As a result of this price discrimination, the company's profits should increase.

However, when a company starts customization, typically its variety of products increases, batch sizes and production volumes become smaller. Figure 1-4 illustrates the economics of production.

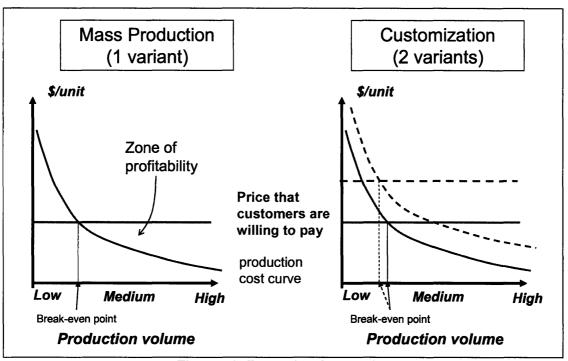


Figure 1-4: Economics of production

The graph on the left of figure 1-4 highlights the break-even production volume. Beyond this specific volume, manufacturing a product is profitable because the potential revenues are superior to the production costs. The high production volume is sufficient to defray the costs of investment in equipment, tooling, engineering and others. By expanding their scale of production in the long run, the company can clearly exploit cost advantages. The effect of economies of scale¹ is to reduce the long run unit costs of production over a range of output. These lower costs represent an improvement in productive efficiency and can feed through to consumers in lower prices. On the other hand, in low to medium volume production where production quantity can not justify the investment, sellers can

¹ By definition economies of scale are the cost advantages due to the fact that the firm's long run average cost curve slopes downward as the scale of the operations expands.

no longer benefit from economies of scale and as such unit costs may significantly escalate. Moreover in low volume production batch sizes are smaller; manufacturing smaller batch sizes means typically more set-ups and changeovers. Ancillary costs are incurred every time a machine is set up or changed over. Some additional costs may also occur due to increased inventories or the use of specific equipments or tooling. Thus customizing a product adds some ancillary costs such as additional set-up expenses, new tools purchasing, etc., so the production curve shifts upward as it is shown on the graph on the right of figure 1-4. In addition the price that customers are willing to pay for the variants goes up because they grant a premium for variety. Consequently the new breakeven production volume shifts (see figure 1-4). Since customization implies reducing the production volume, the manufacturers would expect that the break-even volume of the customized product is lower than the one for the standard product. However it is not always the case as it is shown in figure 1-5.

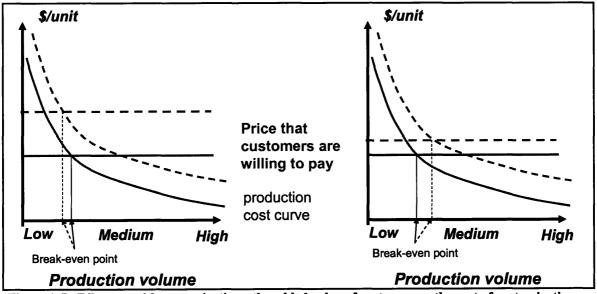


Figure 1-5: Dilemma with customization - the added value of customer vs. the cost of customization

If the customers think that the variants don't match with their needs, they will not grant so much interest. In the case of the right graph, the premium is not high enough to compensate the increase of the manufacturing cost. The break-even production volume is higher than the one in the case of mass production. The customizable product is no

longer profitable at low volume. Finally, these graphs show the importance of comparing customer behavior to the incremental cost of customization.

When managers have to make strategic variety decisions, which affect the number and scope of the variety offered to the customers, they should consider the trade-offs between the benefits and disadvantages of customization. Not all components are customizable, managers can offer variety only if the sales of the variants will increase the company's profits. That means that the managerial decisions should be based on an assessment of whether the additional revenues realized from the introduction of the new variety will be more than the increased cost of providing it. The thesis will focus on the investigation of direct and indirect costs of increased variety. A costing method as described in the previous paragraph can be useful to quickly estimate the costs of introducing or reducing variety. Such a tool will help focus the decision makers on where variety can be added profitably and where it should be avoided.

1.3 Problem statement

As automotive companies look for ways to stay competitive in the global market place, the concept of customization has appeared as a potential advantage. Consequently, a better understanding of the effects of customization decisions on the economics of car manufacturing has high leverage potential. What is needed is a method to help project leaders and engineers manage the incremental costs of providing variety to the market, which is mainly due to the loss of scale economy in design and production. This thesis focuses on issues concerning manufacturing costs of customized products. In particular this is done by developing methodologies to quantify the costs of providing variety and to select products that incur minimum variety costs.

First, a deeper understanding of the level of customization is absolutely necessary. Customization can be carried out with regard to fit, style, and functionality. In the case of car customization, fit is mostly defined by the sizes and the shapes of some

components. Style is the option to influence the aesthetic design of the car, i.e. interior and exterior appearance. A car's functionality can be defined by its performance and power. There are different approaches for delivering these types of customization. The simplest type of customization allows the customer to choose options of style (colors, fabrics) on standard products within constraints set by the manufacturer. A more advanced form of customization examines the need of each individual customer, to analyze his/her habits and to use this to make an individual car for each customer. This advanced form of customization can only be accomplished when an order is placed by a customer, for example through internet. Between these two extremes lie a variety of approaches all of which involve matching the choices of the individual to a library of existing options for the car. Until now customization in the auto industry has only been developed to a limited extent. Customers choose a type of car based on performance and power among a wide panel of cars. They then choose some packages to satisfy their style desire. The fit customization is growing fast in the auto industry, but the main issue for the automakers is to determine whether it is profitable or not. Indeed this type of customization will address much more the needs of a specific customer and, thus, there is a possibility to create additional value. However the required changes in the manufacturing process can be complex and costly. With more than 2000 individual components and as many as 300 sub-assemblies that perform integrated functions in the vehicle, the manager should select the number of possible configurations and determine the relevant level of the customization decision. The question of which costs are affected by the decision to customize requires much closer attention. Before making the customization decision the manager should determine based on the degree of customization whether the manufacturing process should be entirely modified to create the customized product, or if the production line can be adjusted to run the standard and customized products. For example a fit customization such as making a larger seat can require additional reinforcements on the seat structure. The customized seat may be manufactured differently; as a result its cost may more closely resemble that of a completely new lower volume component. On the other hand, the manufacturing process of a seat with a leather cover is very similar to the one of a seat with a fabric cover. However the cost analysis should go further, because substituting materials within an

existing process can change yield, operating rates, tooling lives, and more. In addition it should be examined if the equipment and tooling can be reused or not. A replacement of the equipment or tooling adds some costs because it imposes additional set-up time on the production line, and because the cost of investment is defrayed on a smaller production volume. Since the variable and fixed costs of the customized product may change significantly, the manager should estimate the incremental cost and compare it to the benefit of customization before critical financial resources are committed.

To help managers, cost modeling approach can be used to estimate the manufacturing cost of a customized product and to analyze its key drivers. The thesis develops first a methodology based on a cost model framework to deal with the customization decisions. The model merges economic analysis and technical solutions used to assess cost in the auto components industry. In addition it takes into consideration the degree of customization and the level of variance by attributing additional or more expansive tools as well as time lost to increase setups. From this methodology numerous analyses can be done and several important questions will be addressed in this work. What is the cost difference between a standard product and one with multiple customized variants? What drives this cost difference? Which costs are affected the most? Is this difference dependent on the process, the geometry of the components or on other factors? The thesis will address these questions and provide insight by looking at different scenarios of customization. The scenarios are meant to represent the different conditions under which a manager has to make critical customization decisions in the auto industry.

1.4 Thesis outline

Chapter 2 of this thesis outlines the methods, which can estimate the cost of increased variety. Section 2.1 is an overview of the existing manufacturing cost methodologies, which determine the cost of a single product given product characteristics. Section 2.2 explains the limitations of the previous methods when estimates for a large number of components have to be considered and proposes the System Cost Modeling (SCM) as an

alternative. Section 2.3 incorporates some major developments to the SCM to take into consideration the eventual changes in production when a component is customized.

Chapter 3 explains the framework of the case study, which considers the introduction of new variants in the auto industry. Section 3.1 details the baseline assumptions considered for this particular case. Section 3.2 examines which parts or groups of parts of the car can be considered as customizable and then defines different levels of customization that exist for this specific car. Section 3.3 introduces some customization parameters for every component. First the production volume of the customized component should be determined. Then a degree of tool modification is defined for every component of the customized product. An additional set-up time is also incorporated in the processing time of the customized part. Section 3.4 details the different relationships considered in the model to estimate the tooling and equipment investment of certain manufacturing processes such as stamping, die casting and injection molding.

Chapter 4 includes the results and analyses of the case study. Section 4.1 looks at the cost and cost drivers of the standard product; then compares the results of the standard and customized products; discusses the costs variation when the set of manufacturing assumptions is changing. Section 4.2 provides generalized results of the case study, discusses the problem of customization in the auto industry, and produces some recommendations for the automakers.

Chapter 5 lists the conclusions drawn from this work and details opportunities for extension of this work.

Supplemental data and figures referred to in the remainder of this thesis are found in the various appendices.

2 Model methodology

Understanding the customization decision depends heavily on component cost structures. The OEMs want to offer options to the customers if the premium that the customers are willing to pay is superior to the additional cost to customize. The problem is how to assemble cost information for all the relevant components. For an automobile this could mean thousands of components, for which price information for the standard and customized versions would have to be gathered. Since the customization decision is often taken before production begins, there is little data available about the customized product in a fairly early stage of development. The solution is to model the cost of the components. Indeed it establishes a cost structure for all the components that takes into consideration materials, size, required equipment and tooling, so it would allow changes in relevant variables such as volume or production time. Disciplines as diverse as engineering, operations management, or accounting have attacked this question from different angle. The next two sections present the current status of these costing techniques and analyze their advantages and disadvantages. The last section discusses a specific methodology to address questions of customization.

2.1 Manufacturing cost modeling

The issue of manufacturing cost estimation has long been a source of concern for managers and researchers. Several techniques have been proposed to estimate cost but a lot of them has been criticized [10, 11]. While the initial methods were rather crude and served mainly to provide rough orders of magnitude, the last ones are getting more and more precise in the cost estimation.

2.1.1 Rules of thumb

The best known techniques for evaluating the cost of manufacturing processes are simple rules of thumb. Designers or engineers with experience with the relevant technologies and processes usually develop rules of thumb [12]. They are often based on two of the core cost drivers of any manufacturing activity: materials cost and cycle time. Indeed experience in a particular industry enables experts to accurately predict the materials cost as a share of the total cost, suggests the development of rules that are easy to understand and provides results that are sometimes close to the actual cost of component. Processing time combined with a burden rate can also be used to estimate part costs. However, there are three major problems with the rule of thumb techniques. First, they rely heavily on historical data and previous experience. Therefore they have strong limitations in environments of rapid change in materials, technologies and customer requirements. Second, they assume linear relationships between factors driving cost. Third, these are black-box techniques that do not allow the manager to understand the interplay between the several factors that are driving cost. As a result, relying on rules of thumb to make important technical or managerial decisions can be extremely misleading and costly to the company. A similar method has been developed later, called parametric cost estimation. It provides one or few parameters with which cost estimates can be inter- or extrapolated from known product/cost relationships to estimate the cost of the 'unknown' product. It is simple rules adjusted by a fixed multiplier or other scaling factor ('markup'). The downside of this method is its crude level of accuracy; in addition only for items similar in kind costs can be meaningfully estimated.

2.1.2 Activity based costing methodology

Another technique for evaluating the cost of manufacturing processes is the use of current accounting data and practices in the plant. A particularly popular application is activity based costing (ABC). This method attributes direct and overhead costs to products and services on the basis of the underlying activities that generate the costs [13]. It calculates the cost of activities that serve as cost drivers and 'charge' products with the time with which they consume an activity times the use rate per time unit. However ABC has been

of limited help to engineers and designers concerned with changing the manufacturing lines or choosing between alternative materials. The reason for this situation is that ABC is based on historical and descriptive information, and seldom incorporates any engineering control variables. Therefore it hampers the possibility to establish predictions for new manufacturing systems, materials or part characteristics.

2.1.3 Technical cost modeling methodology

The major problems with the previous techniques are that they offer very limited power for estimating the effects of departures from observed conditions in manufacturing cost. These limitations led to the development of the Technical Cost Modeling (TCM) methodology at the Massachusetts Institute of Technology [12, 14]. TCM is related to the activity based costing idea of accounting principles, but uses engineering, technical and economic characteristics associated with each manufacturing activity to evaluate its cost. The model serves as a mathematical transformation, mapping a description of a process and its processing conditions to measures of cost. The technical cost model is a representation of production processes. Its analysis starts with an identification of the relevant process steps required to manufacture a particular component, and then it is constructed through three steps: (i) identifying relevant cost elements, (ii) establishing contributing factors, and (iii) correlating process operations to cost of factor use [14].

The relevance of any particular cost element is a function of the process under consideration. The set of inputs can be broken into four main categories: exogenous, plant, part and process specific variables. The exogenous variables basically characterize the enterprise's interaction with its environment in a quantitative manner, such as financial data (e.g. the rate of return). Plant data relates to information that is not specific to any part or process but to the organization as a whole. Working hours, downtimes and workers per category are some examples of plant wide data. These two groups of variables are thus plant and part generic, that is, are independent of the product and process under analysis. The product variables define the characteristics of the part, namely, its geometry, weight, the raw materials and their cost. The remaining inputs, that

are the process inputs, require a great understanding of the engineering and physical principles underlying the technologies, which when coupled with expertise in process implementation, permits an estimation of the number of workers, times, equipment characteristics and costs, lot sizes, space occupied, etc. Example of process inputs are reject rate, power requirement.

Once the inputs have been defined, the details of the manufacturing process can be mapped to their contributing factors [14]. For example for the die casting process, the molding tool and the molding cycle time can be identified as elements whose requirements would change with design parameters, and could be predicted based on the initial parameters describing the part. Cycle times affect the number of parallel streams necessary to achieve a specified production volume, and are related to part design and process operating conditions. This mapping to design parameters is achieved one of two ways; either based on existing empirical evidence or according to basic scientific and engineering principles. Then a predetermined functional form is assumed and the dependent variables are regressed on the relevant independent ones. Regressions can be linear or can use mathematical transformation to produce linearized forms of non-linear relationships. For example in the die casting process, the solidification time can be expressed by Chvorinov's rule: [15]

Solidification time =
$$Cte \cdot \left(\frac{Volume}{Surface\ Area}\right)^2$$

where

Cte = constant based upon mold material properties, solidification temperature, and pouring temperature.

Volume = casting volume.

Surface Area = casting cooling surface area.

Since it is difficult to obtain accurately such data for every part of the complex system, this solidification time can be estimated by regression analysis. The experts can observe different times for several components; with this information they can then estimate a relationship between this time and part volume, part thickness, material density, thermal conductivity, and coefficient of thermal expansion. As we see in this example, it requires

not only material property information, but also a reasonable description of the cast part's geometry.

The third step in creating a technical cost model is translating the process factors into costs. The total cost of each unit operation is broken down into separately calculated elements: the variable and fixed costs. The variable costs can be directly associated with the production of one unit of output, thus increasing roughly linearly with the production volume. On the contrary, fixed costs remain constant until production capacity is reached, whereupon more equipment is required. These categories are then subdivided into variable costs of material, direct labor, and energy; and the capital costs of main and auxiliary equipment, tooling, building, maintenance and overhead.

Variable costs

The material cost category includes the primary or raw material required for a part as well as any process consumables. The type of material, the amount of scrap and the value of scrap are all important factors in determining material cost. Labor cost includes only the direct labor required for part fabrication. The fully burdened (including benefits) wage, amount of planned and unplanned downtime, and number of labors needed are some of the factors that affect labor costs. The indirect labor is captured in the overhead cost category. Energy costs include the cost of running machinery as well as any additional heating or other energy related input.

Fixed costs

Main machine cost includes the cost of the primary machinery used for the fabrication of a part as well as the installation cost of the machinery; installation cost is usually estimated as a percentage of the machine cost. To calculate the machine cost, the investment required in main machines is first determined from the attributes needed to produce the component. Once the investment is determined a method is needed for allocating those costs among the numerous products that may be produced on this equipment over its lifetime. First the investment is amortized over its useful life in order to obtain an equivalent yearly cost, because it would not make sense to charge the entire

investment to just the first year or years of production. Next, a decision has to be made about how to spread that yearly cost among the numerous products which could be made on that same equipment each year. In the case of dedicated manufacturing, the cost is then the cost of one year of machine use. For non-dedicated manufacturing, the cost is the percentage of yearly machine capacity used times the cost of one year of machine use. Whether or not a machine is dedicated, cycle time, part size, and manufacturing technology all contribute to the unit cost associated with the main machine. Tooling cost includes the cost of dedicated tools required for the manufacturing process. Tooling cost is usually amortized over the life of the product to arrive at an annualized tool cost. This can then be distributed among the part production volume to arrive at a unit tool cost. Product size, complexity, tool material, and any required tool action (such as release springs or pins) can affect tooling cost. Overhead costs include managerial labor as well as other support services. Overhead costs are often estimated as proportional to yearly machine, tooling and building costs. In some cases, the overhead labor costs can be estimated as a number of indirect workers needed to support the functions of the direct Building cost is the cost of the fully built up factory space that the manufacturing operations occupy. The investment in building space is amortized over the life of a building resulting in an annual building cost equivalent. In the case of dedicated manufacturing the building cost is the yearly cost. For non-dedicated manufacturing, the cost is a percentage of the building space used times the yearly cost. Auxiliary equipment costs are the costs of equipment that is required to produce the part, but is often not part of the investment quoted for the main piece of equipment. These costs would include things like conveyance systems, lockout equipment, computers and controllers. Auxiliary costs are often estimated as proportional to main machine cost. Finally, maintenance cost is the cost of upkeep on machines, tools, and auxiliary equipment. Maintenance cost usually scales with the yearly cost of machines, tools, and equipment.

Most applications of TCM have been limited to comparisons involving limited number of parts in one or more competing individual processes to understand the economic implications of changes in process or in critical design parameters (e.g. material,

production volume, factor condition). For example the United States council for automotive research (USCAR) developed a set of Technical Cost Models that are capable of assessing the manufacturing cost associated with the sand casting and die casting of various engine components in both aluminum and magnesium materials [16]. The importance of the model is not in producing an accurate manufacturing cost, but in examining how changes impact cost. Examples of changes that can be made are production volume, equipment type or material selection. A variety of gradual changes can be examined across many aspects of the production process.

2.2 Cost modeling of complex systems

2.2.1 The limitations of the Technical Cost Modeling methodology

The large majority of today's products are the result of a complex combination of parts that require numerous operations in their manufacturing as well as substantial assembly effort. The seat of an automobile, for example, may require 40 different individual parts and more than 10 different processes. If a manager wants to estimate the manufacturing cost of a seat using the TCM approach, he would need to use a combination of a significant number of different Technical Cost Models. For each of them, part and processing information has to be gathered and processed. Because of the high level of details associated with TCM, combining a large number of TCM will require large amounts of information. For the seat example, given that an average model requires the introduction of 25 descriptive variables, more than 10,000 variables would have to be accounted for. For a manufacturing firm, a high level of detail in cost estimation can be very important for rigorous competitive assessment, particularly at the manufacturing stage [10]. If this is the case, companies assemble large teams of engineers and can hire people devoted to estimating the cost of each individual part. However this operation is time consuming, and entering and manipulating large number of variables is very prone to errors. For the overall assessment of a system in early stages of development, or to investigate the generic impact of changes in factor conditions, such a level of detail is not

desirable and sometimes even not possible to achieve. Therefore it is important to develop other less data intensive methods to estimate costs at the early design stage.

2.2.2 The system cost modeling

The TCM methodology is useful when comparing designs or materials solutions for individual or small groups of components. It becomes less practical and sometimes infeasible when trying to model several hundred components. To solve that problem a method has been developed which simplifies the traditional technical cost modeling techniques and uses a limited number of inputs [10]. This method, called the System Cost Model (SCM), "aims at establishing a systematic way to estimate cost functions for complex systems, such as the interior or the chassis of a car, where multiple processes and diverse components are present" [10]. The level of data is reduced but cost estimates are also less precise.

SCM is one modeling structure using different production data for a large number of processes and components. In a similar way as the TCM methodology, SCM breaks down the total manufacturing cost of each components of the system into fixed and variable costs; and then the cost estimations over individual components are aggregated. SCM estimates each of cost factors and process use time with limited information and using simple rules. To limit the number of inputs, the inputs chosen should be used as common inputs to all process models. These inputs might include one to represent the size, because the size is a major factor needed to determine the characteristics of the required processing equipment and tooling. There are many possible proxies for the size of the component: mass, volume or surface area. The choice of this proxy depends heavily of the characteristics of the process. For example in the die casting process the machine characteristics are mainly determined by the projected area, because the die casting press is chosen according to the range of clamping force that it could provide, and the clamping force requirement can be estimated as a function of the part projected area. However for all the joining processes such as adhesive bonding, the most relevant input is the length of the joints. The ideal alternative is to work off one variable that reflects

the part size but that in some processes this is best represented by mass and in other processes by volume. Sometimes the surface area might be even more appropriate.

Another input might include one to represent part complexity. Since detailed information regarding shape, thickness, number of holes etc. might be essential to calculate the equipment or tooling characteristics, a complexity factor can be introduced to substitute this information. It would be estimated by judgment. The lowest level would correspond to simple components; higher levels of complexity would imply more details or additional features that require more complex (and therefore more expensive) equipment. Inputs to indicate which processes and which materials are used should be included. Indeed the material information is critical to estimate the material cost, which is often a significant portion of the total. These simplified inputs could be used directly to determine equipment cost, tooling cost, labor usage, cycle time and material needed for the relevant manufacturing of a component. Then following the TCM logic, the costs are derived from these core estimates.

Unlike TCM that uses detailed component characteristics together with engineering and statistical relationships to determine cost, SCM establishes a direct relationship between the inputs described in the previous paragraph and the cost drivers. In order to simplify the calculations, it is convenient to come up with a uniform modeling scheme that applies across products and processes, thus a similar relationship might be chosen for all the processes. For example for the equipment cost, several authors on the area of cost estimation [12, 17, 18] show that a logarithmic relationships between weight and equipment cost seems to hold in a number of other circumstances. Since this type of behavior is observed for diverse technologies, they suggest a generic choice:

$$Cost = A \cdot (Weight)^b \cdot (Complexity)^c$$

where the relevant parameters A, b, c have to be estimated. The initial estimate of these coefficients is based on a three-point estimation [10], which is basically a regression from three specific points for every process. Once these three specific points are determined,

the three parameters A, b and c are solved by a system of equations. The detailed calculations can be found in the appendix A.

Generally speaking, tool costs are difficult to estimate because they are designed as a unique item for each part. Statistical regression models have been shown to yield reasonably good estimates in some case [12, 17]. However, like many other aspects of previous TCMs the inputs to the regression equations varied widely by process. For SCM, regressions using a limited number of common inputs had to be developed for all processes. Since full regression models for each process would require a great deal of data, the first approach has been to apply the logarithmic relationship for all processes to estimate the equipment investment, tooling investment, cycle time and the number of workers. However, a comparison of the die investment of various stamped components estimated by the system cost model and the real investment occurred by General Motors to manufacture these components show that the percentage of errors can be significant for complex parts. Figure 2-1 indicates that the investment versus complexity relationship does not hold very well at complex level 3. Sometimes the error percentage can reach up to 70%. Since this model is used for managerial decisions, it is important to get more accuracy in the relationships and to decrease the percentage error, especially for the complex parts. The solution would be to develop mathematical models for every process and every intermediate variable (equipment investment, tooling investment, cycle time and the number of workers). As explained in the next section, some major developments have been considered on the current SCM to capture more details of the cost of the components.

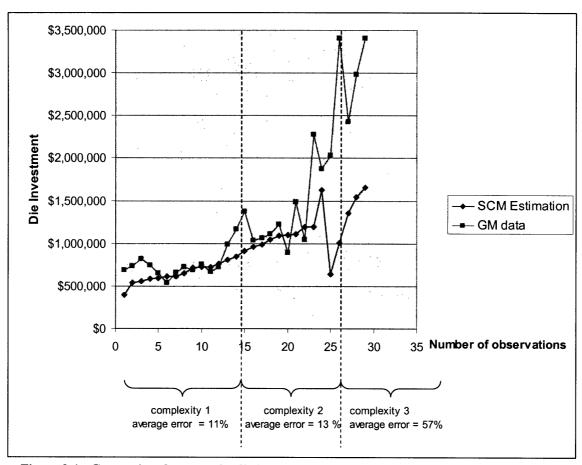


Figure 2-1 : Comparison between the die investment estimated by SCM and the real investment occurred by General Motors

2.3 Extension of the SCM for customization decisions

SCM is a methodology developed to evaluate the cost of complex systems with a large number of individual components and subsystems. This approach involves critical simplifications from traditional technical modeling techniques. Thus it provides only reliable calculations of the overall system costs. The goal of this thesis is to modify and apply this model to be able to make customization decisions, either on a large group of components such as a seat or at the component level such as the front brake or the accelerator pedal. Consequently, the model should be able to generate accurate cost estimates on the component level as well as on the subsystem level. To accomplish this, an extension of the SCM with a focus on getting more accurate individual component

cost estimates was required. Furthermore, specific parameters to be able to address customization decisions had to be added.

The first section focuses on the modification of the relationships to get more accuracy in the intermediate variables. It reconsiders the way to estimate the reject rate, the trim scrap rate and the energy cost. The last section incorporates some additional parameters to be able to estimate the cost of increased variety.

2.3.1 Limitations of the SCM

The existing SCM needed further development to improve calculations related to the reject rate, the trim scrap rate and the energy costs. In the technical cost model approach, the reject rate and the trim scrap rate are considered as fixed. Each is provided as a single input with the same value applied to all processes. These rates are not only dependent on the process characteristics, but also on part characteristics. That means that to be realistic, a reject and trim scrap rate should be attributed to each component in the system cost model and thus the model would need thousands of additional inputs. The solution considered in the thesis was to set up a means for directly estimating trim scrap and reject rate based on part characteristics and the process. Building on the methods employed throughout the SCM, a three point logarithmic relationship was used. This avoided the need for extensive statistical data, while preserving a structure that could later incorporate With this statistical data to improve the accuracy once data becomes available. information, an estimation of the scrap rate can be done for every component of the complex systems manufactured by a specific process. The reject rate has been estimated by a similar method.

In the technical cost model approach, energy costs are calculated from different inputs, such as power requirement of the equipment, electricity price. While the electricity price can be a general input for the system cost model, attributing a power requirement for all the thousands of components is unrealistic since it would require a very large increase in the number of inputs. To overcome this difficulty while keeping the accuracy of the

component manufacturing cost, energy requirements are calculated for each component based on its manufacturing process. To do this, energy cost calculations have been divided into three categories, corresponding to the possible energy sources characteristics: mechanical, electrical or thermal energy. The mechanical energy can be provided through relative motions, or pressure differences, or mass forces generated in the component. The electrical energy can be provided by a discharge between two electrodes, electromagnetic fields or simply by using electrical machine. And the thermal energy is related to the heat required for melting, evaporation, etc. Since a large amount of the energy may be lost during production, energy losses are also taken into account.

Each of these categories can then be estimated using physical relationships and engineering rules of thumb. Mechanical and electrical energy costs have been estimated as a percentage of the equipment cost. This simple approach provides reasonable cost estimates without the need for more complex model inputs. However, a more detailed approach based on the actual energy requirements of the part would yield additional refinements to the cost estimates. However, for the cost of thermal energy, this approach is rather inaccurate. Thermal energy requirements are more likely to scale with the type of material and its thermal properties rather than the equipment used. Therefore a more detailed treatment of the costs associated with thermal energy was required. First, the energy required to raise the temperature of the component from the ambient temperature to its processing temperature is determined. By definition the heat necessary to raise the temperature by ΔT is:

Heat necessary =
$$m \cdot C \cdot \Delta T = m \cdot C \cdot (T_{processing} - T_{ambient})$$

Where m = mass of the component

C = specific heat (the amount of heat energy required to raise 1 g of a substance by 1° Celsius)

Then any heat losses through the tooling or equipment are calculated in order to determine the total thermal energy needed. This extra consideration was important to include because heat losses are often a significant portion of the total energy requirement. For example the heat losses in industrial heating processes are considered to be around

50% of the available energy [19]. Waste-gas heat losses are unavoidable in the operation of all fuel-fired furnaces, kilns, boilers, ovens, and dryers. Air and fuel are mixed and burned to generate heat, and a portion of this heat is transferred to the heating device and its load. These furnace losses include: (see Figure 2-2)

- Heat storage in the furnace structure.
- Losses from the furnace outside walls or structure.
- Heat transported out of the furnace by the load conveyors, fixtures, trays.
- Radiation losses from openings, hot exposed parts.
- Heat carried by the cold air infiltration into the furnace.
- Heat carried by the excess air used in the burners.

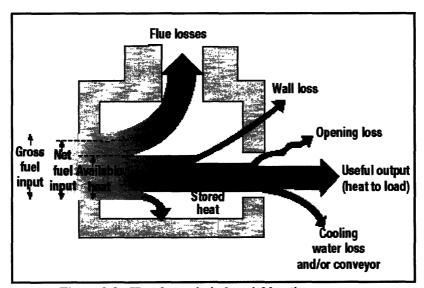


Figure 2-2: Heat losses in industrial heating processes

The greatest source of heat loss in the process is the material handling losses and wall losses. However the material handling losses are not easy to estimate, because it is dependent of a large number of inputs such as the opening of the furnace, the time of load and transfer. It could be represented as a percentage of the heat loss. On the other hand, the wall losses are easy to estimate quantitatively:

Heat losss per unit area =
$$k \cdot \frac{\Delta T}{\Delta x}$$

Where k =thermal conductivity of the structure.

 $\Delta T/\Delta x$ = gradient of temperature inside the wall of the structure.

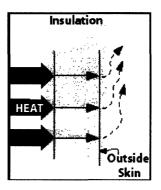


Figure 2-3: Wall losses through a furnace

To conclude, the updated SCM develops certain relationships for the reject rate, trim scrap rate and energy cost. These relationships and the underlying assumptions remain a rough estimation and need further analysis.

2.3.2 Incorporation of customization parameters

Generally, when a product manager wants to determine if it is profitable to have more variety within the future or current product line, he looks at the direct costs of increased variety. Will it require more capital equipment or more space to have more product extensions? How many additional hours will it require to make the customized product? Will any tools have to be added? In order to answer these questions, some customization parameters needed to be incorporate in the updated system cost model.

First it is necessary to introduce a variable for the number of variants and their associated production volume. Incorporating customized product in a product line implies some modifications into the parameters of the product line. Because the construction of any production line is a large investment, the manufacturers prefer to reconfigure the current production lines to handle multiple variants of new product designs. But even if possible, a reconfigurable production line is not without costs. Additional equipment set ups are needed to switch between product variants. Furthermore changes are required to the equipment and tools resulting in modified (and usually increased) costs. The annual equipment is the same for any customized and standard product, but the relative time during which the capital is used for the relevant product is different for the two products.

The process time use is defined as the ratio between the line utilization time, which corresponds to the amount of time needed to manufacture the required volume of components and line available time that indicates the amount of time that the manufacturing equipment is available for the operation. Since the latter indicator is the result of company operating policies, including number of shifts, holidays, and planned line down time, it is the same value for the customized and standard products. However the line utilization time will be lower for the customized product than the standard product. Thus the model should consider separately the process time use, the cycle time, the equipment and tooling cost of the customized and standard product.

It is also important to take into consideration some variations in the initial inputs due to customization. Indeed the customized products may require different material requirements, different or modified equipment or tooling investment. For example, a change in the size of the stamped seat rack can imply a change in the tandem press, if the required tonnage to manufacture this new seat rack is higher. The first reason is that the calculation of the required tonnage is a function not only of the mechanical strength of the material, but also of the part forming area. The second reason is that each tandem press should be chosen according to a range of tonnage. Consequently, the equipment cost has to be determined both for the customized and standard product. While this is often the case, we have only considered limited changes in the customized product and therefore have not needed to consider possible use of alternate equipment in our case study described in chapter 3.

In a similar way, customized products may require additional tooling investment or modified tooling investment. For example, if the size of the customized product, manufactured by a die casting process, increases, the OEM should have a completely new mold. In general each customized part has to be analyzed individually to decide on the degree of tooling alteration required. While customized products may have substantially different costs, we have considered the variants to be very similar. As a result the only changes considered are the tool investment and the increased set-up times. The increased

number of set-ups will lead to longer equipment and labor times thus affecting those cost elements as well.

To conclude, several costing approaches have been developed in this chapter from the first rules of thumb to the technical cost model. The development of these successive models has been pushed by being more and more accurate in the cost estimation. The system cost model relies on a more simplified engineering approach, implying less accuracy. The updated model developed in this thesis aims at being used for the customization decision, thus it seeks for a better accuracy in the component cost estimation through the identification of new parameters or modification of old ones. All these development are essential to further analyze the cost of customization associated to some components or groups of components of a car, as it is reported in the next chapter.

3 Case study definition: customization of an automotive

The usefulness of SCM can be more clearly show through its application of a case study. This case study would focus on the estimation of the manufacturing cost of a complex system and then the estimation of the customization cost. In this chapter the case study explores the model in the context of the automotive industry. With more than 2000 individual components and as many as 200 sub-assemblies, the car is a clear example of a product for which it becomes extremely complex to have detailed cost estimations for all the components. The car analyzed in the case study is a mid-size car manufactured by a major European manufacturer, Volkswagen, produced in 1999. The structure of this Volkswagen car is described in Table 3-1. The structure has been subdivided in different levels. Following a typical division found among OEMs, eight major groups are considered: powertrain, chassis, Heat Ventilation and Air Conditioning (HVAC), interior, body, exterior and electronics. They enable a good understanding of the relative importance of major areas of the car. The secondary level reflects typical sourcing decisions for automakers for supplying sub-assemblies. Table 3-1 describes how the total number of individual components is distributed over these two levels.

Groups	Number of sub-Assemblies	Number of components	
Powertrain	40	434	
Chassis	51	387	
HVAC	14	173	
Interior	39	433	
Body	22	129	
Exterior	31	109	
Electronics and control	27	452	
TOTAL	224	2117	

Table 3-1: Example of car structure (Mid-size car, Volkswagen, 1999)

For each of the components, the weight (as a proxy of the part size), material, complexity and process information has been gathered. In some cases up to three manufacturing processes per component have been considered. For example, the alternator housing, which is made out of aluminum, needs first to be die cast and then machined. An important caveat is that the component breakdown used in the case study does not consider body-in-white (BIW) at the level of individual components. It also does not consider the cost of painting the BIW (although the cost of painting for non-body components is considered) nor the cost of engine dressing or the final or general assembly line by the automaker. It only includes the cost of producing the individual components and assembling them into modules or subassemblies. However it will be substituted by a fixed amount of \$1,500 in the case study.

The first section of this chapter explains the baseline assumptions considered for the study of the customized car described above. The second section examines the different levels of customization existing for this car. Finally the last section describes the detailed relationships considered in the model for certain processes: stamping, die casting and injection molding.

3.1 Baseline assumptions

The calculation of the manufacturing costs associated with the components and sublevels in the car rely on a set of baseline assumptions, described in Table 3-2. Production volume and number of years in production are instrumental in defining the type of vehicle and its useful life. These replicate what is typically found for high volume vehicles in Europe or US. The equipment life of 10 years corresponds to what equipment manufactures and parts suppliers usually report on average, although these can vary with process. For the remaining set of variables, values are based on operating conditions found in the automotive sector in the US and Europe. These values reflect direct information gathered from interviews with firms, or values in published resources. Most of the base information was obtained by Veloso, Henry et al. [20] to assess the competitiveness of the Portuguese auto parts industry. The number of days of operation per year is estimated at 240 days. It assumes no work on weekends and two weeks of line down for personnel holidays. Two shifts correspond to having 16 hours of operations per day. The remaining time is reserved for tasks such as maintenance and line problems. The line available time of 87.5% corresponds to having 2 hours of additional line downtime, both for planned activities and unplanned breakdowns, during the 16 hours of daily operations. Free capacity utilization indicates how the remaining available production time which is not needed for a specific component is used. A value of 100% indicates that all remaining time is used to produce other components, while a value of 0% indicates that the line sits completely idle the remainder of the time. The baseline assumption is that all free capacity is used.

Annual production volume	200,000 parts/year
Years of production	5 years
Life of equipment	10 years
Interest rate	12%
Wage (\$/hour including benefits)	\$56
Days per Year	240 days/year
Number of shifts	2
Line available time (Uptime)	87.5%
Free capacity utilization	100%

Table 3-2: Baseline assumptions of the case study

As it has been mentioned in section 2-3-2, the energy is divided into three categories. The first one is the mechanical energy, which represents 3% of the equipment investment in the baseline assumption. The electrical energy represents 30% of the equipment investment. The thermal energy is considered for the case study as the energy required for melting the component in a typical furnace, whose dimensions are 4 feet by 4 feet by 6 feet, and whose thermal conductivity is the same as a refractory material.

Finally these are the baseline assumptions to manufacture a car in the US or Europe. The two other sections incorporate some additional inputs, which are related to the customization process.

3.2 The levels of customization

The word "customization" is becoming popular for several industries, particularly the automotive industry. However it is difficult to define the customization concept. One first visionary definition of customization can be the ability to provide your customers with anything they want, any time they want it, anywhere they want it, any way they want it and to do this while still remaining profitable. This is quite a goal, but in fact until now one which can rarely be achieved. A practical definition for the car manufacturer is the ability to efficiently deliver many variations of a standard product, each customized to the expressed preferences of the buyer. The products referred to in this second definition are not the "anything-at-any-time" promised by the visionary definition; rather, they are customized within a predetermined envelope of variety. The goal is to ascertain, from the customer's perspective, the range within which a given product can be meaningfully customized for that customer, and then to facilitate the customer's choice of options from within that range. In the car industry one problem of customization is to determine at which level the car manufacturer should offer the variety. Indeed if the manufacturer attempts to offer variety at the component level, the number of possible configurations increases dramatically. For example the front seat consists of six sub-assemblies: the buckle assembly, the cushions, the covers, the frames, the armrest and the headrest. In total that means about 30 components. manufacturer offers two versions (one standard and one customized version) for all the 30 components to the customers, that corresponds to 2³⁰ possible seat types, that means more than one million of combinations. The number of combinations is higher if the manufacturer offers more versions for each component. This number becomes enormous if this method is applied to a large complex system such as a car composed with more than 2000 components. In reality the customers don't ask for so many choices at the component level, but they have specific needs at a different level. For example if they seek the maximum comfort in their seat, they can ask for a specific seat width, depth, or angle, or a customized backrest, whose dimension are larger or taller than the standard seat, which only fits for an average individual profile. Since a change in a seat width, for example a larger seat, implies modifications in some dimensions of the seat rack, the seat back rack, the cover and also the cushion, it is clear that the level of individual components is not the relevant level of analysis for a customized seat. The customer will not ask to change the size of the cushion, but most probably the size of the frame; however there is a strong correlation between the cushion and the frame. That is why all the components of the seat belong to the same group of customization. On the other hand, customers may want variety at the component level such as for the fender liner or the brake pedal. The question of customization level is specific for each component or group of components. Thus, in the case study the individual components have been all analyzed and aggregated at a customization level. The criteria for the determination of the customization level were the following:

- Can the cost model be used to address the customization by a variation of the components inputs? For example, if the customized product requires a variation in the size, material or the complexity, it can be address in the updated SCM. However, customization that requires other types of variation such as a change in the motor oil are not addressed by the SCM and therefore cannot be included in this study.
- Is there an interest in customization? Neither customers nor designers have much interest in customized versions of all vehicle components.

Figure 3-1 shows an example of some components considered for customization of the chassis group (the levels of customization are highlighted in bold). A complete list of all components and their customization level can be found in Appendix B. In the case study the customization of the engine is not considered. While consumers might like to choose engine variants, it was beyond the scope of the SCM to consider the impact of these variants on production costs. The same is true for the air-conditioning system. On the

other hand, in the chassis group, several sub-groups can be customized such as the front brake, the rear brake, the accelerator pedal, the clutch pedal, the rear suspension, the steering column and the fuel tank. Many components in the interior group are also easily customizable; all the sub-groups can be customized except the air bag system. In the exterior group we consider that the following groups are customizable: exterior rear view mirror, seal, front bumper, rear bumper, radiator grill, and spoiler. Table 3-3 described how the total number of customizable groups is distributed over the eight major groups of the car.

Groups	Number of sub- Assemblies	Number of customizable groups	Number of components
Powertrain	40	1	434
Chassis	51	14	387
HVAC ²	14	3	173
Interior	39	35	433
Body	22	3	129
Exterior	31	7	109
Electronics and control	27	2	452
TOTAL	224	65	2117

Table 3-3: Components, groups of customization and sub-assemblies groups for the Volkswagen car

² Heating Ventilation and Air Conditioning

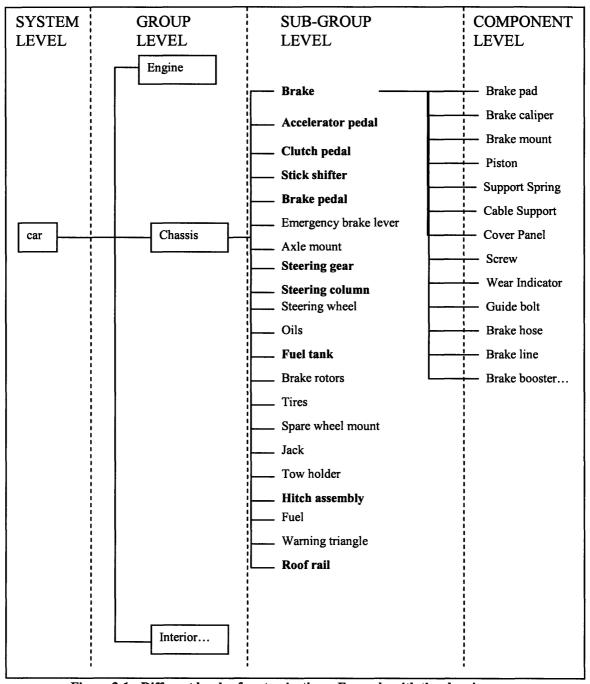


Figure 3-1: Different levels of customization – Example with the chassis group

3.3 The other customization parameters

As it has been mentioned in chapter 2, there are several parameters which characterize the degree and the type of customization. The subject of the case study is a comparison of production for a single vehicle versus production of that same vehicle plus a customized variant (variants A and B). We assume for the study that the size and materials of the customized components are not changed; only the tooling, the equipment and the line utilization can be modified. The four simple metrics (weight, material, complexity and process) are the same for both the base vehicle and its variant. The total production volume in both cases is 200,000 vehicles per year. However, for the scenario involving a customized variant, the overall production volume of 200,000 is divided into 120,000 vehicles per year for one variant and 80,000 vehicles per year for the other.

As mentioned in the previous chapter, the set up time needed to be adjusted for the customized product. In the case study the production lot size is 5000 parts and thus one changeover is needed for every 5000 parts. For the customized products, two changeovers must be considered for each 5000 parts in order to take into account the need to set up the equipment twice (once for each variant) for each production lot. While the lot sizes were considered to be 5000 parts for all manufacturing processes, the set up time varied by process. Table 3-4 gives an example of the set up time considered for different processes.

Manufacturing processes	Set up time
Sand Casting	0 min
Die Casting	5 min
Forging	10 min
Extrusion	10 min
Stamping	10 min
Hydroforming	20 min
Bending	2 min
Machining	0 min
Molding	10 min
Welding	0 min

Table 3-4: Set up times for different manufacturing processes

Finally, the case study needed to consider the effect of producing a customized variant on the tooling investment. The tooling investment can be separated into two categories: the design cost and the construction cost. The design cost is common for both the customized and the standard product, whereas the construction cost is specific depending mostly of the degree of tooling change. In the case study the baseline assumption considers that the design costs represents 10% of the total tooling investment. Since this number is estimated, a further sensitivity analysis will be done in the next chapter. While a continuum of tool modifications and their costs exists depending the specifics of the part and the degree of customized desire, only three options were considered in order to simplify the problem. First, the customized product may require no significant tooling changes. In this case the annualized construction tooling cost is exactly the same for standard and customized products. Second, a small modification to the tool is needed. In this case the tool investment was increased by 30%, called the modified tool rate. Finally the customized product requires a completely different tool. Some savings in terms of design cost may still be possible and thus the additional investment needed for the tool for the customized component was considered to be 90% of the cost of the initial tool. Table 3-5 describes the distribution of all the components over these three categories. It is important to notice that in our case study 65% of the cost is completely unaffected, 23% is greatly affected (radical tool change). So the cost of customization will come from only 27% of the total cost of the car.

Categories of components	Customization parameters	Number of components	Cost for the baseline product
No customized components (incl. BIW Manufacturing/Engine Assembly)		1,457	\$6,559
	No tool change	360	\$502
Customized components	Small tool change	78	\$365
	Radical tool change	222	\$2,360
TOTAL		2,117	\$9,831

Table 3-5: The different categories of customization and tooling modifications

3.4 Modification of the SCM relationships

Improvements in the SCM focused on adjusting the estimated relationships between the simplified inputs and some of the intermediate variables such as the equipment, tooling investment, cycle time and the number of workers. The functional form used in the SCM is not realistic for all the processes. The ideal would be to gather more data from experts and OEM databases and to develop the mathematical models used for SCM cost elements with these new data. This has been done for the major component fabrication processes. The first step was to identify those processes which are most frequently used in component manufacturing. Tables 3-6 and 3-7 give the distribution of the different manufacturing processes for the entire vehicle for the Mid Size Volkswagen produced in 1999:

Table 3-6: Distribution of the primary processes for the entire vehicle by number of parts

Manufacturing Percentage of **Processes** parts 37% Stamping Plastic Molding 31% Casting 4% Forging 1% 1% Roll forming 1% Extrusion 2% Bending 23% Other (less than 1%)

Table 3-7: Distribution of the primary processes for the entire vehicle by weight

Manufacturing	Percentage of
Processes	weight
Stamping	14%
Plastic Molding	10%
Casting	9%
Forging	40%
Roll forming	1%
Extrusion	2%
Bending	2%
Other (less than 1%)	22%

The tables show that the major manufacturing processes are stamping, plastic molding, die casting and forging. From interviews with General Motors experts [21], data collection from General Motors Laboratories and other resources and from some current TCMs used by General Motors, an analysis has been done to get better relationships for

stamping, injection molding and die casting. However to capture more details in the relationships it was necessary to add a few additional inputs about the components, such as its thickness, projected area, or surface area. One idea was to categorize the components per process. The next sections analyze in details these categories and the relationships for the three major processes.

3.4.1 Stamping

Stamping is the process of impressing surface definition and three-dimensional designs onto materials with pressurized tools and dies. The main steps of the operations are blanking and stamping. Stamping can be associated with some major forming operations such as drawing, forming, and restrike. In a standard stamping press, there are four basic components:

- The machine itself, providing the power and the physical structure
- A pair of parallel surfaces that close and open again under power (the "bed", which stays still and the "ram" which moves down and back up)
- A two-part die-set, one part of which is fastened to the bed and the other part to the ram.
- The job-specific punches and dies.

When the ram closes, the punches and dies interact, cutting, bending, etc, and making the desired part. When the ram opens again, the part(s) are removed and new material is moved into place. Figure 3-2 shows a schematic of the typical stamping die.

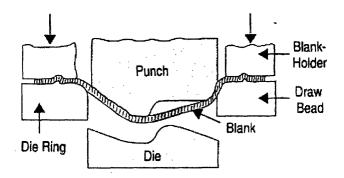


Figure 3-2: A schematic section of a typical stamping die.

The sheet contacts only the punch or the die at any point. Membrane stresses stretch the sheet over the tools.

In this sort of press, the motion supplied by the machine is all vertical. It makes flat parts easily. Stamping can be also used to make some very complex shapes using bends and draws; however this adds to die complexity and cost. The press section is used to make holes and certain other part features. The major factor determining the choice of the press is the tonnage. Every press has a range of tonnage. After gathering data about several stamped parts and their related tonnages, a regression analysis has given the following relationship between the tonnage, the complexity and the area of the part:

Estimated tonnage =
$$27.041 \cdot Surface area \cdot [0.01 \cdot (complexity + 2)]^2$$

With Surface area =
$$\frac{Weight}{Density \cdot Thickness}$$

Since each new complex feature requires expensive cams, benders or other sub-machines to be built into the job-specific tooling, the tooling cost is heavily dependent of the complexity and surface area of the part. A regression analysis from GM data about stamped parts gave the following relationship:

Estimated Tooling Investment = \$11,950 + \$155,888 · Complexity + \$612,322 · Surface Area

These relationships are specific to the stamping process. A similar method of regression analysis has been done to find the detailed relationships for the die casting process.

3.4.2 Die casting

Die casting is a process for producing engineered metal parts by forcing molten metal under high pressure into reusable steel molds. These molds, called dies, can be designed to produce complex shapes with a high degree of accuracy and repeatability. The categories of components for the die casting process are described in Table 3-8. On average, the thickness of the parts in the die casting process is 4 millimeters. Some components are thinner, so their thickness is closer to 2 millimeters; the largest components have a thickness about 8 millimeters. The other variable is the ratio

between the surface area and the projected area of the part. An average ratio is 3. If the part is more curved, the ratio is bigger and about 5; on the other hand the ratio can be lower and about 1.5.

Ratio = surface	Thickness of the part			
area/ projected area	2 mm	4 mm	8 mm	
1.5	Bracket Assembly A/C compressor	Steering column support	Bracket A/C compressor Lower Front	
3	Suspension arm	Support ASM	Transfer case	
5	Motor cover	Instrument panel beam	Cylinder Mount Bracket	

Table 3-8: Typical components for the die casting process

In the die casting process, molten metal is injected, under pressure, into hardened steel dies, often water cooled. Dies are opened, and castings are ejected. The major factor of the equipment investment is the clamping force, which is dependent of the complexity and the part projected area. After gathering data about several GM parts, the regression gives the following relationship:

Estimated Equipment Investment = $\$16,755 \cdot (Clamping Force)^{0.5615}$

With Estimated Clamping Force = $7,750.02 \cdot \text{Projected Area} \cdot (1.5)^{\text{complexity}}$

Estimated Projected Area =
$$\frac{Surface\ Area}{Ratio} = \frac{Volume}{Thickness \cdot Ratio}$$

The cost of the mold increases as the part geometry becomes more complex. Thus, the tooling investment is a function of complexity and surface area. The following relationship comes from the Technical Cost Model made by IBIS Associates [16]:

Estimated Tooling Investment = $\$13,085 \cdot Complexity \cdot (Surface area \cdot Complexity)^{0.294} \cdot Adjust$

With
$$Adjust = \begin{cases} 1 & if \ complexity = 1 \\ 1.6 & otherwise \end{cases}$$

The last process, where detailed relationships have been estimated is the injection molding process.

3.4.3 Injection molding

Injection molding is a polymer processing method similar to the die casting method for metals. A granular polymer material is fed from a hopper into a screw chamber, where it is heated and melted and then injected under high pressure into the mold or die and allowed to solidify. Examples of the applications of this process include the bumper and head lamp. We can distinguish different categories of components manufactured by the injection molding process, which are summarized in Table 3-9. The average thickness is 2 millimeters, the thinner parts have a thickness around 1 millimeter, and whereas the largest molded parts have a thickness around 3 millimeters. The ratio has a range from 1 for the flat parts to 5 for the curved parts.

Ratio = surface area/	Thickness of the part			
projected area	1 mm	2 mm	3 mm	
1	Duct ASM-Air Distribution	Panel ASM-Quarter Upper Trail	Panel ASM-D/Seat Back Cushion Outer FIN	
3	Liner ASM-Rear- Wheelhouse Panel	Module ASM HTR& A/C EVPR&BLO	Fascia ASM Front Bumper	
5		Pocket Body Side- T- Panel		

Table 3-9: Typical components for injection molding process

The molding machines are mainly characterized by their clamping force (up to 30 MN). In the updated SCM, the relationships for the equipment and tooling investment come from the ones used in the Technical Cost Model developed at MIT Materials Systems Laboratory [22].

Estimated Equipment Investment = 14,829 + 41 · Clamping Force

With Clamping Force = Projected Area
$$\cdot \left(1 + \frac{Complexity}{10}\right) \cdot \left(\frac{224}{\sqrt{Thickness}} + 172\right)$$

The mold is the part of the machine that receives the plastic and shapes it appropriately. Its cost is dependent of the projected area, complexity and weight of the part. The formula used in the updated SCM is the one estimated in the TCM used at MIT Materials Systems Laboratory [22].

Estimated Tooling Investment =
$$220 \cdot Weight \cdot (1 + Complexity/10) + 423 \cdot Projected$$
 Area $+ 53,800 \cdot Actions + 33,900$

We assumed that
$$Actions = \begin{cases} 1 & if \ complexity = 3 \\ 0 & otherwise \end{cases}$$

These relationships for the injection molding process are similar to the ones for the die casting process.

To conclude, the model has been largely developed for the three major processes used in the car manufacturing: stamping, die casting and injection molding. These developments allowed the cost models to capture some additional details in the calculation of the manufacturing cost to get closer to the real data and the real physical formulas by requiring just a few more inputs for parts. Beyond the four simple metrics used in the SCM (weight, material, process and complexity), an additional input has been added, which is the ratio between the projected and the surface area. Since it is time-consuming to gather this input for thousands of parts, we established different categories of parts, characterized by their thickness and their ratio. Thus, from a quick look of the part, we can estimate in which category the part belong to. This categorization idea has helped to produce more accurate cost estimates. These inputs and the estimated relationships will be used in the next chapter to estimate the cost of customization of the mid-size car from Volkswagen, manufactured in 1999. Then some manufacturing scenarios and analysis will be also done in the next chapter.

4 Results and analysis

This chapter examines first the results of the case study. Then it identifies how the methods and results presented in the thesis can affect the customization decisions in the auto industry.

4.1 Specific results for the case

4.1.1 The cost analysis of the standard product

Given the set of assumptions described in the previous chapter, the cost model is used to estimate the car manufacturing cost for each of the 2117 individual components. These results are then used to generate the total manufacturing costs for the 224 subassemblies, the 61 customizable groups and the 8 vehicle subsystems. The overall results by major subsystems for the baseline product are presented in figure 4-1.

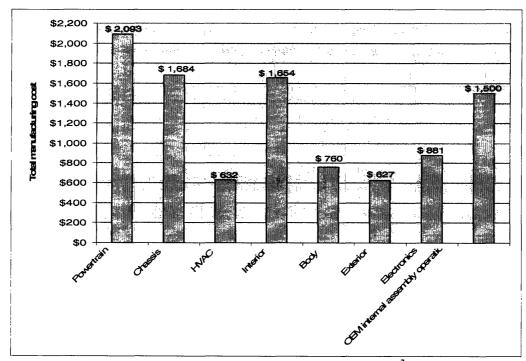


Figure 4-1: Car manufacturing cost breakdown³

³ The cost of OEM internal assembly operations includes the body assembly, paint, engine dressing and final or general assembly lines.

Figures 4-1 and 4-2 show the cost and the distribution (in percentage) of the major subsystems of a car. From these results we see that the powertrain group is the most expensive system of a vehicle, followed by the interior and the chassis. Powertrain represents 22% of the total cost or a total of \$2,093 per vehicle. The exterior, HVAC system (Heating Ventilation and Air conditioning) are less expansive, representing 6% of the total cost. The figures also present an estimate of the engine and body assembly work to show the relative importance of OEM manufacturing responsibility against purchased parts, but this category is not modeled in the updated SCM. Instead an industry estimate of \$1,500 per vehicle is used for all analyses.

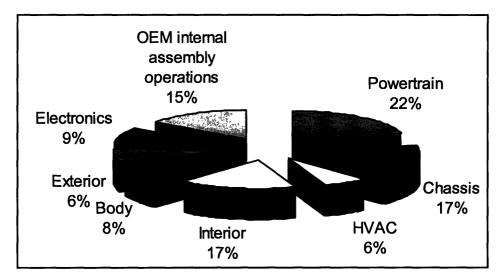


Figure 4-2: Car manufacturing cost breakdown in percentage

When a manager has to make some decisions about new manufacturing systems, alternative materials or parts characteristics, it is important to understand the interplay between the several factors that are driving cost. The manager should have a tool to understand direct costs closely related to manufacturing process and variations of it affect these costs. Given that the model analyzes each cost driver and adds them up, it is possible to establish predictions about the cost of the system and its variations. This is important especially for customization decisions, because the manager can assess the impact of design, materials or other manufacturing changes on the total cost of the system. Secondly using what-if analyses it is possible to assess the impact of changed

input factors on the overall part costs. Figure 4-3 presents the sum of all costs for the baseline product. Tooling costs are the major cost driver with 34% of the total, followed by material costs at 19%. The equipment costs and the labor costs represent 12% and 15% respectively. Tooling is the main cost driver but also the area that is most affected by the decision to customize. Therefore this breakdown shows that customization will likely have a significant effect on cost. In the model, the costs for both the electronic components and the internal OEM assembly operations are included as separate line items. No cost breakdown for these items is possible since they are not modeled. Electronics components are considered as a purchased component and their manufacturing cost is only equal to the material costs. Indeed there is no pre-determined relationship for the tooling or equipment investment of electronics; however it is something which needs definitively further developments. On the other hand the OEM internal assembly operations are also not modeled and counts for \$1,500. The other cost drivers are all modeled but do not reflect the cost breakdowns for either electronic components or OEM assembly activities.

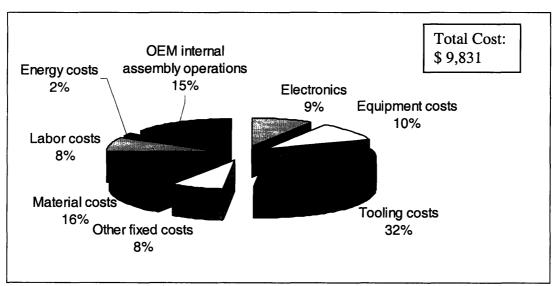


Figure 4-3: Major cost drivers of the car manufacturing

Tooling costs are the major cost driver with 34% of the total, followed by material costs at 19%. The equipment costs and the labor costs represent 12% and 15% respectively.

As important as these is the share of the cost that is associated with purchased electronics, which corresponds to 9% of the total cost.

4.1.2 Cost model validation

To ensure that conclusions and cost comparisons can be done from the analysis, the cost estimation process for the car system must be sufficiently accurate. For the purposes of validating the results, some quotes provided by an OEM for equivalent components in similar cars (although not exactly the same car) have been found. That validation is shown in figure 4-4. This figure also includes the results from using the SCM prior to the modeling modifications. The range of differences at the subsystem level between the updated model and the external quotes provides a good indication of the validity of the modeling method. The accuracy of the cost estimates by subsystem with the closest match for the HVAC group and the largest cost difference for the powertrain group. One of the main reasons is that there are not enough details in the breakdown of components for the powertrain group. For example the crankcase is considered as a simple component, whose weight is around 34kg and whose processes are sand casting and machining. More details about the components and the manufacturing processes of the powertrain would have added more accuracy in the estimation of the manufacturing cost. For example it is not taken into account the installation of the four crankcase pins which holds the crankcase together. Another step not taken into account is the installation of the bolts that will hold the two halves of the crankcase. All these simplifications lead to a rough estimation of the powertrain. Although there are some outliers where the cost difference is large, the total manufacturing cost of the car falls within a 10% difference, which is better than the SCM prior to the modifications (18% difference). improvement is due to the detailed relationships which were added to the SCM in order to capture much more precision in the manufacturing cost.

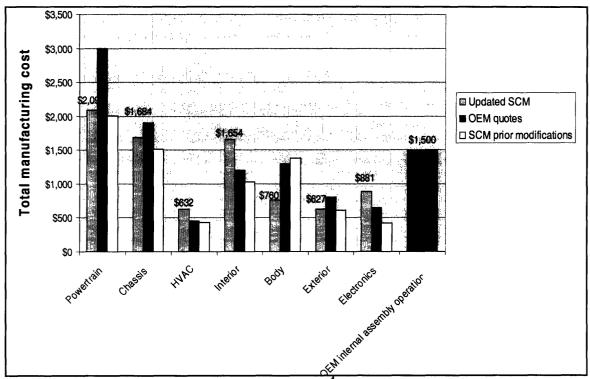


Figure 4-4: Cost differences between OEM quotes⁴, SCM and updated SCM estimations

The errors in estimation include both values where the OEM quote is above and below the value estimated through the updated SCM. The powertrain and chassis groups are both underestimated by 30% for the first one and by 11% for the second; while the interior group is overestimated by 38%. It can be tempting to correlate the errors with the manufacturing processes required to manufacture the groups of components. Table 4-1 shows the major manufacturing processes for the different subsystems of the car. The powertrain and chassis group are both groups where around 50% of the components are stamped, and only 20% are molded plastics, while the components of the interior group are in majority molded plastics (injection molding, RIM/ Foam molding and compression molding are required for 52% of the components). Since the cost estimations of the updated model for the powertrain and chassis groups are closer to the OEM quotes than they were with the previous SCM, this could mean that the relationships for the stamping process have improved the results by adding more accuracy. On the other hand the relationships for the injection molding process may slightly overestimate the real

⁴ Quote is for similar car, but not exactly the same one.

investments of the manufacturers, because in the updated model, the cost estimation is above the OEM quotes.

Groups	Major manufacturing processes	Number of parts manufactured per process	Percentage of components per process
	Stamping		56%
Powertrain	Injection Molding	72	17%
roweitiani	Forging	50	12%
	Die casting	23	5%
	Stamping	184	47%
Chassis	Injection molding	92	23%
Cliassis	Forging	46	12%
	Roll forming	18	5%
	Stamping	80	46%
HVAC	Injection molding	58	34%
Electrics		16	9%
	Injection molding	170	39%
Interior	Stamping	157	36%
Interior	RIM/Foam molding	28	7%
	Compression molding	23	5%
	Stamping	80	62%
Body	Injection molding	31	24%
	Forging	6	5%
	Stamping	20	18%
Exterior	Injection Molding	67	61%
	Extrusion (plastic)	8	7%

Table 4-1: Distribution of the processes over the subsystems of a car

It is important to keep in mind that the actual price that an OEM pays for a particular component, or sub-assembly depends on a larger number of aspects, that ranges from the particular location of the plant and the supplier of the component, the exact volume of production and whether there are wider purchasing agreements. Since the OEM quotes come from a similar car, but not exactly the same, there will remain always a difference between our estimation and these quotes.

4.1.3 Comparison between standard and customized products

The main goal of the thesis is to understand the customization decisions of the OEMs, and more precisely to understand what drives the cost difference between a standard and a customized product. The main assumptions made for the production of the customized product have been described in the chapter 3. Briefly, it has been assumed that the size, materials and the process of the standard and customized versions are identical. The major changes in production between the two variants were the tool modification and the additional set-up time. The initial analysis of the standard product described in the previous paragraph has shown that the cost structure is mainly dependent upon the tooling costs. This is an important aspect for the customization decisions, because the cost of customization could be heavily affected when there is a major tool change. Figure 4-5 shows a comparison between the manufacturing cost of the baseline and the customized product for the eight major groups of the car. The total manufacturing cost for the baseline product is estimated at \$9,831; whereas the estimation for the customized product is \$11,242. This is an increase of 14% of the total cost over the baseline version. Consequently the premium that the customer is willing to pay for "customization" should be at least equal to \$1,411 in order for the manufacturer to cover his expenses.

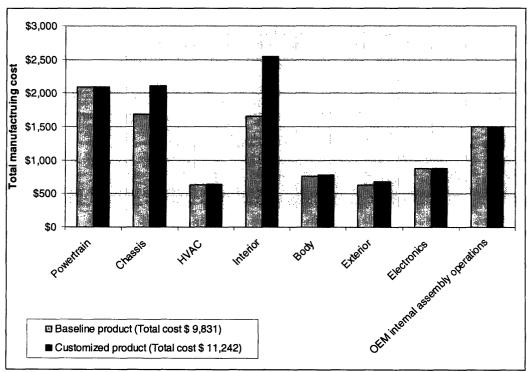


Figure 4-5: Cost breakdown for the standard and customized products

It is important to remember that the total cost of \$11,242 for the customized product represents the maximum cost of the customized version, because it counts for all the possible customized components. However the manufacturer may want to offer variety for the seat group but not for the suspension group, which will mean that the cost increase for the customized product will only include a portion of the \$1411 cost increase. Consequently it is more interesting for customization decisions to look at the absolute difference of the different customizable groups. The absolute difference for all the customizable groups is shown in the appendix C. Table 4-2 provides a sample of some of the results for individual customized groups.

Groups of customization	Baseline Product			Percentage Difference
Side trim	\$131	\$134	\$3	3%
Storage Tray Trunk	\$16	\$26	\$10	64%
Steering column	\$55	\$92	\$37	68%
Trim instrument panel	\$181	\$250	\$69	38%
Seat rack front	\$203	\$351	\$148	73%

Table 4-2: Example of baseline vs. customized costs for different customizable groups

The absolute difference is the main criteria for the customization decision. We can see from table 4-2 that this difference can vary from \$3 to more than \$100. To be able to give guidelines for what to customize, the ideal would be to compare the absolute difference to the premium that customers are willing to pay for the variety. The example of the side trim shows that the absolute difference is very small (\$3.65), so the automakers will likely be willing to do this customization since it does not cost very much; in addition the absolute difference is insignificant in comparison to the baseline product (3% of difference). Concerning the storage tray trunk, the absolute difference is also small (\$10.31), and even if it represents a large amount of the cost of the baseline product (64%), the automakers will choose to customize provided that they can recover this small cost through increased price or market acceptance. For certain components

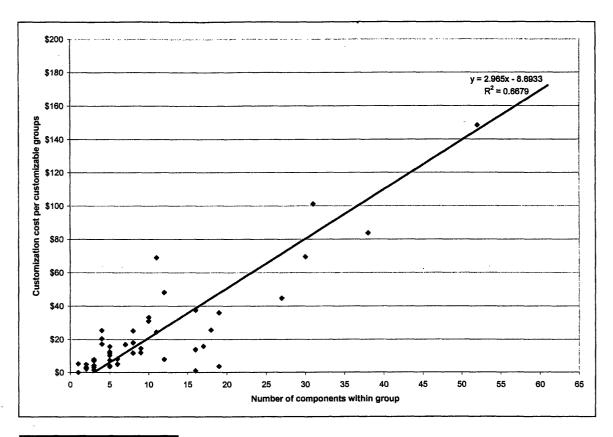
such as the trim instrument panel, the OEM may offer a customized version, because this is an area that is very visible to the customer and may be worth the extra cost of \$69.45. On the other hand, the steering column and the seat rack front are components that are not likely to be customized since the additional cost of customization is high, representing around 70% of the baseline cost and the consumer is not likely to pay such a high premium.

4.1.4 Sources of customization cost premiums

Several factors may explain the large differences in customization cost premium for different groups. Groups have different number of components, made with different production processes and each sub-component may require different levels of redesign for the customized product. The following section explores the impact of each of these factors on the customization cost premium. First, the number of components within the customizable group may be an explanation for a larger cost difference. Table 4-3 gives some examples of some customizable groups, their cost of customization and their number of components.

Groups considered as customizable	Manufacturing cost of the baseline product (\$)	Manufacturing cost of the customized product (\$)	Absolute difference	Number of parts within the group
Damping hood	\$4	\$7	\$3	2
Storage Tray Trunk	\$16	\$26	\$10	5
Steering column	\$55	\$92	\$37	16
Trim instrument panel	\$181	\$250	\$69	30
Seat rack front	\$203	\$351	\$148	52

Table 4-3: Example of customizable groups, their customization costs and their number of parts



Regression Statistics				
Multiple R	0.81728			
R Square	0.667947			
Adjusted R Square	0.661682			
Standard Error	26.72588			
Observations 55				

ANOVA

	df	SS	MS	F_	Significance F
Regression	1	76150.85	76150.85	106.6131	2.7135E-14
Residual	53	37856.45	714.2726		
Total	54	114007.3			

	Coefficien	Standard				Upper	Lower	Upper
	ts	Error	t Stat	P-value	Lower 95%	95%	95.0%	95.0%
Intercept	-8.693304	4.854576	-1.790744	0.079046	-18.43034979	1.043741	-18.43035	1.043741
X Variable 1	2.965006	0.287157	10.32536	2.71E-14	2.38904081	3.540971	2.389041	3.540971

Figure 4-6: Variation of the customization cost with the number of components within the group

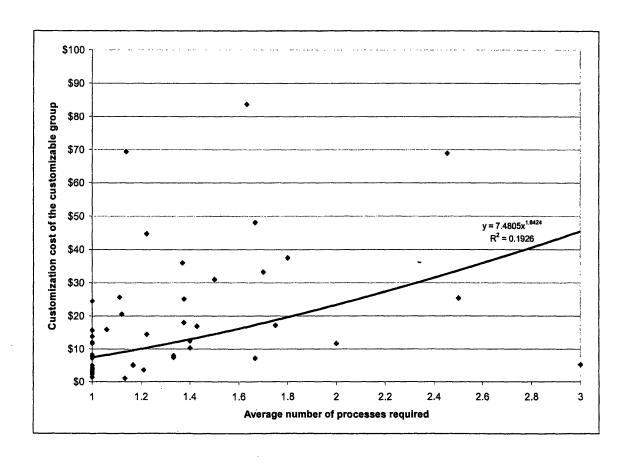
A statistical relationships between the customization cost premium and the number of components has been done for all the 65 customizable groups. The graph and the regression results are shown in figure 4-6. The more components within the group, the more changes or adjustments in the production need to be done and therefore more additional set-up time is needed. This would add more cost for customizing this group.

The regression statistics give the overall goodness-of-fit measures: the R-squared is high (0.667947), the correlation between y and x is significant (0.81728), the "significance F" number and the p-value f the variable are inferior to 0.05, which means that the number of components is a significant predictor of the customization cost (An explanation of all the regression results is explained in details in Appendix D). For example the storage tray trunk, which contains only 5 components, requires an additional cost of \$10 for customization, whereas the seat rack front, which is composed of about 50 components, reaches a cost of customization in the order of \$150, which means fifteen times the customization cost of the storage compartment door.

Second, the processes used to manufacture the components of the customizable group are important for determining the cost of customization. Generally, the components which require at least two or three manufacturing processes have a larger cost of customization. Indeed two parallel manufacturing processes may increase the customization cost, because again there might be additional set-up time for every process considered, and additional cost for the tooling changes. Table 4-4 gives examples of customizable groups associated with the number of processes required for manufacturing the components within the group. The manufacturing of the damping hood requires only one process for each component and thus its cost of customization is minimized. However the seat rack front contains 52 components out of which 5 require three processes to be manufactured. These components are expensive to customize since additional tooling investments are needed for all three processes. Consequently, the customization cost may be higher for this group. Figure 4-7 shows the trend across all most customizable groups. The curve does not fit as well as the curve in figure 4-6, which means that this criterion has less influence, and it may be considered as a secondary criterion. Indeed the statistical relationship is less significant and the explanatory variables explain the variation in cost less well (lower R-square).

Groups considered as customizable	cost of the baseline	Manufacturing cost of the customized product (\$)	Absolute difference	Number of parts which requires 1 process	parts which requires 2	Number of parts which requires 3 processes
Damping hood	\$4	\$7	\$3	2	0	0
Storage Tray Trunk	\$16	\$26	\$10	4	0	1
Steering column	\$55	\$92	\$37	8	4	4
Trim instrument panel	\$181	\$250	\$69	28	0	2
Seat rack front	\$203	\$351	\$148	47	0	5

Table 4-4: Example of customizable groups, their customization cost and their number of processes required



Regression Statistics						
Multiple R	0.31383925					
R Square	0.1926					
Adjusted R Square	0.07800633					
Standard Error	1.00756859					
Observations	46					

ANOVA

	df	SS	MS	F	Significance F
Regression	1	4.88032	4.88032	4.807276	0.033672605
Residual	44	44.66856	1.015194		
Total	45	49.54888			

		Standard				Upper	Lower	Upper
	Coefficients	Error	t Stat	P-value	Lower 95%	95%_	95.0%	95.0%
Intercept	1.37156783	0.206886	6.629582	4E-08	0.954616438	1.788519	0.954616	1.788519
X Variable 1	7.4805	0.007883	2.19255	0.033673	0.001396801	0.033173	0.001397	0.033173

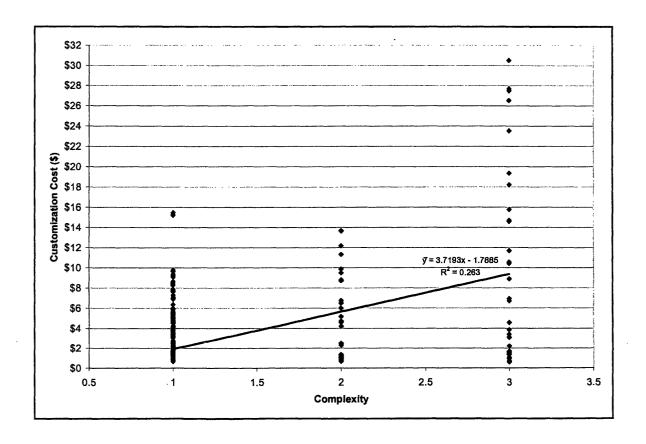
Figure 4-7: Cost of customization as a function of the average number of processes required within the customizable groups

Another factor, which could explain the variation of customization costs of the different customizable groups, is the complexity of the part. The higher the complexity of the part, the more expensive the tool investment may be and the longer the cycle time may be. In addition it is likely that the complex parts have completely dedicated tooling. As such, the production of a customized version of these parts may require a completely new and expensive tool, rather than just a modification of the existing tool. Table 4-5 shows some examples of how the complexity of the components affects the cost of customization. The low absolute cost difference for the damping hood can be explained by the fact that all its components are simple, and therefore, presumably have relatively low tooling investments and short cycle times.

Groups considered as customizable	Absolute difference	Number of parts w/ complexity 1 (% of the cost difference)	Number of parts w/ complexity 2 (% of the cost difference)	Number of parts w/ complexity 3 (% of the cost difference)
Damping hood	\$3	2 (100%)	0	0
Storage Tray Trunk	\$10	5 (100%)	0	0
Steering column	\$37	11 (80%)	2 (15%)	2 (4%)
Trim instrument panel	\$69	25 (85%)	1 (2%)	3 (13%)
Seat rack front	\$148	46 (36%)	1 (1%)	5 (63%)

Table 4-5: The customizable groups, their customization costs and their number of complex parts

The seat rack front group has five complex components. Since the cost increase comes primarily from the five complex parts, we can conclude that the driving force around the cost customization for the seat rack front is the complexity and not the number of parts. This could explain why the seat rack front is so expensive to customize. However, this is not the case for the trim instrument panel and the steering column, where most of their parts are not complex. The cost of customization is much more driven by the number of parts. Figure 4-8 shows the trend of the variation between the customization cost and the complexity for all the customized parts of the car. We can see that the complex parts imply a higher cost customization. The customization cost for these parts can reach \$30; while parts with a lower complexity level have a maximum customization cost around \$15. The regression statistics give the following measures: while the R-squared is a little low (0.2581), the correlation between y and x is significant (0.507989), the "significance F" number and the p-value f the variable are inferior to 0.05, which means that the complexity is a significant predictor of the customization cost.



Regression Statistics						
Multiple R	0.512879					
R Square	0.263045					
Adjusted R Square	0.261819					
Standard Error	3.257589					
Observations	603					

ANOVA

	df	SS	MS	F	Significance F
Regression	1	2276.439	2276.439	214.5178	9.25409E-42
Residual	601	6377.742	10.61188		
Total	602	8654.181			

	Coefficien	Standard				Upper	Lower	Upper
	ts	Error	t Stat	P-value	Lower 95%	95%	95.0%	95.0%
Intercept	-1.788471	0.328645	-5.441958	7.68E-08	-2.433902473	-1.143039	-2.433902	-1.143039
X Variable 1	3.719259	0.253936	14.64643	9.25E-42	3.220548428	4.217969	3.220548	4.217969

Figure 4-8: Variation of the customization cost with the complexity of the part

The last major factor, which may cause a large variation of customization cost for different groups, is the degree of tool change. If a complete new tool is required for the customized product, the tool investment increases by up to 90% of the initial tool investment made for the standard product. There are some savings in the design cost but other than the entire tooling investment needs to be made twice, once for each of the part. For components where a tool modification is sufficient the incremental investment may only be around 30%. Additional tools aren't necessary only modifications to the original tool are needed and thus there is the potential for substantial cost savings. So it is reasonable that a group (e.g. the seat rack front), in which most of components require a new tool for their customized version, will have a higher customization cost than a group (e.g. damping hood) whose components require no tool change (see Table 4-6).

Groups considered as customizable	Absolute difference	Number of parts w/ no tool change	Number of parts w/ adjusted tool	Number of parts w/ new tool
Damping hood	\$3	1	1	0
Storage Tray Trunk	\$10	4	0	1
Steering column	\$37	8	1	7
Trim instrument panel	\$69	12	0	18
Seat rack front	\$148	32	0	29

Table 4-6: Example of customizable groups, their customization cost and the tool modification of the parts

Figure 4-9 shows the trend of the variation between the customization cost and the tool change. The main assumption in the model is that number 0 has been attributed to the non-customized components, number 1 to the customized components with no tool change, number 2 to the customized parts with a small tool change, and number 3 to the customized parts with a radical tool change. We can see on this figure that the customization cost tends to be higher when a radical tool change is needed for the customized product; while customization costs are on average less expensive for small tool change.

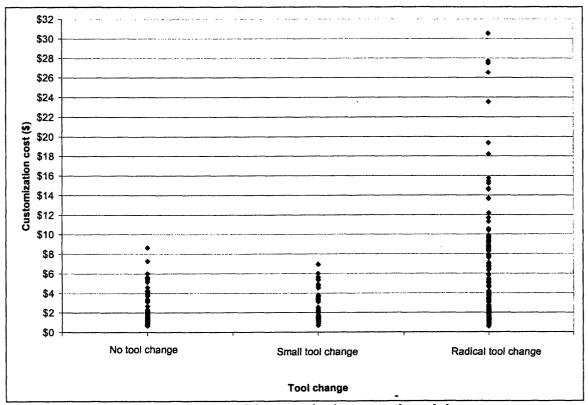


Figure 4-9: variation of the customization versus the tool change

To conclude, the main criteria, which influence the cost of customization, are:

- The number of parts: groups with more parts have higher customization costs.
- The degree of tool change: groups with components that need substantial changes for the customized version and therefore a completely new tool have higher customization costs.

- The tooling investment of the manufacturing process: groups with components made by processing methods that require large investments in tools will have higher customization costs.

The other criteria have less impact on the cost of customization

- The complexity of the parts: groups with more complex parts have higher customization costs.
- The number of process steps: groups with parts that require more steps have higher customization costs.

4.1.5 Sensitivity analysis

Two important strategic variables for a development project are the production volume and product life. It could be interesting to understand how changes in the set of assumptions, especially changes in production volume and product life, may alter the costs discussed above. As it has been previously mentioned, production volume affects how fixed costs are spread over each unit of production. Thus the higher the production volume, the less expensive the unit manufacturing cost of the car. Figure 4-10 shows the impact of production volume on both the standard and the customized product. As it has been mentioned in the chapter 3, the sensitivity analysis has been done, given the assumption that the four simple metrics (weight, material, complexity and process) are the same for both the base vehicle and its variant, but the total production volume in both cases is equal. However, for all the scenarios involving a customized variant, the overall production volume is divided into 60% of the total production volume for one variant and 40% for the other. Table 4-7 summarizes the distribution of the production volume for the two variants; the total production volume varies from 20,000 to 200,000 vehicles per year.

		Production	Volume (ve	hicles per year	r)
Baseline product	20,000	50,000	100,000	150,000	200,000
Product A	12,000	30,000	60,000	90,000	120,000
Product B	8,000	20,000	40,000	60,000	80,000

Table 4-7: Production volume for the two variants of the car.

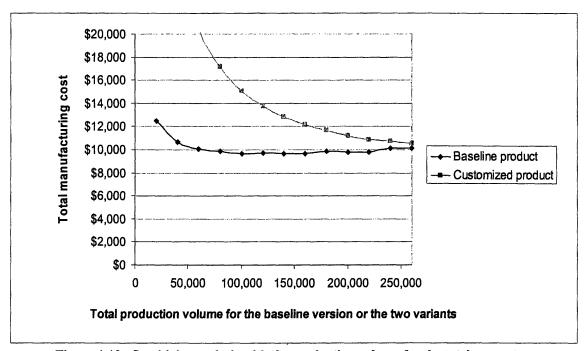


Figure 4-10: Sensitivity analysis with the production volume for the total car system

A reduction of the production volume can have a substantial impact on the cost of the customized product. Indeed the cost difference with a high production volume such as 250,000 parts per year is estimated around \$600, whereas at lower production volumes such as 100,000 parts per year, the cost difference can be as high as \$5,000. Often at low volumes the additional tools that are needed for customized products are poorly utilized, while at high volumes additional tools might be needed anyway, so the cost penalty for an additional customized tool is low in those cases. However this cost difference means that all 65 groups are customized, which of course is unlikely. Figure 4-11 shows the same sensitivity analysis but for one customizable group, the trim instrument panel. As expected, as production volume decreases the additional customization cost increases. At production volumes as high as 250,000 vehicles per year, the cost difference between

the standard and the customized trim instrument panel is around \$25, whereas in the very low production volume range (around 10,000 vehicles per year) the cost difference can be as high as \$300, which corresponds to two thirds of the price of the baseline product. Therefore, it is quite expensive for the automakers to customize the trim instrument panel at very low production volumes.

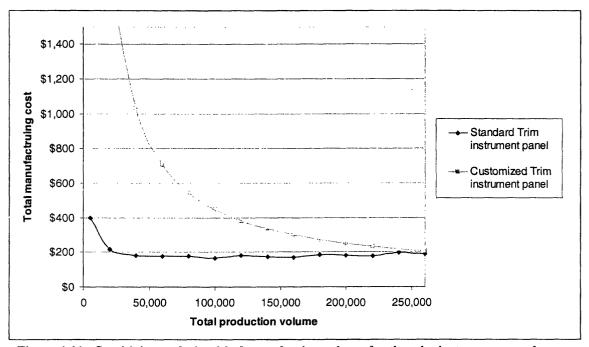


Figure 4-11: Sensitivity analysis with the production volume for the trim instrument panel group

Product life is the number of years a product is expected to be produced; it is also the number of years over which tooling costs are amortized. Shorter product lifetimes result in higher yearly costs for tooling. If the automaker could offer a more customized product with lots of variants, it may be able to extend the product life. Figure 4-12 shows the impact of variations of the product life on the total manufacturing cost of a car. The variations between the cost of the standard and customized products vary from \$1,200 (when the product life equals 3 years) to \$1,411 (when the product life equals 5 years). Product life has a small effect on the customization cost because many parts can be spread on the tooling investments across. Figure 4-12 shows changes in the product life only from three to eight. The impact would have been more important if the variation in the production life were larger, which is not likely to happen.

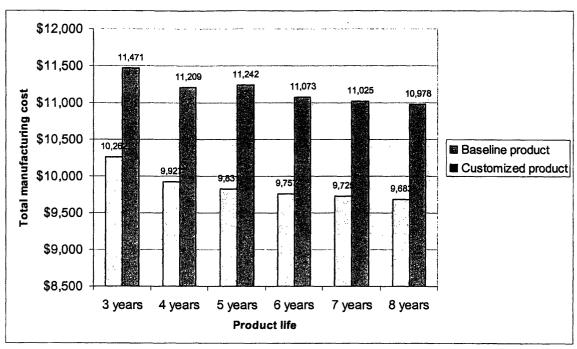


Figure 4-12: Sensitivity analysis with the product life for the complex car system

Figure 4-13 shows variations of the customization with the production volume for several customizable groups. As expected, whatever the customizable groups, as production volume increases, the cost difference decreases. At production volume less than 80,000 vehicles per year, the cost of customization is very high, because the large fixed investment in machine and tools can not be spread enough on the total production volume. From this graph, we can see also different sensitivities to the production volume. For a given product life (5 years), the cost differences of the brake fall in a range between \$501 (at a production volume of 100,000 vehicles per year) and \$289 at high production volume (260,000 vehicles per year). This corresponds to a difference of \$212. The cost differences for the trim instrument panel are generally not as and range from \$443 at low volume and to \$204 at high volume. This corresponds to a higher difference (\$239). Consequently the trim instrument panel is more sensitive to the production volume than the brake.

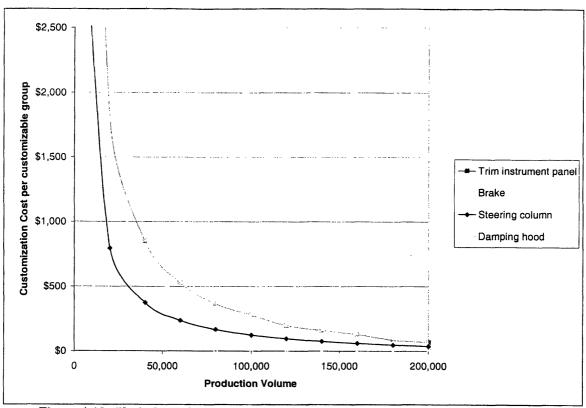


Figure 4-13: Variations of the customization cost with the production volume for several customizable groups

All these results show that production volume and product life are two variables, which can impact the customization cost of the different customizable groups.

4.2 Implications for the problem of customization

4.2.1 General discussion from the case

To help the manager make better customization decisions, it is important to determine the different elements which influence the cost of customization. As we mentioned in the paragraph 4.1.2, one of these elements is the characteristics of the manufacturing process required and its major cost drivers, in particular the balance between investments in non-dedicated equipment and dedicated tooling as well as the relationship between cycle time and set up time. Since the only changes in the production of the customized product considered in this work concern the tool modifications and the addition of some set up

time, it is important to assess how theses effects play out together in order to draw some conclusions about customization.

According to figure 4-3, the main cost drivers of the vehicle manufacturing are the tooling costs (32%), the material costs (16%), the OEM assembly activities (16%) and the equipment costs (10%). The other cost drivers are less significant and represent less than 10% of the total car manufacturing. Since the size and the complexity of the customized product are the same as in the baseline version, there is no additional material cost for customization. For the same reason the equipment investment and the number of workers are unchanged when standard and customized products are compared. Consequently the major modification is the tooling costs. When the share of tooling cost of one manufacturing process is important, the large influence of the tooling costs creates a large gap between the manufacturing cost of the standard and the customized product. On the other hand, if the share of tooling cost is less expansive, the effect of the tool modification may be less important, except if another factor predominates. Figure 4-14 shows the trend of the customization cost with the percentage of the unit tooling cost over the total manufacturing unit cost of the baseline product for several manufacturing processes. For every customized part, we only consider the primary manufacturing process of the part. Then we calculate the percentage of the unit tooling cost over the total unit cost of the part and plot it on the graph with its corresponding customization cost. As expected, as the percentage of tooling cost increases the customization cost increases. Given the sharp slope of the curves for most of the manufacturing processes on the graph, we can conclude that a small variation in the tooling cost implies an important increase in the customization cost.

The second factor which has to be taken into consideration in the discussion, is the relative importance of the set up time compared with the production cycle time. Indeed as mentioned above, introducing a customized version in the production increases the number of set ups, thus increasing the total production time. If the set up time is negligible compared to the total cycle time, the addition of one or more additional set up does not really affect the cycle time, consequently the line utilization of the standard and

customized products may be very similar. On the other hand, if the setup time is large percentage of the total production time, then additional setups required for the customized product will significantly affect the amount of equipment time charged to the part. Furthermore, other costs that scale with the equipment utilization, such as the labor or energy costs, will also increase, resulting in an even great cost increase for the customized product. Figure 4-15 shows the trend of the customization with the percentage of the annual time for setups for a given production volume of 100,000 vehicles per year over the annual time attributed to total cycle time for several manufacturing processes. For every customized part, we only consider the primary manufacturing process of the part. Then we calculate the percentage of the annual time for setups over the total production time of the part and plot it on the graph with its As expected, as the percentage increases the corresponding customization cost. customization cost increases. The slope of the curves for all the manufacturing processes on the graph are sharp, which means that the setup time is an important factor of the customization cost.

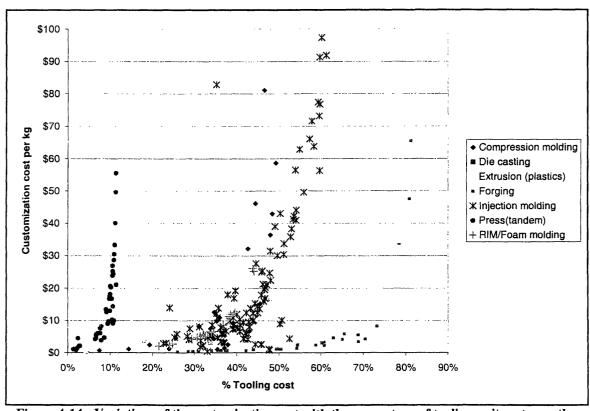


Figure 4-14: Variations of the customization cost with the percentage of tooling unit cost over the total unit cost

At least it is relevant to notify the order in which the manufacturing processes appear on the graph. The stamping process has a high percentage of setup time, which corresponds to a small cycle time in comparison to the setup time. On the other hand, the injection molding has a small percentage of setup time, which means that the setup time is considered small in comparison to the total production time.

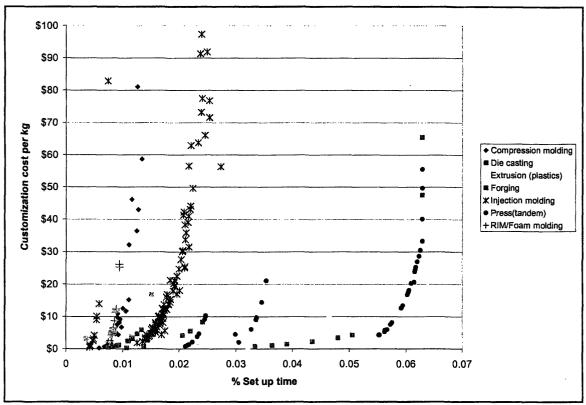


Figure 4-15: Variations of the customization cost with the percentage of set up time over the total cycle time

To conclude, some process characteristics such as tooling investment and set up time are important to be considered when customization decisions have to be made.

4.2.2 Recommendations

The previous chapters offered a method to estimate the cost of customization. After analysis of the customization process we considered only some changes in the production

characteristics in our case study: a variation in the tool investment and in the cycle time. From the analyses of the previous section we can also already draw some guidelines concerning the best way to minimize the customization cost. The guidelines can be categorized into three types: the production volume, the group and part characteristics, the process characteristics.

• High Production Volume

From the sensitivity analysis it is clear that the customization should be done at a large scale of the production volume (200,000 vehicles per year); otherwise it is too expensive to offer variety, because the customization cost increases exponentially with the production volume. Since the production volume reflects the market conditions; it is not always easy to choose it. However it may be interesting to produce one high volume vehicle that has multiple customized variants versus multiple low volume vehicles. Indeed at a production volume of 200,000 vehicles per year the cost of a vehicle with two variants is \$11,242; while the cost of two standard vehicles at a production volume of 100,000 vehicles per year each is $$9,674 \times 2 = $19,348$. Consequently customization cost for a variety of parts or groups kept to a minimum when done for high volume cars and this may be a more cost effective approach to offering variety than producing multiple low volume vehicles.

• Group and parts characteristics : small group of simple parts

It is recommended to customize when the customizable group consists of a few simple parts, which require at maximum one or two manufacturing processes to minimize the customization cost. These two criteria are independent of each other; however the number of parts within a customizable group seems to have more impact on the customization cost than the number of manufacturing processes required for every part of this group.

• Process characteristics: low tooling investment and small set up time

Customizing a product implies several changes in the process characteristics such as the tooling and the processing time. One of the criteria of the customization decision is the

tooling investment of the process. If the percentage of unit tooling cost over the total manufacturing cost is high, there will be a large impact on the customization cost. Furthermore if the customized product requires a substantially different or even a completely new tool, the cost of the customized product could be as much as twice the cost of the standard product. The influence of the annual time lost to set up compared to the total annual production time also a substantial criterion, because it modifies the line utilization and consequently increases the manufacturing cost.

5 Conclusions and future work

5.1 Conclusions

The goal of this work was to address the question of customization for the automotive industry. Initial chapters proposed a general methodology to understand the cost structure of a complex system. The later chapters offer an analysis of different manufacturing scenarios applicable in the automotive industry. First, the manufacturing cost of a standard product and a product with multiple variants are compared; then an analysis to understand the variations of the customization cost under different operating conditions is done. The customization cost of several groups of components is studied in detail to draw some conclusions for further recommendations to the automakers.

Several conclusions have been drawn from the analysis of the case study:

- The major cost driver of the car manufacturing is the tooling cost, followed by the assembly operations and the equipment cost.
- The customization cost for a group of components can be as low as \$3, but can also reach high cost around \$150. This large difference highlights the importance of estimating the manufacturing cost before critical financial resources are committed.

Some considerations concerning the selection of groups of components to be customized seem generalizable in the automotive industry:

- Is the production volume large enough?
- How large is the group of components to be customized?
- How complex are the components within the group?
- How many processes are required to manufacture the components?
- What is the cost structure of the manufacturing processes?
- What is the influence of the tooling investment on the total manufacturing cost?
- What is the influence of the set-up time on the total production time?
- How easy it is to adjust or re-use the tools?

5.2 Future work

A number of additional developments can be done in future work in order to answer the problem of customization

• The development of the methodology

The methodology has generated some results of manufacturing costs which fall within a range of +/-20% of values typically experienced by the automotive OEMs for these subsystems. While this level of accuracy was considered to be sufficient for the customization analysis, further refinements could improve the accuracy of the cost estimation and thus allow the user to make more informed customization decisions. Model refinements will entail gathering component and processing conditions data for each process to enable more accurate estimates if the functional relationships.

While energy costs may often represent a low percentage of the total car manufacturing cost; some model improvements are needed in this area. Presently, mechanical and electrical energy costs are estimated as a percentage of the equipment investment. Further research would be in developing a method to characterize the actual mechanical or electrical requirements of the process. Then, by determining the losses or other inefficiencies, it would be possible to calculate the cost of supplying the energy needs. In addition the models lack a systematic view of energy. Further work should begin with an appropriate energy balance and then a discussion of the energy requirements of each type (thermal, mechanical, etc). The user should also be able to specify the energy sources and the model would have a method to address energy conversion and other types of losses. A similar idea could be developed for materials costs. The model lacks a systematic material balance, which would describe accurately all the material losses. First products with multiple materials are now handled poorly. Losses in the model are a function of each process and were applied to all materials. But in reality each material would often correspond to just a subset of the processes used to make a multi-material part. And thus the inputs should have assigned materials to the appropriate process and then only that scrap rate applied to the material. Also, little if any consideration is given to process materials in the current model.

The methodology needs some further development to be more accurate in the manufacturing cost. One major development could be to take into consideration the logistic and supply chain costs. Some factors would be particularly instructive to incorporate in the model: the incorporation of inventory and transportation costs. First these costs have to be considered in the total manufacturing cost of a car. In addition they may be higher for a product with multiple variants than for a single vehicle, so it may be relevant for customization decisions.

• The customization considerations

First it would be instructive to gather some data about the customer preferences and utility. Thus it would be interesting to compare the obtained results for the customization cost of different groups of component with the added value considered by the customer. Some research [23] has begun to explore the customer perceived value of customization, by constructing some utility functions from quantitative measures and statistical analyses about customer's subjective preferences. This could make a large framework around customization decisions that would balance that with issues of value of customization.

Another important development would be to consider that the components in a car are not totally independent each other. For example the dimensions of the seat frame should be related to the dimensions of the seat cover; or the two parts of the seat frame should have the same length. Thus when the model estimates the customization of a group of components, it would calculate the cost of only the components, which are connected together. Basically what is needed is a way to rigorously discuss the interdependence of the part design. An idea would be to develop a method which would allow the user the make changes to any part or groups of parts and the model would automatically determine all the changes that would be needed throughout the vehicle.

6 Appendices

Appendix A: The three point estimation – Determination of the parameters A, b, c

The system cost model establishes a direct relationship between the inputs and the cost drivers. When this relationship has the following functional form:

$$Cost = A \cdot (Weight)^b \cdot (Complexity)^c$$
 (Equation 1)

the relevant parameters A, b, c have to be estimated. The approach is to have an initial estimate of the three coefficients in the proposed relationship based on a three-point estimation [10].

While any three points can be used, the particular evaluation that was selected follows the procedure described below, given the example of the determination of the parameters for the equipment cost:

1. <u>Identification of extreme points</u>. The choices for two of the points were the extremes. For a range of components for which equipment cost is to be estimated, the extreme points are such that the component with minimum weight (*Min_Weight*) and complexity equal to one is associated with the minimum equipment cost (*Min_Cost*), and the component with maximum weight (*Max_Weight*) and complexity level equal to three corresponds to the highest equipment cost (*Max_Cost*). This uses the weight and complexity information for the set of parts manufactured with the relevant technology. Equipment costs for the extreme parts are gathered either from published sources or directly from equipment suppliers. For example an observation of several stamped parts reveals that weights range from a few grams to 15 kg. Eliminating the parts below 10g whose cost is mostly material driven, stamped parts will have a weight from 0.1 kg (*Min_Weight*) to 15 kg (*Max_Weight*) and complexities from 1 to 3. Literature on stamping establishes that a line of tandem presses required to handle components

weighting 0.1 kg and with minimal complexity costs approximately \$200,000 (Min_Cost). The cost of a press line to stamp a 15 kg part of high complexity was estimated to be \$6,000,000 (Max_Cost). These values establish the extreme points.

2. Mid point estimation. An additional point is required to complete the estimation. The strategy was to choose a point that would define the relative importance of complexity and weight in establishing equipment cost. The mid point chosen corresponds to a simple part (complexity equal to one) with maximum weight defines the share of the maximum equipment cost that is defined by the weight as opposed to complexity. If the equipment cost for this part is close to the maximum cost, then most of the cost is defined by weight; if it is closer to the minimum cost, then complexity is the determining factor. To have this tradeoff explicit, equipment cost for this point is presented as a share of the difference between the values gathered for the extreme points defined before, instead of an absolute value. This share value is labeled as a weight Factor. For example for the stamping process, it was assumed 80% of the cost difference is determined by weight (this is equivalent to having Factor = 80%), while only 20% is determined by part complexity. In other words a part weighting 15 kg with a complexity level of 1 requires a press line that costs approximately \$4.84 Million (80% of the way from \$200,000 to \$6M).

Given this methodology, the three points are the used to determine the coefficient A, b, c. This is done by writing an equation for each of the points and then solving for the unknown coefficients. That solution is given by the equations below:

$$\begin{cases} Max_Cost = A \cdot (Max_Weight)^b \cdot (3)^c \\ Min_Cost = A \cdot (Min_Weight)^b \cdot (1)^c \\ Min_Cost + (Max_Cost - Min_Cost) \cdot Factor = A \cdot (Max_Weight)^b \cdot (1)^c \end{cases}$$

Where Factor is the share of the cost difference explained by the complexity level.

Solving these equations results in:

$$A = \frac{Min_Cost}{(Min_Weight)^b}$$

$$b = \frac{\log\left(\frac{Max_Weight}{Min_Weight}\right)}{\log\left(1 + \left(\frac{Max_Cost}{Min_Cost} - 1\right) \cdot Factor\right)}$$

$$c = (\log 3)^{-1} \cdot \log \left(\frac{Max _ Cost}{A \cdot (Max _ Weight)^b} \right)$$

Appendix B: List of the components and their level of customization

			endix B: List	or the	COL	PART CHAR	CHIS	ап	IU		evel of c	ustomiz	au	VIII	3 7 16
GR(CL	JP.	PART NAME		9	PART CHAR	ACTERISTIC		Н	PROCESS DEFINITI	ONS	0	- G	STOMIZ/ g ∢	_
	J,	. 5	Assembly Name	g		- □	£	Mass	Ę,	Name	Tan Tan	FE .	늏	volum d part	olume
Group	I	Group of customizatio	5 2	Part Name	Part Mass	ē	P Aith	75	Complexity	l -	2	8	omized? change		Production v
ğ	į	stomiz	S S	<u> </u>	<u> </u>	Material	Mixed	Share	ē	Process	¥	X	혈형	g č	Į
ľ	Т	ð	3	<u> </u>	o da		-	ર્જ	٥	Æ	Æ	P 20	٥F	Production v Customized] 3
H	ŀ	٦	clutch pressure plate w/ friction disk	flywheel		STEEL	STEEL	90%	3	Forging	Machining Center	Heat Treatment	nol 0	120,000	
Г	t		clutch pressure plate w/ friction disk	flywheel - Cover	3,401	STEEL	-	100%	3	Press (Tandem)	Machining Center	Other - Not relevant	no 0	120,000	80
1	Ţ		clutch pressure plate w/ friction disk	screw		STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant Heat Treatment		120,000	
1	٠.	-7	clutch pressure plate w/ friction disk clutch pressure plate w/ friction disk	clutch disk clutch pressure pla		STEEL	STEEL STEEL	90%	3	Forging Forging	Machining Center Machining Center	Heat Treatment	no o	120,000	
3	t	1	clutch pressure plate w/ friction disk	clutch pressure pla	775	STEEL		100%	1	Press (Tandem)	Machining Center	Other - Not relevant	no 0	120,000	8
H	4	_1	clutch pressure plate w/ friction disk	release bearing		STEEL	AL.	70%		Forming & Shaping Forging	Other - Not relevant Precision Mechanics	Other - Not relevant Other - Not relevant	no 0	120,000	
۲	۲		clutch controls at the transmission clutch controls at the transmission	acrew		STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant		120,000	
1	1	1	oil tank, oil filler plugs, oil drain plugs			STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant		120,000	
1	#	-1	oil tank, oil filler plugs, oil drain plugs oil tank, oil filler plugs, oil drain plugs			AL STEEL	-	100%	+	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant		120,000 120,000	8 8
7	it	1	transmission housing, transmission co		5,452		-	100%	3	Die Casting	Machining Center	Other - Not relevant	no 0	120,000	8
_	1	1	transmission housing, transmission co		7,940			100%	3	Die Casting	Machining Center Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000	
1	╫		transmission housing, transmission co- transmission housing, transmission co-			STEEL	-	100%	1	Press (Tandem) Molding	Other - Not relevant			120,000	
1	1	1	transmission housing, transmission co	acraw	34	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant			120,000	
-1	4		transmission housing, transmission co- gears w/ clutch bodies	transmission gear	1.323	STEEL STEEL	- STEEL	100%	늯	Forming & Shaping Forging	Other - Not relevant Milling	Other - Not relevant Heat Treatment		120,000	
7	Ť		gears w/ clutch bodies	transmission gear		STEEL	STEEL	90%	3	Forging	Milling	Heat Treatment	no 0	120,000	8
1	٠.	_1	gears w/ clutch bodies	transmission gear	1,002		GRAPHITE	90%	3	Forging	Milling	Heat Treatment		120,000	
-	-	1	gears w/ clutch bodies gears w/ clutch bodies	transmission gear transmission gear	831 938	GRAPHITE GRAPHITE	GRAPHITE	90%		Forging Forging	Milling Milling	Heat Treatment Heat Treatment	no 0 no 0	120,000	
7	t	1	gears w/ clutch bodies	transmission gear	583	GRAPHITE		90%	3	Forging	Milling	Heat Treatment	no 0	120,000	8
1	Ţ	_1	gears w/ clutch bodies	gear	971 447		STEEL	90%	3	Forging Forging	Milling	Heat Treatment Heat Treatment		120,000	
1	#	-1	gears w/ clutch bodies gears w/ clutch bodies	gear transmission gear	737		GRAPHITE	90%	3	Forging	Milling	Heat Treatment	no 0	120,000	8 (
7	1	1	gears w/ clutch bodies	reverse gear shaft		STEEL	STEEL	90%	3	Forging	Milling	Heat Treatment	no 0	120,000	8
1	-		gears w/ clutch bodies gears w/ clutch bodies	rotational seal		ACM STEEL	- STEEL			Molding Forging	Other - Not relevant Milling	Other - Not relevant Heat Treatment	nol 0	120,000	8 (
1	Ť	_1	gears w/ clutch bodies	driven shaft	2,174	STEEL	STEEL	90%	3	Forging	Milling	Heat Treatment	no 0	120,000	8 (
1	ų.		gears w/ clutch bodies	driven shaft		STEEL	STEEL	90%	3	Forging	Machining Center	Heat Treatment	no 0 no 0	120,000	
1	1	1	bearing for G 17 A bearing for G 17 A	Z tapered roller be- screw		STEEL	Ē	100%	1	Forming & Shaping	Precision Mechanics Other - Not relevant	Other - Not relevant	no 0	120,000	8 (
1	1		bearing for G 17 A	lock plate	2	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant		120,000	
1	1		bearing for G 17 A bearing for G 17 A	Z tapered roller be washer disk		STEEL				Forming & Shaping	Precision Mechanics Other - Not relevant	Other - Not relevant Other - Not relevant		120,000	
1	t	1	bearing for G 17 A	retainer ring	4	STEEL	F	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000	8
1	-	1	bearing for G 17 A	oil slinger disk Z tapered roller be		STEEL		100%	1	Forging	Other - Not relevant Precision Mechanics	Other - Not relevant Other - Not relevant	no 0		
1	-	-1	bearing for G 17 A bearing for G 17 A	Z tapered roller be	488 242	STEEL	-	100%		Forging Forging	Precision Mechanics	Other - Not relevant		120,000	
1	1	_1	bearing for G 17 A	thrust washer	10	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000	8 (
1		-1	bearing for G 17 A bearing for G 17 A	retainer ring Z tapered roller be		STEEL				Forming & Shaping Forging	Other - Not relevant Precision Mechanics	Other - Not relevant Other - Not relevant		120,000	
-	ŧ	-1	bearing for G 17 A	thrust washer		STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000) 8
_1	1	_1	bearing for G 17 A	Z tapered roller be	243	STEEL		100%	1	Forging	Precision Mechanics	Other - Not relevant	no 0	120,000	
1	╬	-	bearing for G 17 A bearing for G 17 A	thrust washer retainer ring		STEEL STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000	
1	1	_1	bearing for G 17 A	Z needle bushing	_52	STEEL		100%	1	Forging	Precision Mechanics	Other - Not relevant	no 0	120,000	1
1	#	-1	bearing for G 17 A bearing for G 17 A	thrust washer linear needle beari		STEEL	-	100%	+	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0	120,000	
1	٠.	寸	bearing for G 17 A	support disk		STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000	8
	1		bearing for G 17 A	needle cage		STEEL	PA66-GF			Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000	
1	╫	-7	bearing for G 17 A bearing for G 17 A	Z pressure disk needle cage		STEEL	PA66-GF	100%	H	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000) 8
3	1	_1	bearing for G 17 A	needle cage	36	STEEL	PA66-GF	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000	
1	•	-1	bearing for G 17 A bearing for G 17 A	needie cage needie cage	38	STEEL	PA66-GF PA66-GF	100%	4	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000	
1	-	1	bearing for G 17 A	spacer bushing	116	STEEL		100%	1	Roll forming	Other - Not relevant	Other - Not relevant	no 0	120,000	8 (
3	ıŢ	_1	bearing for G 17 A	retainer ring	.7	STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant	Other - Not relevant		120,000	
-	#	1	bearing for G 17 A synchromesh	needle cage synchronizing ring		MS	PA66-GF	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Molding Other - Not relevant		120,000	
3	1	_1	synchromesh	spacer	37	STEEL	·	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000) 6
-	¥		synchromesh	synchronizing ring syncrodog		MS	- STEEL	90%	爿	Forming & Shaping Powder Metalurov	Other - Not relevant Milling	Other - Not relevant Heat Treatment	no 0 no 0	120,000	
7	1	_1	synchromesh synchromesh	thrust block		STEEL	-	100%	1	Powder Metalurgy Forming & Shaping Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000	1 8
1	1	_1	synchromesh	spring	4	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	no O	120,000	
-	•		synchromesh synchromesh	retainer ring sliding collar		STEEL	- STEEL	70%	爿	Forming & Shaping Forging	Other - Not relevant Milling	Heat Treatment		120,000	
1	iľ	1	synchromesh	synchronizing ring	74	MS		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000	1 8
1		1	synchromesh	spacer synchronizing ring	34	MS	<u> </u>	100%	4	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	100 0	120,000 120,000	8 (0
1			synchromesh synchromesh	syncrodog	328	STEEL	STEEL	70%	2	Powder Metalurgy	Heat Treatment	Milling	no 0	120,000	8 10
1	ī	1	synchromesh	thrust block	_ 2	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000) [
-		1	synchromesh synchromesh	spring retainer ring		STEEL	-	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant		120,000	
1	1	- 1	synchromesh	sliding collar	238	STEEL	STEEL	70%	2	Forging	Milling	Heat Treatment	no 0	120,000	1
•	•		synchromesh	synchronizing ring		MS STEEL	<u> </u>	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant		no 0	120,000 120,000	3 6
•	-		synchromesh synchromesh	shim synchronizing ring		MS	Ē-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000) [
•	1	1	synchromesh	syncrodog	318	STEEL	STEEL	70%	3	Powder Metalurgy	Milling	Heat Treatment	nol 0	120,000	oT − 8
		-1	synchromesh synchromesh	thrust block spring	2	STEEL	-	100%	₩	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	mo 6	120,000	1
1	1	1	synchromesh	retainer ring	_ 7	STEEL	E	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000) E
			synchromesh	aliding collar Z shift sleeve	208	STEEL	MS	70%	2	Forging Forging	Heat Treatment	Milling Milling	no 0	120,000	0 8
-			synchromesh synchromesh	syncrodog		STEEL	STEEL	70%	2	Powder Metalurgy	Milling	Heat Treatment	no 0	120,000	OT 8
1	1	1	synchromesh	retainer ring	_ 7	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 120,000 120,000	0 6
1		1	differential gearbox	Z differential housi thrust washer com		CAST IRON PLASTIC	STEEL	100%	귀	Sand Casting Molding	Machining Center Other - Not relevant	Heat Treatment Other - Not relevant	no 0	120,000	0 6
-			differential gearbox differential gearbox	bevel pinion	474	STEEL	STEEL	70%	2	Sand Casting Molding Powder Metalurgy	Heat Treatment	Milling	no 0	120,000	0 8
7		1	differential gearbox	bevel pinion	207	STEEL	STEEL	70%	2	Powder Metalurgy	Heat Treatment	Milling Heat Treatment		120,000 120,000	
-	╫	_1	differential gearbox differential gearbox	differential pinion s	. 2	STEEL	STEEL	100%	f	Forging Forming & Shaping	Milling Other - Not relevant	Other - Not relevant	no 0	120,000	ď
1	1	1	differential gearbox	Z tapered roller be	1,252	STEEL	<u> </u>	100%	3	Forging	Precision Mechanics	Other - Not relevant	no 0	120,000 120,000	0 8
1	#	-1	differential gearbox differential gearbox	thrust washer Z tapered roller be		STEEL	-	100%	2	Forming & Shaping Forging	Precision Mechanics	Other - Not relevant Other - Not relevant	no 0	120,000	ग ह
	1		differential gearbox	washer		STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000	0 8

81 1	1 differential gearbox	flanged shaft	1,182	STAINLESS	STAINLESS	70%	2	Forging	Milling	Heat Treatment	no I o	120,000 80,000
81 1 81 1	1 differential gearbox 1 differential gearbox	rotational seal compression spring	21	RUBBER	-	100% 100%	7	Molding Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
81 1	1 differential gearbox	thrust washer	10	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
81 1 81 1	1 differential gearbox 1 differential gearbox	bevel ring retainer ring	1	STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
81 1	1 differential gearbox 1 differential gearbox	Z push on shaft screw		STEEL	STEEL	70% 100%	1	Forging Forming & Shaping	Heat Treatment Other - Not relevant	Milling Other - Not relevant	no 0	120,000 80,000 120,000 80,000
81 1	1 differential gearbox 1 differential gearbox	nut for flanged sha radial seal	44	STEEL	-	100%	1	Forming & Shaping Molding	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
81 1	1 differential gearbox	bearing case	868	AL	Ė.,	100%	1	Die Casting	Drilling	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
81 1	1 differential gearbox 1 differential gearbox	support	309 46	STEEL	AL.	100% 75%	1	Die Casting Forming & Shaping	Drilling Other - Not relevant	Other - Not relevant Forming & Shaping	no 0	120,000 80,000 120,000 80,000
81 1 81 1	1 differential gearbox	screw flanged shaft	55	STEEL	AL	75% 90%	1 2	Forming & Shaping	Other - Not relevant Milling	Forming & Shaping Heat Treatment	no 0	120,000 80,000
81 1	1 differential gearbox 1 differential gearbox	Z tapered roller be	270	STEEL	RUBBER	90%	2		Assembly	Injection Molding	no 0	120,000 80,000 120,000 80,000
81 1	1 differential gearbox 1 differential gearbox	retainer ring cover panel		STEEL	-	100%	+	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
81 1 82 1	1 differential gearbox 1 manual transmission	screw		STEEL	-	100% 100%	-	Forming & Shaping Molding	Other - Not relevant Other - Not relevant		no 0	120,000 80,000
82 1	1 manual transmission		3	Ε		100%	-	Other - Not relevant	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
82 1 82 1	1 manual transmission 1 manual transmission	 	195 1	AL PLASTIC	-	100%	1	Die Casting Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
82 1	1 manual transmission 1 manual transmission			EPDM AL	-	100%	1	Molding Die Casting	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000
82 1	1 manual transmission			EPDM	-	100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
82 1 82 1	1 manual transmission 1 manual transmission	<u> </u>		STEEL	•	100%	7	Forming & Shaping Forging	Other - Not relevant Milling	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
82 1 82 1	1 manual transmission		14	EPDM		100%	-	Molding	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
82 1	1 manual transmission 1 manual transmission	Z arrestor bolt	7	PA6-GF	STEEL	100% 80%	7	Forming & Shaping Molding	Other - Not relevant		no 0	120,000 80,000 120,000 80,000
82 1 82 1	1 manual transmission 1 manual transmission	Z shifting rod Z shifting rod		STEEL	AL AL	50% 50%	1	Investment Casting Investment Casting	GMAW/FCAW-MIG GMAW/FCAW-MIG	Investment Casting Investment Casting	no 0	120,000 80,000 120,000 80,000
82 1	1 manual transmission	Z shifting rod	560	STEEL	AL	50%	1	Investment Casting	GMAW/FCAW-MIG	Investment Casting	no 0	120,000 80,000
82 1 82 1	1 manual transmission 1 manual transmission	Z shift fork bearing sleeve	344 26	STEEL	AL -	50% 100%	1	Investment Casting Forming & Shaping	Other - Not relevant		no 0	120,000 80,000 120,000 80,000
83 1 111 1	1 transmission oil 1 crankcase	transmission oil crankcase	893 34,930		CAST IRON	100%	3		Other - Not relevant Machining Center		no 0 no 0	120,000 80,000 120,000 80,000
111 1	1 crankçase	bearing cover	385	CAST IRON	-	100%	Ť	Sand Casting	Drilling	Other - Not relevant	no 0	120,000 80,000
111 1	1 crankcase 1 crankcase	bearing cover screw	445 55	STEEL		100%	1	Sand Casting Forming & Shaping		Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
111 1	1 crankcase 1 crankcase	oil jet hollow bolt	- 8 10	STEEL	<u> </u>	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000
111 1	1 crankcase	oil pan	2,045	AL	-	100%	3	Press (Tandem)	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
111 1	1 crankcase 1 crankcase	splash plate screw	10	PA6-GF STEEL		100%	3	Injection Molding Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
111 1	1 crankcase 1 crankcase	screw	18 10			100%	+	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
111 1	1 crankcase 1 crankcase	oil drain plug radial seal	37	STEEL		100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
111 1	1 crankcase	gasket	561	AL	AL.	50%	2	Die Casting	Other - Not relevant Drilling	Milling	no 0 no 0	120,000 80,000 120,000 80,000
111 1	1 crankcase 1 crankcase	gasket Timing belt cover		MS PA66-GF	PPS	100% 95%	1	Forging Injection Molding	Drilling Other - Not relevant	Other - Not relevant Forming & Shaping	no 0	120,000 80,000 120,000 80,000
111 1	1 crankcase 1 crankcase	cover Timing belt cover	62	STEEL	-	100%	2	Press (Tandem) Press (Tandem)	Painting	Other - Not relevant Other - Not relevant	no 0	120,000 80,000
111 1	1 crankcase	Tirning belt cover	126	STEEL		100%	1	Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
111 1	1 crankcase 1 crankcase	screw	9	STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
112 1	1 cylinder head 1 cylinder head	cylinder head gask Z cylinder head		RUBBER	STEEL	100%	3	Molding Die Casting	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
112 1	1 cylinder head	bearing cover	45	AL	-	100%	1	Die Casting	Other - Not relevant	Milling Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
112 1	1 cylinder head 1 cylinder head	bearing cover assembly aid	57 117	STEEL	-	100% 100%	+	Die Casting Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
112 1	1 cylinder head 1 cylinder head	screw	15	STEEL	-	100%			Other - Not relevant		no 0 no 0	120,000 80,000
112 1	1 cylinder head	nut	6	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
112 1	1 cylinder head 1 cylinder head	gasket cap	48	PA-GF	- EPDM	100%	1	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
112 1	1 cylinder head 1 cylinder head	nut splash plate	211	STEEL PA6-GF		100%	- -	Forming & Shaping Injection Molding		Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
112 1	1 cylinder head	Cam cover	888	AL		100%	1	Die Casting	Milling	Other - Not relevant	no 0	120,000 80,000
113 1	1 crankshaft, bearing, rotational seals 1 crankshaft, bearing, rotational seals	crankshaft belt pulley	1,748		EPDM	100% 75%	2	Forging Press (Tandem)	Machining Center Other - Not relevant	Other - Not relevant Injection Molding	no 0 no 0	120,000 80,000 120,000 80,000
113 1	1 crankshaft, bearing, rotational seals 1 crankshaft, bearing, rotational seals	rotational seal		STEEL	EPDM	100% 80%	+		Other - Not relevant Other - Not relevant	Other - Not relevant Molding	no 0 no 0	120,000 80,000 120,000 80,000
113 1	1 crankshaft, bearing, rotational seals 1 crankshaft, bearing, rotational seals	thrust washer thrust washer	9	STEEL STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
113 1	1 crankshaft, bearing, rotational seals	bearing liner	29	STEEL		100%	1	Forming & Shaping		Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
113 1 114 1	1 crankshaft, bearing, rotational seals 1 connecting rod and cap w/ bearings	bearing liner connecting rod		STEEL STAINLESS	-	100%	+	Forging	Milling	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
114 1	1 connecting rod and cap w/ bearings 1 connecting rod and cap w/ bearings	connecting rod bea bearing liner		STAINLESS STEEL		100%	1	Forging		Other - Not relevant	no 0	120,000 80,000
114 1	connecting rod and cap w/ bearings	bearing liner	17	STEEL		100%	.1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
115 1	1 connecting rod and cap w/ bearings 1 piston, piston rings, piston pin	piston	269			100% 100%	2	Die Casting	Other - Not relevant Milling	Other - Not relevant	по 0	120,000 80,000 120,000 80,000
115 1	1 piston, piston rings, piston pin 1 piston, piston rings, piston pin	piston ring piston ring		STEEL		100% 100%	1	Forming & Shaping	Other - Not relevant			120,000 80,000 120,000 80,000
115 1	1 piston, piston rings, piston pin	oil scraper ring	4	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
115 1	1 piston, piston rings, piston pin 1 piston, piston rings, piston pin	piston pin retainer ring	1	STEEL STEEL		100% 100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
116 1	1 cam shaft 1 cam shaft	cam shaft rotational seal	14	STAINLESS STEEL	EPDM	100%	1	Forging Forming & Shaping	Milling Other - Not relevant	Other - Not relevant Other - Not relevant		120,000 80,000 120,000 80,000
117 1	1 cam pulleys 1 cam pulleys	Timing belt Z cam shaft pulley	117	RUBBER	PA66-GF	50%	1	Vulcanization	Other - Not relevant	Compression Molding	no 0	120,000 80,000
117 1	cam pulleys	crankshaft sprocke	275	STEEL	-	100%	1	Forging	Milling	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
117 1 1	cam pulleys	idler pulley screw		STEEL STEEL	STEEL	50% 100%	2			Press (Tandem) Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
117 1	cam pulleys	screw	119	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
117 1 1	cam pulleys	washer	3	STEEL	•	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
118 1 1 119 1 1	lifter with adjuster plate intake and exhaust valve	hydraulic lifter intake valve		STEEL	- 1	100%		Press (Tandem) Forging	Other - Not relevant Milling	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
119 1 1	intake and exhaust valve intake and exhaust valve	valve shaft seal valve guide	1		EPDM	100% 100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
119 1 1	intake and exhaust valve	cone	1	STEEL		100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
119 1 1	intake and exhaust valve intake and exhaust valve	spring seat valve spring		STEEL STEEL	<u> </u>	100%	.1	Press (Tandem) Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant		120,000 80,000 120,000 80,000
119 1 1 120 1 1	intake and exhaust valve oil pump w/ drive	exhaust valve oil pump housing		STEEL		100% 100%	1	Forging	Milling	Other - Not relevant	no 0	120,000 80,000
120 1 1	oil pump w/ drive	lid	100	AL .	-	100%	1	Die Casting	Milling	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
120 1 1	oil pump w/ drive oil pump w/ drive	external rotor interior light	200	STEEL STEEL		100%	1	Forging	Milling	Other - Not relevant Other - Not relevant		120,000 80,000 120,000 80,000
120 1 1 120 1 1	oil pump w/ drive oil pump w/ drive	drive pulley drive chain	135	STEEL STEEL	: ===	100% 100%	1	Press (Tandem)	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000
120 1 1	oil pump w/ drive oil pump w/ drive	tensioner	57	PA-66	STEEL	100%	1	Molding	Other - Not relevant	Forming & Shaping	no 0	120,000 80,000 120,000 80,000
120 1 1	oil pump w/ drive	radial seal Intake runner	166		STEEL	100% 60%	1	Bending	Press (Tandem)	Other - Not relevant GMAW/FCAW-MIG		120,000 80,000 120,000 80,000
120 1 1	oil pump w/ drive oil pump w/ drive	screw	12	STEEL STEEL	:	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
120 1 1	oil pump w/ drive	screw		STEEL		100%	1)	Forming & Shaping	Other - Not relevant	Other - Not relevant		120,000 80,000

	· · · · · · · · · · · · · · · · · · ·										
	1 oil pump w/ drive 1 oil filter and oil cooler	flange gasket	926	AL	STEEL	100%		Forming & Shaping Die Casting	Other - Not relevant Milling	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
121 1	1 oil filter and oil cooler	threaded nipple	90	STEEL	•	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
121 1	1 oil filter and oil cooler 1 oil filter and oil cooler	radial seal		STEEL EPDM	-	100%		Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
121 1	foil filter and oil cooler	oli cooler	440	AL	AL	50%		Press (Tandem)	Press (Tandem)	GMAW/FCAW-MIG	no 0 120,000 80,000
121 1	1 oil filter and oil cooler 1 oil filter and oil cooler	nut radial seal		STEEL EPDM	-	100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
121 1	1 oil filter and oil cooler	oil filter	630	STEEL	PUR	50%	3		Other - Not relevant	Nonwoven	no 0 120,000 80,000
121 1	1 oil filter and oil cooler 1 oil filter and oil cooler	gasket hose	20	STEEL	-	100%	+	Forming & Shaping Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000
121 1	oil filter and oil cooler	hose		EPDM	PÉ	100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
121 1	1 oil filter and oil cooler	hose clamp		STEEL	-	100%		Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
122 1	1 oil level dipatick, sleeve bushing 1 oil level dipatick, sleeve bushing	oil level dipstick sleeve tube	34	PBT	P8T -	70% 100%		Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
122 1	lioil level dipstick, sleeve bushing	sleeve tube		STEEL	=	100%		Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
122 1	i oil level dipatick, sleeve bushing i oil level dipatick, sleeve bushing	support		STEEL	-	100%	17	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
123 1	i oil level sensor (WIV) , sensor	oil level sensor	103	AL	EPDM	100%	1	Electronics	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
123 1	1 oil level sensor (WIV) , sensor 1 shield penels and skids preventing der	engine shielding		UP-GF	-	100%		Forming & Shaping Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
128 1	shield panels and skids preventing dar	rubber bearing	. 17	STEEL	RUBBER	100%	1.	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
128 1	1 shield panels and skids preventing day 1 shield panels and skids preventing day			STEEL		100%		Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
129 1	design cover	design cover	951	PA8-GF	-	100%	2	Injection Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
129 1	1 design cover 1 design cover	support bracket bolt		STEEL	-	100%	1		Other - Not relevant		no 0 120,000 80,000
129 1	design cover	grommet		RUBBER	Ē	100%		Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
129 1	design cover	washer nut		STEEL	-	100%		Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
129 1	design cover	ball joint head	8	PPA-GF	-	100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
130 1	injection system	engine control mod support		Electronics STEEL	-	100%		Electronics Press (Tandem)	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
130 1	Injection system	bracket	۵	POM	-	100%	+	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
130 1 1	injection system	bracket screw	6	POM	-	100%	1		Other - Not relevant		no 0 120,000 80,000
130 1	Injection system	throttle body contro	987	STEEL	PBT-GF	80%	1	Forming & Shaping Die Casting	Milling	Electronics	no 0 120,000 80,000 no 0 120,000 80,000
130 1	Injection system	gasket	2	PAPER	-	100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
130 1	Injection system	air flow meter	225	STEEL PBT-GF	-	100%	1 2	Forming & Shaping Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
130 1	injection system	radial seal	5	EPDM	<u> </u>	100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
130 1	I injection system	screw pedal position sens		STEEL PP-GF	STEEL	100%		Forming & Shaping Electronics	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
130 1	Injection system	acrew	- 6	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
	Injection system	oxygen sensor oxygen sensor		Electronics Electronics	-	100%	1	Electronics Electronics	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
130 1	injection system	fuel line compound	162	PLASTIC	-	100%		Extrusion (plastic)	Compression Molding	Other - Not relevant	no 0 120,000 80,000
130 1	Injection system	vacuum hose hose clamp	51 3	PLASTIC STEEL	<u>-</u>	100%	+	Molding Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
130 1	Injection system	support	20	STEEL	PA66-GF	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
130 1	Pinjection system	screw	7	STEEL		100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
130 1 1	injection system	clamp	2	AL	-	100%	1	Molding		Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
	injection system	fuel distributor pressure regulator	173 48	PA66-GF	STEEL	100%	1	Injection Molding Electric	Other - Not relevant Other - Not relevant	Casting Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
	injection system	bracket		STEEL	-	100%	1	Forming & Shaping		Other - Not relevant	no 0 120,000 80,000
130 1 1	injection system	hose	8	PLASTIC	-	100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
130 1 1	Injection system	injector radial seal	48	EPDM	-	100%	1	Electro-Mechanical Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
130 1 1	injection system_	radial seal		EPDM		100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
	injection system	bracket screw		STEEL	-	100%	+	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
130 1 1	Injection system	air line	52	STEEL	-	100%	Π	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
130 1 1	Injection system	hose clamp		STEEL EPDM	- PLASTIC	100%	1	Forming & Shaping Molding	Other - Not relevant Molding	Molding	no 0 120,000 80,000 no 0 120,000 80,000
130 1 1	injection system	support	2	PA-86	-	100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
130 1 1	injection system	hose clamp fuel tank breather		STEEL PA66-GF	-	100%	1	Forming & Shaping Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
130 1 1	injection system	support	13	EPDM	-	100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
130 1 1	injection system	Vacuum line Z fuel pump		POM	POM	100% 35%	1 2	Molding Injection Molding	Other - Not relevant Injection Molding	Other - Not relevant Electric	no 0 120,000 80,000 no 0 120,000 80,000
130 1 1	injection system	retainer		POM	-	100%	1	Injection Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
130 1 1	injection system	radial seal cap nut	48 82	RUBBER PE	:	100%	1	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
130 1 1	injection system	lid	233	PLASTIC		100%	1	Injection Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
130 1 1	injection system injection system	screw		STEEL	<u>: </u>	100%	1	Forming & Shaping Forming & Shaping		Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
130 1 1	injection system	bracket		STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
130 1 1	injection system intake line and manifold	switch intake runner	3,394	PA-6		100%		Electric Die Casting	Other - Not relevant Milling	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
131 1 1	intake line and manifold	intake manifold	1,088	AL		100%	1	Die Casting	Milling	Other - Not relevant	no 0 120,000 80,000
	intake line and manifold intake line and manifold	gasket gasket		RUBBER	-	100%		Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
131 1	intake line and manifold	SCTOW	38	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
	intake line and manifold Intake line and manifold	screw	15	STEEL STEEL		100%	1		Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
131 1 1	intake line and manifold	nut	6	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
131 1 1	intake line and manifold intake line and manifold	support	170	STEEL		100%		Press (Tandem) Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
132 1 1	air filter	air filter housing	808	PLASTIC		100%	3	injection Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
	air filter	filter element	300	EPDM PLASTIC	EPDM	50%	1	injection Molding	RIM/Foam Molding	Other - Not relevant	no 0 120,000 80,000
132 1 1	air filter air filter	air filter housing intake runner	115	PP	EPDM	100%	1	Injection Molding	Other - Not relevant		no 0 120,000 80,000
132 1 1	air filter	intake runner	140	PP		100%	1.1	Injection Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
	air filter air filter	connecting pipe splashguard		TEEE PLASTIC		100%		Injection Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
132 1 1	air filter	ciamp	27_	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
132 1 1	air filter air filter	hose clamp gasket		EPDM	-	100%	1	Molding	Other - Not relevant_ Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
132 1 1	air filter	retainer	12	EPDM	-	100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
132 1 1	air filter air filter	retainer sleeve	7.	EPDM STEEL	-	100%	1	Molding Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
132 1 1	air filter	screw	4	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
132 1 1	air filter air filter	screw screw		STEEL		100%	H	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
133 1 1	crankcase ventilation	hase	220	AL	-	100%	1	Extrusion	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
133 1 1	crankcase ventilation crankcase ventilation	hose clamp		STEEL		100%			Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
133 1 1	crankcase ventilation	hase support	4	PLASTIC		100%	Ī	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
134 1 1	exhaust manifold exhaust manifold	exhaust manifold	5,403 1,500	STEEL	- STEEL	100% 50%	1	Other - Not relevant Press (Tandem)	Other - Not relevant GMAW/FCAW-MIG	Other - Not relevant Press (Tandem)	no 0 120,000 80,000 no 0 120,000 80,000
134 1 1	exhaust manifold		1,000	STEEL	-	100%	1	Press (Tandem)	GMAW/FCAW-MIG	Other - Not relevant	no 0 120,000 80,000
134 1 1	exhaust manifold exhaust manifold	exhaust manifold	1.500	STEEL CAST IRON	CAST IRON	100% 70%	1	Press (Tandem) Sand Casting		Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
134 1 1	exhaust manifold	exhaust manifold	1,000	CAST IRON	CAST IRON	70%	1	Sand Casting	GMAW/FCAW-MIG	Other - Not relevant	no 0 120,000 80,000
134 1 1	exhaust manifold exhaust manifold	gasket nut		STEEL STEEL	-	100%		Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
134 1 1	exhaust manifold	support	294	STEEL		100%	2	Press (Tandem)	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
134 1 1	exhaust manifold exhaust manifold	screw washer		STEEL STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000

134 1	1 exhaust manifold	nut	13	STEEL	I	100%	1 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,00
135 1	1 exhaust gas recirculation (EGR), EGF	EGR valve		STEEL	AL	40%	3	Press (Tandem)	Precision Mechanics	Die Casting	no 0	120,000 80,00
135 1	1 exhaust gas recirculation (EGR), EGR 1 exhaust gas recirculation (EGR), EGR	gasket		STEEL	:	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant		no 0	120,000 80,00 120,000 80,00
135 1	1 exhaust gas recirculation (EGR), EGF	hose		RUBBER	-	100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0	120,000 80,00
135 1	1 exhaust gas recirculation (EGR), EGF 1 exhaust gas recirculation (EGR), EGF	clamp pipe clamp	188	STEEL	:	100%	1 +	Forming & Shaping Coiling	Other - Not relevant Other - Not relevant		no 0	120,000 80,00 120,000 80,00
136 1	1 secondary air system	secondary air pum	1,317	PA6-GF	STEEL	100%		Precision Mechanics	Other - Not relevant	Other - Not relevant	no 0	120,000 80,00
136 1	1 secondary air system 1 secondary air system	nut support		STEEL	-	100% 100%	1 1	Forming & Shaping Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,00 120,000 80,00
136 1	1 secondary air system	acrew	13	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,00
136 1	1 secondary air system 1 secondary air system	valve gasket	194	PAPER		100%	1 1	Die Casting Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,00 120,000 80,00
136 1	1 secondary air system	screw	9	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,00
136 1	1 secondary air system 1 secondary air system	adapter		STEEL	AL.	100%	1	Die Casting Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
136 1	1 secondary air system	screw		STEEL	<u> </u>	100%	1	Forming & Shaping	Other - Not relevant		no 0	120,000 80,00
136 1	1 secondary air system	connecting pipe		PA6-GF		100%	1	Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
136 1 136 1	1 secondary air system 1 secondary air system	connecting tube support	173 3	PLASTIC	-	100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 no 0	120,000 80,00
136 1	1 secondary air system	support		PA-66 STEEL		100%	1 1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0	120,000 80,00
136 1	1 secondary air system 1 secondary air system	clamp screw		STEEL	-	100%	+	Forming & Shaping Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
136 1	1 secondary air system	clamp	12		•	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
136 1	1 secondary air system 1 secondary air system	hose	106	STEEL PA6-GF	-	100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
137 1	1 mufflers	exhaust pipe	4,295		STEEL	40% 100%	1	Sand Casting	Bending	GMAW/FCAW-MIG	no 0	120,000 80,000
137 1	1 mufflers	catalytic converter connecting tube	3,866 693	STEEL	AL	70%	2	Electronics Bending	Other - Not relevant GMAW/FCAW-MIG	Other - Not relevant Bending	no 0	120,000 80,000 120,000 80,000
137 1	1 mufflers	connecting tube	1,146	STEEL	STEEL	80%	2	Bending	Press (Tandem)	GMAW/FCAW-MIG	no 0	120,000 80,000
137 1	1 mufflers 1 mufflers	resonator connecting tube	6,338 1,898		-	100%	1	Bending Bending	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,00
137 1	1 mufflers	connecting tube	176	STEEL	· CTEP	100%	1	Roll forming	Other · Not relevant	Other - Not relevant	no 0	120,000 80,000
137 1	1 multiers 1 multiers	muffler tailpipe	5,738 777	STEEL	STEEL	70% 100%	2	Roll forming Roll forming	GMAW/FCAW-MIG Bending	Roll forming Other - Not relevant	no 0	120,000 80,000 120,000 80,000
137 1	1 mufflers	gasket	26			100%	1	Press (Tandem)	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000
137 1	1 mufflers 1 mufflers	nut gasket	20	STEEL	==	100%	1	Forming & Shaping Press (Tandem)	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
137 1	1 mulfiers	screw	17	STEEL	•	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
137 1	1 mulfiers 1 mulfiers	nut heat shield panel	530	STEEL	. 	100%	2	Forming & Shaping Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
137 1	1 mufflers	acrew	6	STEEL		100%	. 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,00
137 1	1 mufflers 1 mufflers	push nut screw	- 7 5	STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
137 1	1 mufflers	pipe clamp	161	STEEL		100%	1	Forging	Other - Not relevant	Other - Not relevant	no 0	120,000 80,00
137 1	1 mufflers 1 mufflers	nut		STEEL	-	100%	+	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
137 1	1 mufflers	exhaust rubber har	75	EPDM		100%	1	Injection Molding	Other - Not relevant	Other - Not relevant	no 0	120,000 80,00
138 1	1 heat shield panels 1 heat shield panels	heat shield panel	825 648		-	100%	3	Press (Tandem) Press (Tandem)			no 0	120,000 80,000 120,000 80,000
138 1	1 heat shield panels	heat shield panel	804	AL	-	100%	2	Press (Tandem)	Other - Not relevant	Other - Not relevant	no 0	120,000 80,00
138 1	1 heat shield panels 1 heat shield panels	heat shield panel heat shield panel	348 453		-	100%	2	Press (Tandem) Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
138 1	1 heat shield panels	nut	5	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
138 1	1 heat shield panels 1 heat shield panels	heat shield panel heat shield panel	120	AL		100%	2	Press (Tandem) Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
138 1	1 heat shield panels	heat shield panel	78	AL	-	100%	2	Press (Tandem)	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
138 1	1 heat shield panels 1 heat shield panels	heat shield panel shield		AL	AL	100%	1	Press (Tandem) Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
138 1	heat shield panels	shield	25	AL	-	100%	İ	Press (Tandem)	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
138 1	1 heat shield panels 1 heat shield panels	shield bracket		STEEL	-	100%	1	Press (Tandem) Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
138 1	1 heat shield panels	screw	8	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
138 1	1 neat shield panels	nut motor oil	883	STEEL	-	100%	1	Forming & Shaping Other - Not relevant	Other - Not relevant Other - Not relevant		no 0 no 0	120,000 80,000 120,000 80,000
140 1	1 coolant	coolant	1,055	Ε	-	100%		Other - Not relevant	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
156 1	1 engine fastening elements	bearing block screw	912 19			100%	2	Press (Tandem) Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
156 1	1 engine fastening elements 1 engine fastening elements	angle support	465		_	100%	2	Die Casting			no 0	120,000 80,000
156 1	1 engine fastening elements 1 engine fastening elements	screw		STEEL		100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
156 1	engine fastening elements	support bearing	6,505	CAST IRON		100%	2	Sand Casting	Milling	Other - Not relevant	no 0	120,000 80,000
156 1	1 engine fastening elements	screw Z damping elemen	1.005		- RUBBER	100% 70%	3	Forming & Shaping Press (Tandem)	Other - Not relevant Assembly	Other - Not relevant Injection Molding	no 0	120,000 80,000 120,000 80,000
157 1	1 engine damping elements 1 engine damping elements	Z damping elemen	302		STEEL	70%	2	Injection Molding	Assembly	Forming & Shaping	no 0	120,000 80,000
157 1 157 1		nut nut		STEEL		100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
158 1	transmission fastening elements	support bearing	1,215			100%	2	Die Casting	Milling	Other - Not relevant	no 0	120,000 80,000
158 1 158 1	1 transmission fastening elements 1 transmission fastening elements	screw support	90 118	STEEL		100%	1	Forming & Shaping Forging	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
158 1	transmission fastening elements	screw		STEEL		100%	Ħ	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
158 1	transmission fastening elements	screw	65	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
158 1	transmission fastening elements	actem		STEEL		100%			Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
158 1 158 1		screw		STEEL		100%		Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
158 1	transmission fastening elements	screw	72	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
159 1		transmission bearing	1,910	AL STEEL	RUBBER	70% 100%	3	Press (Tandem) Forming & Shaping	Assembly Other - Not relevant	Injection Molding Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
159 1	1 transmission damping elements 1 transmission damping elements	screw screw	45	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
159 1 159 1	transmission damping elements	acrew nut	89	STEEL		100% 100%	7	Forming & Shaping			no 0 no 0	120,000 80,000 120,000 80,000
159 1	1 transmission damping elements	washer	54	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000
159 1	1 transmission damping elements	hinged column	1,295	AL	RUBBER	70% 100%	3	Die Casting	Assembly	Injection Molding	no 0 no 0	120,000 80,000
		screw nut	18	STEEL		100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant		no 0	120,000 80,000
16 2 2	1 front brake	brake mount	1,742		STAINLESS	90%	3	Sand Casting	Milling	Heat Treatment	yes 3	120,000 80,000
		brake caliper piston	483	STEEL	STEEL	90%	1	Sand Casting Forging	Machining Center Milling	Heat Treatment Heat Treatment	yes 3 yes 2	120,000 80,000 120,000 80,000
16 2 2	front brake	gasket brake pad	7	EPDM	STEEL	100%		Molding	Other - Not relevant	Other - Not relevant Heat Treatment	yes 1	120,000 80,000
16 2 2	front brake	brake pad brake pad	555	STEEL	STEEL	80%	3	Forging Forging	Impregnation Impregnation	Heat Treatment	yes 2	120,000 80,000
16 2 2	front brake	brake pad	513	STEEL STEEL	STEEL	80% 100%	3	Forging	Impregnation	Heat Treatment Other - Not relevant	yes 2 yes 1	120,000 80,000 120,000 80,000
16 2 2	front brake	cable support screw	3	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1	120,000 80,000
16 2 2	front brake	support spring bleeder valve	11	STEEL		100%	1	Bending Forming & Shaping	Other - Not relevant Other - Not relevant		yes 1	120,000 80,000 120,000 80,000
16 2 2	1 front brake	dust cap	1	EPDM		100%	1	Molding	Other - Not relevant	Other - Not relevant	yes 1	120,000 80,000
	front brake	dust cap guide boit		PP STEEL		100%	1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 yes 1	120,000 80,000 120,000 80,000
16 2 2	front brake	screw	77	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1	120,000 80,000
		cover panel screw		STEEL	-	100%	-	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes 1 yes 1	120,000 80,000
17 2 2	rear brake	brake mount	767	STAINLESS	STAINLESS	90%	1	Investment Casting	Milling	Heat Treatment	yes 3	120,000 80,000
17 2 2	rear brake	brake caliper piston		CAST IRON STEEL	CAST IRON STEEL	90% 90%	3		Milling	Heat Treatment Heat Treatment	yes 3 yes 2	120,000 80,000 120,000 80,000
17 2 2	rear brake	gasket	6	EPDM		100%		Molding	Other - Not relevant	Other - Not relevant	yes 1	120,000 80,000
17 2 2		brake pad wear indicator	234	STEEL Electronics	STEEL	90% 100%	- 6	Forging Electronics	Impregnation Other - Not relevant	Heat Treatment Other - Not relevant	yes 2 yes 1	120,000 80,000 120,000 80,000
17 2 2		cable tray		STEEL	-	100%	÷		Other - Not relevant	Other - Not relevant	yes 1	120,000 80,000

17 2 21 reer brake	cable support		STEEL	F	100%		Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
17 2 21 rear brake 17 2 21 rear brake	screw bleeder valve		STEEL	-	100%		Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000
17 2 21 rear brake	dust cap	1	EPDM		100%	6 1	Molding	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
17 2 21 rear brake	protective cover		STEEL_		100%			Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000
17 2 21 rear brake 17 2 21 rear brake	SCIEW	12	STEEL	-	100%		Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000
17 2 21 rear brake	cover panel	653	STEEL		100%	1	Press (Tandem)	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid ten 18 2 21 brake pressure lines, hoses, fluid ten		105	STEEL	EPDM EPDM	50% 50%		Forging Forging	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid tan 18 2 21 brake pressure lines, hoses, fluid tan	k breke hose		STEEL STEEL	EPDM	100%	1	Forging	Other - Not relevant	Vulcanization	no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid tan	k brake line	56	STEEL	-	100%	1	Roll forming	Welding and Cutting Welding and Cutting	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid tan 18 2 21 brake pressure lines, hoses, fluid tan	support bracket		STEEL	-	100%		Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid tan	support spring	3	STEEL	F	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid ten 18 2 21 brake pressure lines, hoses, fluid ten	support		PLASTIC	==	100%			Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid tan 18 2 21 brake pressure lines, hoses, fluid tan			PLASTIC PLASTIC		100%	1	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid tan	support	5	PLASTIC		100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid tan 18 2 21 brake pressure lines, hoses, fluid tan			STEEL		100%		Roll forming Roll forming	Welding and Cutting Welding and Cutting	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid tan 18 2 21 brake pressure lines, hoses, fluid tan	brake line		STEEL	-	100%	1	Roll forming Roll forming	Welding and Cutting Welding and Cutting	Other - Not relevant	no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid ten	brake line	83	STEEL	-	100%	1	Roll forming	Welding and Cutting	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid tan 18 2 21 brake pressure lines, hoses, fluid tan			STEEL		100%			Welding and Cutting Welding and Cutting	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid ten	brake line	69	STEEL	===	100%	1	Roll forming	Welding and Cutting	Other - Not relevant	no 0 120,000 80,000
18 2 21 brake pressure lines, hoses, fluid tan	screw	6	STEEL	<u> </u>	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	power brake boosts HOUSING LOV	3,951 901	- STEEL	-	100%	1 -	Other - Not relevant Investment Casting	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster	HOUSING LOV	6	STEEL		100%		Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	BRACKET BRACKET	6	STEEL		100%		Press (Tandem) Forming & Shaping	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	RETAINER RETAINER	67	STEEL		100%	1	Forming & Shaping	Other - Not relevant		ne 0 120,000 80,000
19 2 21 brake booster	GASKET	48	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	GASKET GASKET	14	STEEL	<u> </u>	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster	DIAPHRAGM	96	EPDM		100%	3	Extrusion (plastic)	Vulcanization	Other - Not relevant	no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	PISTON SPRING	76	PET STEEL	Ē	100%	2	Forming & Shaping	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	PISTON SEAL		STEEL	-	100%			Milling	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster	SHAFT	200	STEEL		100%	1	Forging	Milling	Other - Not relevant	no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	BOOT ISOLATOR		PUR	 	100%	1			Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	PLUNGER PLUNGER	47	STEEL	-	100%	_2	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
19 2 21 brake booster	HOUSING UPP	984	STEEL	-	100%	2	Investment Casting	Other - Not relevant Milling	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	RÉTAINER TUBE		PA-66		100%	1		Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster	COVER	4	PA-66		100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	CONNECTOR VALVE	11	PA-66 POM	<u> </u>	100%	1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	master cylinder cap	502 17	AL PP/EPDM	AL	70%		Investment Casting Molding		Investment Casting Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster	plug	3	EPDM		100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	nut brake fluid contains	109	PP	-	100%	1	Injection Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster 19 2 21 brake booster	gasket gasket		EPDM EPDM		100%			Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
19 2 21 brake booster	vacuum line	59	TEEE-EPDW	PLASTIC	95%	1	Extrusion (plastic)	Other - Not relevant	Bending	no 0 120,000 80,000
20 2 21 brake pressure control system 20 2 21 brake pressure control system	hydraulic unit support	3,604 323	STEEL	- STEEL	100%	2	Press (Tandem)	Other - Not relevant Welding and Cutting	Press (Tandem)	no 0 120,000 80,000 no 0 120,000 80,000
20 2 21 brake pressure control system 20 2 21 brake pressure control system	rubber bearing shoulder bolt	11	- STEEL	-	100%			Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
20 2 21 brake pressure control system	screw	23	STEEL		100%	Ţ	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
20 2 21 brake pressure control system 21 2 21 brake fluid	nut brake fluid	1,082		-	100%	+	Other - Not relevant	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
68 2 22 accelerator with controls 68 2 22 accelerator with controls	accelerator pedal screw		STEEL	EPDM .	85% 100%			Other - Not relevant		
68 2 22 accelerator with controls	stop	27	PA6.6-GF-PA				Forming & Shaping			yes 3 120,000 80,000
89 2 23 clutch pedal w/ controls 89 2 23 clutch pedal w/ controls	clutch pedal				100%	1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000
69 2 23 clutch pedal w/ controls	bushing	1	PA6.6-GF STEEL	-	100%	1	Molding Injection Molding Molding	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000
	stop	1 17	STEEL PA66-GF	- - STEEL	100% 100%	1-1-1-1	Molding Injection Molding Molding Injection Molding	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000
69 2 23 clutch pedal w/ controls 69 2 23 clutch pedal w/ controls	atop Clutch master cylin screw	1 17 157 5	STEEL PA66-GF PAA-GF STEEL	- - STEEL -	100% 100% 100% 70% 100%	1-1-1-	Molding Injection Molding Molding Injection Molding Injection Molding Forming & Shaping	Other - Not relevant Press (Tandem) Other - Not relevant	Other - Not relevant Precision Mechanics Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000
69 2 23 clutch pedal w/ controls	stop Clutch master cylin screw guide compression spring	17 157 157 5 3	STEEL PA86-GF PAA-GF STEEL PLASTIC STEEL	STEEL - - - - PLASTIC	100% 100% 100% 70% 100% 100% 30%	1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Forming & Shaping Molding Colling	Other - Not relevant Injection Molding	Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000
89 2 23 clutch pedal w/ controls	stop Clutch master cylin screw guide compression spring cover	1 17 157 5 3 31 48	STEEL PA66-GF PAA-GF STEEL PLASTIC STEEL ABS	STEEL	100% 100% 100% 70% 100% 100% 30%	1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Forming & Shaping Molding Colling Injection Molding	Other - Not relevant Press (Tandem) Other - Not relevant Other - Not relevant Injection Motding Other - Not relevant	Other - Not relevant Precialon Mechanics Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000
69 2 23 clutch pedal w/ controls 69 2 2 35 clutch pedal w/ controls 69 2 23 clutch pedal w/ controls	stop Ciutch master cylin screw guide compression spring cover screw bleeder	1 17 157 5 3 31 48 2 43	STEEL PA66-GF PAA-GF STEEL PLASTIC STEEL ABS STEEL PA66-GF	PLASTIC STEEL	100% 100% 100% 70% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Forming & Shaping Molding Colling Injection Molding Forming & Shaping Injection Molding Injection Molding	Other - Not relevant Press (Tandem) Other - Not relevant Other - Not relevant Injection Modding Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Press (Tandem)	Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120
69 2 23 clutch pedal w/ controls	atop Ciutch master cylir screw guide compression spring cover screw bleeder Z pressure line bracket	1 17 157 5 3 31 48 2 43 328	STEEL PA66-GF PAA-GF STEEL PLASTIC STEEL ABS STEEL ABS STEEL STEEL STEEL STEEL STEEL	- PLASTIC - -	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Forming & Sheping Molding Colling Injection Molding Forming & Shaping Injection Molding Forming & Shaping Forming & Shaping Forming & Shaping Forming & Shaping Forming & Shaping Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000 90
69 2 23 clutch pedal w/ controls	stop Clutch master cylin screw guide compression spring cover screw bleeder Z pressure line bracket bracket	1 17 157 5 3 31 48 2 43 328 1	STEEL PA66-GF PAA-GF STEEL PLASTIC STEEL ABS STEEL PA66-GF STEEL STEEL STEEL STEEL	PLASTIC STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Molding Injection Molding Injection Molding Injection Molding Forming & Sheping Molding Colling Injection Molding Forming & Sheping Injection Molding Forming & Sheping	Other - Not relevant	Other - Not relevant	yes 3 22,000 80,000 1,00
69 2 23 clutch pedal w/ controls	stop Ciutch master cylir screw guide compression spring cover screw bleeder Z pressure line bracket support screw	1 17 157 5 3 31 48 2 43 328 1 1 1 30 5	STEEL PAGG GF PAA-GF STEEL PLASTIC STEEL ABS STEEL PAGG GF STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL	PLASTIC STEEL	100% 100% 100% 100% 100% 100% 30% 100% 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Molding Injection Molding Injection Molding Injection Molding Forming & Sheping Molding Colling Injection Molding Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 11 20,000 80,000 yes 13 120,000 80,000 yes 3 120,000 80,000 yes 14 120,000 80,000 yes 17 120,000 80,000
69 2 23 clutch pedal w/ controls	stop Ciutch master cylir screw guide compression spring cover screw bleeder Z pressure line bracket support screw feed hose hose clamp	1 177 157 5 3 3 31 48 2 43 328 1 1 1 30 5 5	STEEL PAGG-GF PAA-GF STEEL PLASTIC STEEL ABS STEEL	PLASTIC STEEL	100% 100% 70% 100% 100% 100% 100% 100% 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Molding Injection Molding Injection Molding Injection Molding Forming & Sheping Molding Colling Injection Molding Forming & Shaping Injection Molding Forming & Shaping Molding Forming & Shaping Molding Forming & Shaping Molding & Shaping & Shaping Molding & Shaping	Other - Not relevant	Other - Not relevant	yes 3 22,000 80,000 yes 1 20,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000
69 2 23 clutch pedd w/ controls	stop Gutch mester cylir screw guide compression spring cover screw bleeder Z pressure line bracket pracket support screw feed hose hose clamp support	1 177 157 5 3 31 48 2 43 326 1 1 1 30 5 5 1 1 1 30 2 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4	STEEL PAGG GF PAGG GF STEEL PLASTIC STEEL ABS STEEL PAGG GF STEEL	PLASTIC STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Forming & Sheping Molding Forming & Sheping Injection Molding Forming & Sheping Injection Molding Forming & Sheping	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120
69 2 23 clutch pedal w/ controls 68 2 23 clutch pedal w/ controls 68 2 23 clutch pedal w/ controls 69 2 23 clutch pedal w/ controls	dog Oluch master cylir screw judice cylir screw judice compression spring cover screw bleeder 22 pressure line bracket bracket screw support screw support screw aupport screw aupport screw 22 chiller knob	1 177 157 5 3 3 311 488 2 433 328 1 1 1 3 3 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	STEEL PASS-OF PAA-GF STEEL PLASTIC STEEL PASS-OF STEEL LEPDM STEEL STEEL LEPDM LEPTHER	PLASTIC STEEL	100% 100% 100% 100% 100% 100% 100% 100%		Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Sheping Molding Colling Injection Molding Forming & Sheping Injection Molding Forming & Sheping Forming & Shepin	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000 80,000 yes 1 120,000 80,000 80,000 yes 1 120,000 80
69 2 23 clutch pedal w/ controls	dog Gluch master cylir screw judde compression spring cover screw bleeder Screw bleeder Screw bracket support screw fleed hose hose damp support screw Carimp support Screw Screw Carimp Screw Screw Carimp Screw	1 1 177 1577 1577 1577 1577 1577 1577 1	STEEL PAGE-GF PAAG-GF STEEL	PLASTIC - STEEL EPDM	100% 100% 100% 100% 100% 100% 100% 100%		Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Sheping Molding Colling Injection Molding Forming & Sheping Injection Molding Forming & Sheping Forming & Shepin	Other - Not relevant Injection Moiding Other - Not relevant Injection Moiding Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 120
69 2 23 clutch pedal w/ controls 69 2 2 35 clutch pedal w/ controls 69 2 2 35 clutch pedal w/ controls 69 2 2 35 clutch pedal w/ controls 69 2 23 clutch pedal w/ controls 69 2 24 clutch pedal w/ controls 69 2 23 clutch pedal w/ controls 69 2 24 clutch pedal w/ controls 69 2 25 clutch pedal w/ controls 69 2 24 clutch pedal w/ controls 69 2 25 clutch pedal w/ con	dog Gluch master cylir screw judde compression spring cover screw Useader Z pressure line bracket support screw these damp support screw Z priffer knob hose clamp shift housing shift housing	1 1 17 157 157 157 157 157 157 157 157 1	STEEL PAGE-GF PAGE-GF PAGE-GF PAGE-GF STEEL PAGE-GF STEEL LEATHER STEEL	PLASTIC - STEEL EPDM	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Shaping Molding Colling Injection Molding Forming & Shaping Injection Molding Forming & Shaping Extrusion (pleasite) Forming & Shaping Extrusion (pleasite) Forming & Shaping City Colling City C	Other - Not relevant Injection Modeling Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 11 20,000 80,000 yes 13 120,000 80,000 yes 14 120,000 80,000 yes 14 120,000 80,000 yes 17 120,000 80,000 yes 18 120,000 80,000 yes 19 120,000 80,000
69 2 23 clutch pedal w/ controls	dog Clutch master cylir screw judde Cover	1 1 177 157 157 157 157 157 157 157 157	STEEL PAG-GF PAG-GF PAG-GF STEEL PAG-GF STEEL PAG-GF STEEL	PLASTIC - STEEL EPOM	100% 100% 100% 100% 100% 100% 100% 100%		Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Sheping Molding Colling Injection Molding Forming & Shaping Injection Molding Forming & Shaping Forming & Shapin	Other - Not relevant Injection Modeling Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 11 20,000 80,000 yes 31 90,000 80,000 yes 31 90,000 80,000 yes 11 120,000 80,000 yes 12 120,000 80,000 yes 2 120,000 80,000
69 2 23 clutch pedal wf controls 69 2 2 33 clutch pedal wf controls 69 2 23 clutch pedal wf controls 69 2 24 clutch chiffer wf transmission controls, 60 2 24 clutch chiffer wf transmission controls, 60 2 24 clutch chiffer wf transmission controls, 60 2 24 clutch wf transmission controls, 61 2 24 clutch wf transmission controls, 62 2 24 clutch wf transmission controls, 63 2 2 2 clutch pedal wf transmission controls, 64 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Jeop Gutch master cylir screw judde Gower Gover ous	1 177 157 5 3 3 118 48 48 48 48 48 48 48 48 48 48 48 48 48	STEEL PAGG OF PAGG OF PAGG OF PAGG OF STEEL ABB STEEL ABB STEEL	PLASTIC - STEEL EPDM	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Sheping Molding Forming & Sheping Injection Molding Forming & Sheping Injection Molding Forming & Sheping Rotting Ro	Other - Not relevant Injection Medding Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 20,000 80,000 yes 1 20,000 80,000 yes 3 20,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 1 720,000 80,000 yes 1 20,000 80,000
69 2 23 clutch pedal w/ controls 69 2 24 clutch setal w/ controls 69 2 25 clutch setal w/ controls 69 2 25 clutch setal w/ controls	dog Oluch master cylir scraw Journal of the scraw J	1 177 157 5 3 3 148 43 328 1 1 3 3 24 4 3 3 24 4 4 144 4 3 1,032 600 150 100 100 100 100 100 100 100 100 1	STEEL PAGE-GF PAGE-GF PAGE-GF PAGE-GF PAGE-GF STEEL	PLASTIC - STEEL EPOM	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Sheping Molding Colling Injection Molding Forming & Sheping Injection Molding Forming & Sheping Frescion Molding Injection Molding Injection Molding	Other - Not relevant Press (Tendern) Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 120
69 2 23 clutch pedal w/ controls 69 2 24 clutch shifter w/ transmission controls, 69 2 24 clutch shifter w/ t	dog Oluch master cylir scraw Journal of the scraw J	1 1 17 157 157 157 157 157 157 157 157 1	STEEL PAGE-GF PAGE-GF PAGE-GF PAGE-GF PAGE-GF STEEL	PLASTIC - STEEL EPOM	100% 100% 100% 100% 100% 100% 30% 100% 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Colling Injection Molding Goding Golding Injection Molding Forming & Shaping Injection Molding Forming & Shaping Preset (I andem) Forming Pring Forming & Shaping Frest (I andem) Forming & Shaping Frest (I andem) Forming & Shaping Frest (I andem) Forming & Shaping Frestion Mochanics Injection Modding Forming & Shaping Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 120
69 2 23 clutch pedal wf controls 69 2 2 33 clutch pedal wf controls 69 2 23 clutch pedal wf controls 69 2 24 clutch pedal wf controls 69 2 24 clutch pedal wf controls 69 2 24 clutch shifter wf transmission controls, 70 2 24 clutch wf transmission controls, 70 2 24 c	dog Gluch master cylir screw judde Gompresion spring Gover screw bleeder Z pressure line bracket bracket bracket support screw hose damp support screw Z effect Screw Support Support Support Support Screw Support	1 1 17 17 17 17 17 17 17 17 17 17 17 17	STEEL PAGE PAGE PAGE PAGE PAGE PAGE STEEL PAGE STEEL PASTIC PASTIC	PLASTIC - STEEL EPDM	100% 100% 100% 100% 100% 100% 30% 100% 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Sheping Molding Sheping Molding Injection Molding Forming & Sheping Injection Molding Forming & Sheping & Shepin	Other - Not relevant Press (Tandem) Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 11 20,000 80,000 yes 41 120,000 80,000 yes 53 20,000 80,000 yes 61 120,000 80,000 yes 11 120,000 80,000 yes 21 120,000 80,000 yes 31 120,000 80,000
69 2 23 clutch pedal wf controls 69 2 2 32 clutch pedal wf controls 69 2 23 clutch pedal wf controls 69 2 24 elick shifter wf transmission controls, 70 3 7 2 24 elick shifter wf transmission controls, 7	dog Gluch master cylir screw judde Gompression spring Gover screw bleeder Z pressure line bracket bracket bracket bracket support screw these damp support screw Z effict flood hose flood Bracket Bracket Support screw Z effict flood hose flood Bracket Support screw Support S	1 1 177 157 157 157 157 157 157 157 157	STEEL	PLASTIC STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Sheping Molding Forming & Sheping Injection Molding Forming & Sheping Injection Molding Forming & Sheping	Other - Not relevant Injection Medding Other - Not relevant Press (Tandem) Sending Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 220,000 80,000 yes 1 120,000 80,000 yes 3 230,000 80,000 yes 1 120,000 80,000
69 2 23 clutch pedal wf controls 68 2 23 clutch pedal wf controls 68 2 23 clutch pedal wf controls 69 2 24 elick shifter wf transmission controls, 70 3 24 elick shifter wf transmission controls, 70 3 24 elick shifter wf tr	Jeop Guich master cylir screw judde Goulch master cylir screw judde Gompresion spring Gover acrew bleeder Z pressure line bracket bracket screw feed hose hose those damp support acrew 2 z ehriter knob hose damp shift housing s	1 1 177 157 157 157 157 157 157 157 157	STEEL	PLASTIC STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Sheping Molding Forming & Sheping Injection Molding Forming & Sheping Injection Molding Forming & Sheping	Other - Not relevant	Other - Not relevant	yes 3 22,000 80,000 yes 1 22,000 80,000 yes 1 22,000 80,000 yes 3 23,000 80,000 yes 3 22,000 80,000 yes 1 22,000 80,000 yes 1 122,000 80,000
69 2 23 clutch pedal wf controls 69 2 2 32 clutch pedal wf controls 69 2 23 clutch pedal wf controls 69 2 24 elick shifter wf transmission controls, 70 2 24 elick shif	Jeop Couch master cylir screw judde compression spring cover acrew bleeder Termination of the compression spring cover acrew bleeder Termination of the cover acrew bleeder Termination of the cover acrew aupport acrew Z shifter froot hose clamp shift housing shift housing shift housing shift housing Stick Spring Stock Spring Stock Spring Stock Spring cover panel set acrew mut Z shifting cable bracket cover see acrew mut acrew the cover acre acres acres the cover acres	1 1 177 157 157 157 157 157 157 157 157	STEEL PAGE PAGE PAGE PAGE PAGE PAGE STEEL	PLASTIC STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Colling Injection Molding Forming & Shaping Injection Molding Forming & Shaping Injection Molding Forming & Shaping President Mechanics Injection Mochanics Injection Mochanics Forming & Shaping Frestigting & Shaping Molding Fress (Tendem)	Other - Not relevant	Other - Not relevant	yes 3 20,000 80,000 yes 1 20,000 80,000 yes 1 20,000 80,000 yes 3 20,000 80,000 yes 3 20,000 80,000 yes 1 20,000 80,000 yes 1 120,000 80,000
69 2 23 clutch pedal w/ controls 69 2 24 clutch setal w/ controls 60 2 24 clutch setal w/ controls	dop Gluch master cylir scraw Joude Gompresion spring Gover G	1 1 177 1577 5 1 1 1 1 1 1 1 1 1 1 1 1 1	STEEL PAGE PAGE PAGE PAGE PAGE PAGE STEEL	PLASTIC STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Colling Injection Molding Forming & Shaping Injection Molding Forming & Shaping Presetted Molding Presetted Molding Frection Mochanics Forming & Shaping Forming & Shaping Forming & Shaping Forming & Shaping Frection Mochanics Forming & Shaping Frection Mochanics Forming & Shaping Frection Mochanics Forming & Shaping Presetted Mochanics Forming & Shaping Molding Prese (Tendem) Molding Prese (Tendem) Molding & Shaping & Shaping & Shaping & Shaping & Shaping & Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 220,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000
69 2 23 clutch pedal w/ controls 69 2 24 clutch pedal w/ controls	dog Gluch master cylir screw judde Gompression spring Gover screw bleeder Screw Scre	1 1 177 1577 1577 1577 1577 1577 1577 1	STEEL	PLASTIC STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Colling Injection Molding Forming & Shaping Injection Molding Forming & Shaping Injection Molding Forming & Shaping Fred Injection Molding Fred Injection Molding Fred Shaping Molding Shaping Molding Shaping	Other - Not relevant Injection Modding Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 220,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000
69 2 23 clutch pedal w/ controls 69 2 24 clutch shifter w/ transmission controls, 69 2 24 clutch shifter w/ transmission controls, 69 2 24 clutch shifter w/ transmission controls, 60 2 24 cl	Jeop Gutch master cylir screw judde Gutch master cylir screw judde Gompresion spring Gover screw belease a government of the screw belease a government of the screw belease a government of the screw hose best whose damp support screw hose famp support screw hose screw support screw shift housing shift housing shift housing shift housing shift housing Stick Spring Stick Spring Stick Spring Stick Spring Stick Spring cable bracket bracket cuff seal screw rut I z elector cable support matter thanker bumper guide bushing acrew I will screw a screw I will still still still screw a screw I will screw a sc	1 1 177 1575 1575 1575 1575 1575 1575 1	STEEL	PLASTIC STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Forming & Sheping Molding Forming & Sheping Injection Molding Forming & Sheping Injection Molding Forming & Sheping	Other - Not relevant	Other - Not relevant	yes 3 22,000 80,000 yes 1 22,000 80,000 yes 1 22,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000 <
69 2 23 clutch pedal w/ controls 69 2 24 clutch pedal w/ controls	Jeop Gutch master cylir screw judde Goulch master cylir screw judde Goognesson spring Gover screw Gover screw Gover Screw Gover or Gover Gover Governor Gover Gover Governor Gove	1 1 177 1577 1577 1577 1577 1577 1577 1	STEEL	PLASTIC STEEL EPOM PLASTIC STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Molding Injection Molding Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Shaping Molding Forming & Shaping Injection Molding Forming & Shaping Injection Molding Forming & Shaping Fresciation Mechanica Forming & Shaping Fo	Other - Not relevant	Other - Not relevant	yes 3 20,000 80,000 yes 1 20,000 80,000 yes 1 20,000 80,000 yes 3 25,000 80,000 yes 1 20,000 80,000 yes 1 20,000 80,000 yes 1 20,000 80,000 yes 1 120,000 80,000

70 2 24 stick shifter w/ transmission controls		60 STEEL	Ţ- · · ·	100% 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	
70 2 24 stick shifter w/ transmission controls 71 2 25 brake pedal with master cylinder con	r brake pedal	3 STEEL 860 STEEL	STEEL	100% 1 85% 1	Forging	Press (Tandem)	Other - Not relevant Welding and Cutting	yes 3 120,000 80,000
71 2 25 brake pedal with master cylinder con 71 2 25 brake pedal with master cylinder con		204 STEEL 3 STEEL		100% 1		Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000
71 2 25 brake pedal with master cylinder con 71 2 25 brake pedal with master cylinder con	r retainer washer	7 STEEL 1 STEEL	-	100% 1	Forming & Shaping	Other - Not relevant		
72 2 2 assembly plate, bearing block	bearing block bearing block	3,040 STEEL 800 STEEL	1	100% 3	Precision Mechanic	Other - Not relevant	Other - Not relevant	
72 2 2 assembly plate, bearing block	bearing block	400 STEEL	STEEL	100% 2	Press (Tandem)	Welding and Cutting	Painting	no 0 120,000 80,000
72 2 2 assembly plate, bearing block 72 2 2 assembly plate, bearing block	bearing block bearing block	300 STEEL 200 STEEL	STEEL	70% 1 100% 1	Press (Tandem)	Welding and Cutting Welding and Cutting	Painting	no 0 120,000 80,000 no 0 120,000 80,000
72 2 2 assembly plate, bearing block 72 2 2 assembly plate, bearing block	bearing block bearing block	550 STEEL 600 STEEL	STEEL	100% 2 100% 2		Welding and Cutting Welding and Cutting		no 0 120,000 80,000 no 0 120,000 80,000
72 2 assembly plate, bearing block 72 2 assembly plate, bearing block	bearing block bearing block	100 STEEL 90 STEEL	STEEL	100% 1 100% 1	Press (Tandem)	Welding and Cutting Welding and Cutting	Painting	no 0 120,000 80,000 no 0 120,000 80,000
72 2 2 assembly plate, bearing block	screw	18 STEEL 34 STEEL	-	100% 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
72 2 2 assembly plate, bearing block	nut	7 STEEL		100% 1	Forming & Shaping	Other - Not relevant		no 0 120,000 80,000
73 2 26 emergency brake lever 73 2 26 emergency brake lever	emergency lever b	88 PP	LEATHER -	90% 1	Press (Tandem) Injection Molding	Press (Tandem) Other - Not relevant	Injection Molding Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
73 2 26 emergency brake lever 73 2 26 emergency brake lever	trim screw	92 PP 18 STEEL		100% 1 100% 1		Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
73 2 26 emergency brake lever 73 2 26 emergency brake lever	washer Z pull cable	2 STEEL 83 STEEL-CF	- POM	100% 1 70% 1	Forming & Shaping Forming & Shaping	Other - Not relevant Molding	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
73 2 26 emergency brake lever	pin	4 STEEL	-	100% 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
73 2 26 emergency brake lever 73 2 26 emergency brake lever	Z pull cable	1 STEEL 84 STEEL	- PLASTIC	100% 1 70% 1	Forming & Shaping	Other - Not relevant		no 0 120,000 80,000
73 2 26 emergency brake lever 73 2 26 emergency brake lever	Z compensation le nut	59 STEEL 5 STEEL	-	100% 1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
73 2 26 emergency brake lever 73 2 26 emergency brake lever	spring retainer tension spring	2 PLASTIC 10 STEEL	-	100% 1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
73 2 26 emergency brake lever	support	7 STEEL	-	100% 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
73 2 26 emergency brake lever 73 2 26 emergency brake lever	brake cable bracket	445 STEEL 5 STEEL	PVC -	70% 1 100% 1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
84 2 27 axle mount 84 2 27 axle mount	rear axle mount	22,954 STEEL 336 STEEL	RUBBER	95% 3 100% 1		GMAW/FCAW-MIG Other - Not relevant	Other - Not relevant Other - Not relevant	yes 3 120,000 80,000
84 2 27 axie mount 84 2 27 axie mount	rear axle bearing	1,128 STEEL 722 STEEL	AL .	75% 2 100% 1		Other - Not relevant Other - Not relevant		yes 3 120,000 80,000 yes 3 120,000 80,000
84 2 27 axie mount	screw	173 STEEL	-	100% 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
84 2 27 axie mount	screw	47 STEEL 36 STEEL	-	100% 1 100% 1		Other - Not relevant Other - Not relevant	Other · Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000
85 2 27 control arm 85 2 27 control arm	control arm screw	14,860 STAINLES	S STAINLES	100% 1	Forming & Shaping	GMAW/FCAW-MIG Other - Not relevant	Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000
85 2 27 control arm 86 2 27 wheel bearing, bearings, gaskets	nut wheel bearing	22 STEEL 733 STEEL	EPDM	100% 1 80% 3	Forming & Shaping	Other - Not relevant Milling	Other - Not relevant Injection Molding	yes 1 120,000 80,000 yes 3 120,000 80,000
86 2 27 wheel bearing, bearings, gaskets 87 2 27 springs, coil springs	retainer ring Z spring base	22 STEEL 357 STEEL	RUBBER	100% 1 90% 1	Forming & Shaping	Other - Not relevant Milling		yes 1 120,000 80,000
87 2 27 springs, coil springs	coil spring	3,312 STEEL	-	100% 2		Other - Not relevant	Other - Not relevant	yes 2 120,000 80,000
87 2 27 springs, coil springs 87 2 27 springs, coil springs	bedding layer cushion bumper	18 PUR 145 STEEL	RUBBER	100% 1 75% 1	Moiding Press (Tandem)	Other - Not relevant Assembly	Other - Not relevant Vulcanization	yes 1 120,000 80,000 yes 1 120,000 80,000
88 2 27 stabilizer bar 88 2 27 stabilizer bar	stabilizer bar clamp	3,958 STEEL 82 STEEL	-	100% 1 100% 1	Heat Treatment Forming & Shaping	Bending Other - Not relevant	Other - Not relevant Other - Not relevant	yes 2 120,000 80,000 yes 1 120,000 80,000
88 2 27 stabilizer bar 88 2 27 stabilizer bar	bearing clamp	18 RUBBER 91 STEEL	<u> </u>	100% 1	Molding Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	yes 1 120,000 80,000
88 2 27 stabilizer bar	bearing	26 RUBBER	<u> </u>	100% 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
88 2 27 stabilizer bar 89 2 27 shock absorber	shock absorber	17 STEEL 1,980 STEEL	STEEL STEEL	100% 1 70% 3	Forging	Other - Not relevant Milling	Other - Not relevant Press (Tandem)	yes 1 120,000 80,000 yes 3 120,000 80,000
89 2 27 shock absorber 89 2 27 shock absorber	shock absorber - e shock absorber - in	495 STEEL 990 STEEL	STEEL	80% 3 80% 3	Roll forming Roll forming	Forging Press (Tandem)	GMAW/FCAW-MIG Precision Mechanics	yes 2 120,000 80,000 yes 2 120,000 80,000
89 2 27 shock absorber 89 2 27 shock absorber	screw	80 STEEL 178 STEEL		100% 1 100% 1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000
89 2 27 shock absorber 90 2 27 wheel hubs	nut wheel hub	33 STEEL 2,442 STEEL	- STEEL	100% 1	Forming & Shaping	Other - Not relevant		yes 1 120,000 80,000
91 2 27 brake disks, brake drums	brake rotor	4,076 STEEL	STEEL	70% 3	Forging Forging	Heat Treatment	Milling	yes 3 120,000 80,000 yes 3 120,000 80,000
91 2 27 brake disks, brake drums 105 2 2 steering gear	steering gear	15 STEEL 2,751 AL	STEEL	100% 1 60% 3	Forming & Shaping Die Casting	Other - Not relevant Roll forming	Other - Not relevant Heat Treatment	yes 1 120,000 80,000 no 0 120,000 80,000
105 2 2 steering gear 105 2 2 steering gear	steering gear - inte	4,126 STEEL 138 EPDM	STEEL	75% 3 100% 1	Forging Injection Molding	Forging Other - Not relevant	Precision Mechanics Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
105 2 2 steering gear 105 2 2 steering gear	rubber bearing clamp	61 RUBBER 245 STEEL		100% 1	Vulcanization Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
105 2 2 steering gear 105 2 2 steering gear	nut	16 STEEL 36 STEEL	-	100% 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
105 2 2 steering gear	protective cover	169 CR	-	100% 1	Forming & Shaping Blow Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
105 2 2 steering gear 105 2 2 steering gear	clamp clamp	5 AL 7 AL	-	100% 1 100% 1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
106 2 2 track rods 106 2 2 track rods	track red ball steering tie rod	779 STEEL 434 STEEL	STEEL	70% 1 70% 1	Forging Forging	Heat Treatment Heat Treatment	Milling Milling	no 0 120,000 80,000 no 0 120,000 80,000
106 2 2 track rods 106 2 2 track rods	track rod ball nut	792 STEEL 15 STEEL	CR	70% 1 100% 1	Forging Forming & Shaping	Heat Treatment Other - Not relevant	Milling Other - Not relevant	no 0 120,000 80,000
106 2 2 track rods	nut	16 STEEL	- BTEE:	100% 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
107 2 2 steering power assist	vane pump screw	1,267 AL 24 STEEL	STEEL	35% 1 100% 1	Forming & Shaping	Die Casting Other - Not relevant	Precision Mechanics Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
107 2 2 steering power assist 107 2 2 steering power assist	port radiai seal	47 STEEL 1 EPDM	+	100% 1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
107 2 2 steering power assist 107 2 2 steering power assist	screw	5 STEEL 15 STEEL		100% 1	Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
107 2 2 steering power assist	clamp hollow bolt	13 STEEL 33 STEEL	-	100% 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
107 2 2 steering power assist	radial seal	2 AL	İ	100% 1		Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
107 2 2 steering power assist 107 2 2 steering power assist	vee belt pulley screw	413 STEEL 11 STEEL	STEEL -	70% 1 100% 1	Forging Forming & Shaping	Milling Other - Not relevant	Heat Treatment Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
107 2 2 steering power assist 107 2 2 steering power assist	cap oil tank	26 PA66-GF 223 PA66-GF	STEEL	100% 1 60% 1	Molding Injection Molding	Other - Not relevant Injection Molding	Other - Not relevant Adhesive Bonding	no 0 120,000 80,000 no 0 120,000 80,000
107 2 2 steering power assist 107 2 2 steering power assist	support	42 STEEL 3 STEEL	EPDM -	100% 1	Forming & Shaping	Other - Not relevant Other - Not relevant	Molding	no 0 120,000 80,000 no 0 120,000 80,000
107 2 2 steering power assist	screw	8 STEEL 14 STEEL	1	100% 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
107 2 2 steering power assist	return hose	220 RUBBER	STEEL	100% 1 70% 1	Forming & Shaping Extrusion (plastic)	Other - Not relevant Other - Not relevant	Forming & Shaping	no 0 120,000 80,000 no 0 120,000 80,000
107 2 2 steering power assist 107 2 2 steering power assist	suction hose suction hose	215 EPDM 135 RUBBER	RUBBER	50% 1 50% 1	Extrusion (plastic) Extrusion (plastic)	Other - Not relevant Other - Not relevant	Compression Molding Compression Molding	no 0 120,000 80,000 no 0 120,000 80,000
107 2 2 steering power assist 107 2 2 steering power assist	coolant tube expansion hose	450 STEEL 1,227 STEEL	STEEL STEEL	70% 1 80% 3	Roll forming Roll forming	Bending Bending	GMAW/FCAW-MIG Adhesive Bonding	no 0 120,000 80,000 no 0 120,000 80,000
108 2 28 steering column, steering wheel tilt 108 2 28 steering column, steering wheel tilt	steering column steering column - L	4,936 - 2,000 STEEL		100%	Other - Not relevant	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
108 2 28 steering column, steering wheel tilt	steering column - S	800 STEEL	STEEL	60% 3	Forging Forging	Milling Heat Treatment	Heat Treatment Milling	yes 3 120,000 80,000 yes 3 120,000 80,000
108 2 28 steering column, steering wheel tilt 108 2 28 steering column, steering wheel tilt	steering column - i steering column - E	150 STEEL 987 STEEL	STEEL	50% 2 70% 2	Forging Rall forming	Forging Milling	GMAW/FCAW-MIG Precision Mechanics	yes 3 120,000 80,000 yes 2 120,000 80,000
108 2 28 steering column, steering wheel tilt 108 2 28 steering column, steering wheel tilt	steering column - E steering column - E	150 STEEL 350 STEEL	STEEL	75% 1	Press (Tandem) Press (Tandem)	GMAW/FCAW-MIG GMAW/FCAW-MIG	Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 3 120,000 80,000
108 2 28 steering column, steering wheel tilt 108 2 28 steering column, steering wheel tilt	steering column - E	250 STEEL 250 STEEL	STEEL	50% 1	Press (Tandem)	GMAW/FCAW-MIG	Other - Not relevant	yes 3 120,000 80,000
108 2 28 steering column, steering wheel tilt	steering column - E torque to break bol	12 STEEL	-	100% 1	Press (Tandem) Forming & Shaping	GMAW/FCAW-MIG Other - Not relevant	Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000
108 2 28 steering column, steering wheel tilt 108 2 28 steering column, steering wheel tilt	bushing screw	21 PUR 11 STEEL	STEEL	100% 1 100% 1	Molding Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000
108 2 28 steering column, steering wheel tilt	Lancia de la balla			100% 1	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
108 2 28 steering column, steering wheel tilt	eccentric bolt nut	27 STEEL 4 STEEL	-		Forming & Shaping			
108 2 28 steering column, steering wheel tilt 108 2 28 steering column, steering wheel tilt 108 2 28 steering column, steering wheel tilt		27 STEEL 4 STEEL 28 ABS 1 PLASTIC	PC	100% 1 100% 1	Forming & Shaping Molding Molding	Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000

109 2 2	steering wheel	screw	46	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 1	20,000 80,000
110 2 2	olis fuel tank, assembly filler neck	power steering fluid fuel tank	873 7,805	•		100%	2	Other - Not relevant	Other - Not relevant Assembly	Other - Not relevant Other - Not relevant	no 0 1	20,000 80,000 20,000 80,000
181 2 29	fuel tank, assembly filler neck fuel tank, assembly filler neck	tensioning strep tensioning strep	903	STEEL STEEL		100%		Press (Tandem) Press (Tandem)		Other - Not relevant Other - Not relevant	yes 2 1	20,000 80,000
181 2 29	fuel tank, assembly filler neck	screw	15	STEEL		100%			Other - Not relevant GMAW/FCAW-MIG	Other - Not relevant	yes 1 1	20,000 80,000
182 2 2 182 2 2	filler neck	fuel filler door screw	4	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 1	20,000 80,000
182 2 2 182 2 2		Z drip pan ring	8	PVC STEEL	-	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 1	20,000 80,000 20,000 80,000
	filler neck filler neck	tank cap Z pot		PA66-GF STEEL	POM	100%	1 2	Injection Molding Forging	Other - Not relevant Other - Not relevant		no 0 1	20,000 80,000 20,000 80,000
182 2 2 182 2 2	filler neck	Z funnel radial seal	45	STEEL EPDM	PLASTIC	80% 100%	1	Roll forming Molding	Other - Not relevant Other - Not relevant	Molding		20,000 80,000
182 2 2	filler neck	filler neck	1,044	PE	-	100%	2	Injection Molding	Other - Not relevant	Other - Not relevant	no 0 1	20,000 80,000
182 2 2 182 2 2	filler neck filler neck	cuff seal screw	8	EPDM STEEL	:	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 1	20,000 80,000 20,000 80,000
183 2 2 183 2 2	fuel lines	fuel filter Z support	317 104	AL PP-GF		100%	1 2	Press (Tandem) Injection Molding	Other - Not relevant Other - Not relevant			20,000 80,000 20,000 80,000
183 2 2	fuel lines	bracket	5	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 1	20,000 80,000 20,000 80,000
183 2 2 183 2 2	fuel lines	hose clamp support	. 7	PLASTIC		100%	1.	Molding	Other - Not relevant	Other - Not relevant	no 0 1	20,000 80,000
183 2 2 183 2 2	fuel lines fuel lines	support Z fuel feed line	42	PA-86 PA-6	STÉEL	100%		Molding Molding	Other - Not relevant Other - Not relevant			20,000 80,000 20,000 80,000
183 2 2	fuel lines	Z fuel feed line Z fuel return line		PA-8 PA-8	STEEL STEEL	20%			Other - Not relevant Other - Not relevant			20,000 80,000
183 2 2	fuel lines	Z fuel return line	40	PA-6	STEEL	20%	1	Molding	Other - Not relevant	Forming & Shaping	no 0 1	20,000 80,000
183 2 2 183 2 2	fuel lines fuel lines	Z check valve Z tube	37	PE PA-8		100%	1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 1	20,000 80,000
183 2 2 183 2 2	fuel lines	hose clamp Z tube	47	STEEL PA-8	STEEL	100%	1		Other - Not relevant Other - Not relevant			20,000 80,000
	fuel lines	Z tube	57		STEEL STEEL	20%	1	Molding Molding	Other - Not relevant Other - Not relevant	Forming & Shaping	no 0 1	20,000 80,000
183 2 2	fuel lines	hose clamp	3	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 1	20,000 80,000
	carbon filter and controls	bleeder valve carbon filter contai	1.030	POM PA-66		100%	1	Blow Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 1	20,000 80,000 20,000 80,000
		support screw	8	STEEL STEEL	-	100%	1	Press (Tandem) Forming & Shaping		Other - Not relevant	no 0 1	20,000 80,000 20,000 80,000
184 2 2 184 2 2	carbon filter and controls	nut Z gravity valve	. 3	STEEL PLASTIC	-	100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant		no 0 1	20,000 80,000 120,000 80,000
184 2 2	carbon filter and controls	radial seal	1	EPDM	- EDDA:	100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 1	20,000 80,000
184 2 2	carbon filter and controls carbon filter and controls	Z bleeder plece breather tube	5	PA-6	EPDM -	100% 100%		Molding Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 1	20,000 80,000 120,000 80,000
184 2 2 184 2 2	carbon filter and controls	Z breather tube Z breather tube		PA-8 PA-8		100%	1	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 1	20,000 80,000 20,000 80,000
184 2 2		Z breather tube Z breather tube		PA-8 PA-8	-	100%	1	Molding Molding	Other - Not relevant Other - Not relevant			20,000 80,000 20,000 80,000
184 2 2	carbon filter and controls	Z breather tube	23	PA-6 STEEL		100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 1	20,000 80,000 20,000 80,000
185 2 210	axle mount	control arm acrew	147	STEEL	-	100%	3	Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	yes 1 1	20,000 80,000
[185] 2] 210	axie mount	acrew acorn nut		STEEL	-	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	VRS 1 1	20,000 80,000 120,000 80,000
186 2 210	control arm	control arm screw	4,090	STAINLESS STEEL	RUBBER	80% 100%	2	Forging Forming & Shaping	Assembly Other - Not relevant	Injection Molding Other - Not relevant		120,000 80,000 120,000 80,000
186 2 210	control arm	control arm	4,031		RUBBER RUBBER	80%	2	Forging	Assembly Assembly	Injection Molding Injection Molding	yes 3 1	120,000 80,000 120,000 80,000
187 2 210	ioints	guide joint nut as	20	STEEL	-	100%	2		Other - Not relevant	Other - Not relevant	yes 1 1	20,000 80,000
187 2 210		screw hinge bearing	4,874	STEEL STAINLESS	-	100%	3	Forming & Shaping Forging	Other - Not relevant Machining Center	Other - Not relevant Other - Not relevant	yes 3 1	120,000 80,000 120,000 80,000
188 2 210	hinge bearing, steering knuckle	screw wheel bearing		STEEL	- EPDM	100%	13	Forming & Shaping Forging	Other - Not relevant Milling	Other - Not relevant Injection Molding	yes 1 1 yes 3 1	120,000 80,000 120,000 80,000
189 2 210	wheel bearing assembly	retainer ring	22	STEEL	-	100%	1	Forging	Other - Not relevant	Other - Not relevant Other - Not relevant	yes 1 1	120,000 80,000 120,000 80,000
190 2 210	wheel bearing assembly springs, coll springs	screw coll spring	2,730	STEEL STEEL	-	100%	9	Bending	Other - Not relevant Heat Treatment	Other - Not relevant	yes 2 1	20,000 80,000
190 2 210	springs, coli springs stabilizer bar	spring seat stabilizer bar	194 2,924	STEEL	-	100%	- -	Press (Tandem) Bending	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 2 1	120,000 80,000 120,000 80,000
191 2 210	stabilizer bar stabilizer bar	coupling rod nut		STEEL	RUBBER	100%	1	Forming & Shaping Forming & Shaping	Assembly Other - Not relevant	Other - Not relevant Other - Not relevant		120,000 80,000
191 2 210	stabilizer bar	nut	25	STEEL RUBBER	-	100%	1		Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 1	120,000 80,000 120,000 80,000
191 2 210	stabilizer bar stabilizer bar	rubber bearing clamp	60	STEEL		100%	1	Press (Tandem)	Other - Not relevant	Other - Not relevant	yes 1 '	120,000 80,000
191 2 210	stabilizer bar stabilizer bar	nut		STEEL		100%	7	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1	120,000 80,000 120,000 80,000
192 2 210	shock absorber shock absorber	McPherson strut bellows		STEEL EPDM	STEEL PP	70% 50%	7	Forging Injection Molding	Milling Other - Not relevant	Forging Molding		120,000 80,000 120,000 80,000
192 2 210	shock absorber	cushion bumper	49	PUR PLASTIC	_	100%	7	Injection Molding Injection Molding		Other - Not relevant	yes 1 1	120,000 80,000 120,000 80,000
192 2 210		nut	24	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1 1	120,000 80,000
	shock absorber shock absorber	suspension suppor strut bearing	324	STEEL	RUBBER RUBBER	80% 80%	3	Forging	Other - Not relevant Milling	Molding	Vest 3	120,000 80,000 120,000 80,000
192 2 210	shock absorber shock absorber	nut linear ball baring	19	STEEL	- STÉEL	100%	1	Forming & Shaping Molding	Other - Not relevant	Other - Not relevant Other - Not relevant		120,000 80,000 120,000 80,000
193 2 210	wheel drive, joint shafts wheel drive, joint shafts	universal joint universal joint	6,900	STEEL	RUBBER RUBBER	80%	3	Forging Forging	Assembly	Injection Molding Injection Molding		120,000 80,000
193 2 210	wheel drive, joint shafts	screw .	21	STEEL	-	100%	-	Forming & Shaping	Other - Not relevant	Other - Not relevant Heat Treatment	yes 1	120,000 80,000 120,000 80,000
194 2 210 195 2 21	brake rotors, brake drums	wheel hub brake rotor	7,424	STEEL STAINLESS	STEEL STAINLESS	90% 90%	3	Forging Forging	Milling Machining Center	Heat Treatment	yes 0	120,000 80,000
195 2 21	brake rotors, brake drums rims, wheel lugs, nuts	screw wheel rim	10,805			100%	2	Sand Casting	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 3	120,000 80,000 120,000 80,000
208 2 211	rims, wheel lugs, nuts rims, wheel lugs, nuts	wheel lug nut wheel lug nut	103	STEEL	-	100%	11	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1	120,000 80,000 120,000 80,000
207 2 2	tires, valves, balancing weights	tire	9,842	RUBBER	STEEL	80%	3	Compression Molding Molding	Vulcanization	Assembly	no 0	120,000 80,000 120,000 80,000
208 2 2	spare wheel mount	valve spare wheel fixture	2,191	EPDM STEEL	STEEL -	100%	2	Forging	Assembly Other - Not relevant		0	120,000 80,000
208 2 2 208 2 2	spare wheel mount spare wheel mount	cover	444	STEEL PP		100%	1	Forming & Shaping Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
208 2 2 209 2 2	spare wheel mount lack	latch lack	13	PLASTIC STEEL	STEEL	100% 50%	3	Forging	IGMAW/FCAW-MIG	Other - Not relevant Forging	no 0	120,000 80,000 120,000 80,000
209 2 2	iack	retainer	138	PP STEEL	- PLASTIC	100%	2	Injection Molding Assembly	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
210 2 2	lack tools, bag	screw lug nut wrench	348	STEEL	- 50110	100%	1	Forging	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
210 2 2	tools, beg tools, beg	open end wrench puller hook	2	STEEL STEEL			1	Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000
211 2 2	tow holder front and rear tow holder front and rear	tie-down grommet screw	111 31	STEEL	<u> </u>	100%	1	Forging Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
212 2 212	hitch assembly hitch assembly	Z ball neck protective cover	4,047	STAINLESS PLASTIC		100%	1	Forging Molding	Painting	Other - Not relevant Other - Not relevant	ves 1	120,000 80,000 120,000 80,000
212 2 212	hitch assembly	key	5	PA	STEEL	50%	1	Molding	Other - Not relevant Milling		yes 1 yes 3	120,000 80,000 120,000 80,000
212 2 212	hitch assembly hitch assembly	retainer clamping plate	83	STEEL		100%	1	Press (Tandem)	Other - Not relevant	Other - Not relevant	yes 1	120,000 80,000
212 2 212	hitch assembly hitch assembly	acrew acrew	24	STEEL		100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1	120,000 80,000 120,000 80,000
212 2 212	hitch assembly	acrew mounting	8	STEEL STEEL	- STEEL	100%	1		Other - Not relevant GMAW/FCAW-MIG	Other - Not relevant	ves 3	120,000 80,000 120,000 80,000
212 2 212	hitch assembly hitch assembly	screw	46 752	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1	120,000 80,000
214 2 2	fuel warning triangle with holder and warni	fuel support	259	STEEL STEEL	EPDM	100%	2	Press (Tandem)	Assembly Other - Not relevant	Other - Not relevant	no 0 no 0 no 0	120,000 80,000 120,000 80,000
214 2 2 215 2 213	warning triangle with holder and warn! roof rail	roof rail	2,525	AL.			2	Press (Tandem)	Other - Not relevant	Other - Not relevant	yes 3	120,000 80,000
215 2 213	roof rail	rubber seal	24	EPDM	ŀ			Injection Molding	Other - Not relevant	Other - Not relevant	yes 1	120,000 80,000

124 3 3 Galdator and expansion tank, noses 100 100 1. 100 1. 100 1. 100 1. 100 1. 100 1. 100 1. 100 1. 1.	120,000 80,000 120,000 80,000
124 3 3 3 3 3 3 3 3 3	120,000 80,000 120,000 80,000
124 3 3 adulator and expansion tank, noses sides plastic 1,108 PA86-GF PA86-GF 50% 1 Molding 0	120,000 80,000 120,000 80,000
124 3 3 3 3 3 3 3 3 3	120,000 80,000 120,000 80,000
124 3 3 3 3 3 3 3 3 3	120,000 80,000 120,000 80,000
124 3 3 3 3 3 3 3 3 3	120,000 80,000 120,000 80,000
124 3 3 adulator and expansion tank, hoses 5 STEEL 100% 1 1 1 1 1 1 1 1 1	120,000 80,000 120,000 80,000
124 3 3 dadator and expansion tank, noses expansion tank, nose expansion tank, no	120,000 80,000 125,000 80,000
124 3 3 3 3 3 3 3 3 3	120,000 80,000 120,000 120,000 80,000 80,000 120,000 80,000 80,000 120,000 80,000 80,000 120,000 80,00
124 3 3 fadiator and expansion tank, hose 5 5 5 5 5 5 5 5 5	120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000
124 3 3 dadator and expansion tank, hoses support 3 STEEL 100% 1 Forming & Shaping Other - Not relevant no control of the cont	120,000 80,000 120,000 80,000
124 3 3radator and expansion tank, hoses 124 3 3radator and expansion tank, hoses 124 3 3 3 3 3 3 3 3 3	120,000 80,000 120,000 80,000
124 3 3 fadiator and expansion tank, hoses 5 EPDM 100% 1 Molding Other - Not relevant no 124 3 3 fadiator and expansion tank, hoses coolant hose 137 PA66-GF EPDM 100% 1 forming & Shaping Other - Not relevant no 124 3 3 fadiator and expansion tank, hoses coolant liange 137 PA66-GF EPDM 100% 1 forming & Shaping Other - Not relevant Other - Not relevant no 124 3 3 fadiator and expansion tank, hoses coolant hose 3 EPDM 100% 1 forming & Shaping Other - Not relevant Other - Not relevant no 124 3 3 fadiator and expansion tank, hoses coolant hose 3 EPDM 100% 1 Molding Other - Not relevant Other - Not relevant no 124 3 3 fadiator and expansion tank, hose coolant hose 29 EPDM 100% 1 Molding Other - Not relevant Other - Not relevant no 124 3 3 fadiator and expansion tank, hose coolant hose 29 EPDM 100% 1 Molding Other - Not relevant Other - Not relevant no 124 3 3 fadiator and expansion tank, hose coolant hose 47 EPDM 100% 1 Molding Other - Not relevant Other - Not relevant no 124 3 3 fadiator and expansion tank, hose coolant hose 47 EPDM 100% 1 fadiator 100% 1 forming & Shaping Other - Not relevant no 124 3 3 fadiator and expansion tank, hoses coolant hose 485 EPDM 100% 1 Extrusion (plastic) Press (Tandem) Other - Not relevant no 124 3 3 fadiator and expansion tank, hoses coolant hose 434 EPDM 100% 1 Extrusion (plastic) Other - Not relevant no 124 3 3 fadiator and expansion tank, hoses false	120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000
124 3 3 dadiator and expansion tank, hoses coolant flange 137 PA86-GF EPDM 100% 1 Injection Molding Other - Not relevant Other - Not relevant no 124 3 3 dadiator and expansion tank, hoses coolant hose 33 EPDM 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant no 124 3 3 dadiator and expansion tank, hoses tep jece 21 PA86-GF 100% 1 Molding Other - Not relevant Other - Not relevant no 124 3 3 dadiator and expansion tank, hoses tep jece 22 EPDM 100% 1 Molding Other - Not relevant Other - Not relevant no 124 3 3 dadiator and expansion tank, hoses coolant hose 29 EPDM 100% 1 Molding Other - Not relevant No 124 3 3 dadiator and expansion tank, hoses coolant hose 47 EPDM 100% 1 Molding Other - Not relevant No 124 3 3 dadiator and expansion tank, hoses coolant tube 45 EPDM 100% 1 Extrusion (plastic) 100F - Not relevant Other - Not relevant No 124 3 3 dadiator and expansion tank, hoses coolant hose 48 EPDM 100% 1 Extrusion (plastic) Compression Molding Other - Not relevant No 124 3 3 dadiator and expansion tank, hoses Coolant hose 48 EPDM 100% 1 Extrusion (plastic) Compression Molding Other - Not relevant No 124 3 3 dadiator and expansion tank, hoses 100% 1 Extrusion (plastic) Compression Molding Other - Not relevant No 124 3 3 dadiator and expansion tank, hoses 100% 1 Extrusion (plastic) Compression Molding Other - Not relevant No 124 3 3 dadiator and expansion tank, hoses 100% 1 Extrusion (plastic) Compression Molding Other - Not relevant No 124 3 3 dadiator and expansion tank, hoses 100% 1 Extrusion (plastic) Compression Molding Other - Not relevant No 124 3 3 dadiator and expansion tank, hoses 100% 1 Extrusion (plastic) Compression Molding Other - Not relevant No 124 3 3 3 dadiator and expansion tank, hoses 100% 100%	120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000
124 3 3 dadiator and expansion tank, hoses coolant hose 33 EPDM 100% 1 Molding Other - Not relevant Not re	120,000 80,000 120,000 80,000 120,000 80,000 120,000 80,000
124 3 Stadiator and expansion tank, hoses coolant hose 29 EPDM 100% 1 Molding Other - Not relevant no C	120,000 80,000 120,000 80,000
124 3 3radiator and expansion tank, hoses hose clamp 8 STEEL 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant no C	
124 3 3 Radiator and expansion tank, hoses coolant hose 434 EPDM - 100% 1 Extrusion (plastic) Compression Molding Other - Not relevant no 0 124 3 3 Radiator and expansion tank, hoses lange gasket 53 PA66-GF STEEL 100% 1 Molding Other - Not relevant 10 ther - Not relevant no 0 124 3 3 Radiator and expansion tank, hoses hose clamp 17 STEEL - 100% 1 Forming & Shaping Other - Not relevant 10 ther - Not relevant no 0 125 3 3 Water pump will drive coolant pump 683 AL STEEL 100% 1 Frecision Mechanics Other - Not relevant 10 ther - Not relevant no 0 125 3 3 Water pump will drive 10 125 3 125 3 Water pump will drive 10 125 3 125 3 Water pump will drive 10 125 3 125 3 Water pump will drive 10 125 3 125 3 Water pump will drive 10 125 3 125 3 Water pump will drive 10 125 3 125 3 Water pump will drive 10 125 3 125 3 Water pump will drive 10 125 3 125 3 Water pump will drive 10 125 3 125 3 Water pump will drive 10 125 3 125	
124 3 3 radiator and expansion tank, hoses hose clamp 17 STEEL - 100% 1 Forming & Shaping Other - Not relevant Oth	120,000 80,000
	120,000 80,000
125 3 3 Water pump w/ drive gasket 1 EPDM - 100% 1 Molding Other - Not relevant Other - Not relevant To Other - Not relevant Other	120,000 80,000
125 3 3 Water pump w/ drive auxiliary coolant p. 401 STEEL PA66-GF 100% 1 Precision Mechanics Other - Not relevant Other - Not relevant One - Not relevant Other - Not relevant O	120,000 80,000
125 3 3 Water pump w/ drive retainer 33 EPDM - 100% 1 Molding Other - Not relevant Other -	120,000 80,000
125 3 3 Water pump w/ drive nut 3 STEEL - 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant no 0 126 3 3 fan w/ drive radiator scoop 774 PA66-GF - 100% 1 Injection Molding Other - Not relevant Other - Not relevant no 0	120,000 80,000
126 3 3 fan w' drive screw 5 STEEL - 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant no 0 126 3 3 fan w' drive seal 5 EPDM STEEL 100% 1 Molding Other - Not relevant Other - Not relevant no 0	120,000 80,000 120,000 80,000
126 3 3 fan w/ drive thermo switch 51 - 100% 1 Electric Other - Not relevant Other - Not relevant no 0 126 3 3 fan w/ drive fan star 294 PA66-GF - 100% 1 Injection Molding Other - Not relevant Other - Not relevant no 0	120,000 80,000
126 3 3 fan w drive electric motor 1,366 STEEL 100% 2 Electric Other - Not relevant Other - Not relevant no 0 126 3 3 fan w drive rotainer 282 PA69-GF - 100% 1 Injection Molding Other - Not relevant Other - Not relevant no 0 126 3 3 fan w drive screw 4 STEFL - 100% 1 Formion & Shaping Other - Not relevant Other - Not relevant no 0	
126 3 3 Ian w/ drive screw 3 STEEL - 100% 1 Forming & Shaping Other - Not relevant One -	120,000 80,000
126 3 3 3 fan wildrive electronic control n 158 PA6-GF - 100% 1 Electronics Other Not relevant Other Not relevant no 0	
126 3 3/fan w drive screw 4 STEEL - 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant no 0 127 3 3 Thermostat 128 129	
127 3 3 3 3 3 3 3 3 3	120,000 80,000
196 3 3 heater, housing, heater exchanger, far housing 2,207 PP - 100% 2 Injection Moiding Other - Not relevant Other - Not relevant on 0 196 3 3 heater, housing, heater exchanger, far housing	120,000 80,000
196 3 3 heater, housing, heater exchanger, far screw 11 STEEL - 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant no 0 196 3 3 heater, housing, heater exchanger, far fan motor 864 PP - 100% 1 Electric Other - Not relevant Other - Not relevant no 0	
196 3 3 heater, housing, heater exchanger, farl screw 1 STEEL - 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant on 0 0 heater, housing, heater exchanger, farl heat exchanger 674 AL - 100% 3 Assembly Other - Not relevant Other - Not relevant no 0 0	
197 3 3 3 3 coolant circuit heating Z coolant hose 168 PA6-GF EPDM 50% 2 Molding Other - Not relevant Molding no 0 197 3 3 coolant circuit heating Z coolant hose 323 PA6-GF EPDM 50% 2 Injection Molding Other - Not relevant Compresson Molding no 0	
197 3 3 coolant circuit heating Z coolant hose 294 PA6-GF EPDM 50% 2 Molding Other - Not relevant Molding no 0 197 3 3 coolant circuit heating thermo switch 21 AL PA-86 100% 1 Electric Other - Not relevant Other - Not relevant no 0	
197 3 3 3coolant crouit heating thermo switch 16 AL PA-66 100% 1 Electric Other Not relevant Other - Not relevant 1 no 0 197 3 3 3coolant crouit heating bracket 2 STEEL - 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant 1 no 0 0 197 3 3 3coolant crouit heating radia seal 1 EPDM - 100% 1 Modified Other - Not relevant Other - N	120,000 80,000 120,000 80,000
197 3 3 3 3 3 3 3 3 3 3	120,000 80,000
197 3 3 3 coolant circuit heating screw 3 STEEL - 100% 1 Forming & Shaping Other - Not relevant 1 on 0 0 197 3 3 coolant circuit heating hose clamp 10 STEEL - 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant 0 no 0 197 3 3 coolant circuit heating hose clamp 10 STEEL - 100% 1 Forming & Shaping Other - Not relevant 0 no 0 197 3 3 coolant circuit heating	120,000 80,000 120,000 80,000 120,000 80,000
197 3 3 coolant circuit heating nut 1 PLASTIC - 100% 1 Molding Other Not relevant Other Not relevant no 0 197 3 3 coolant circuit heating support 62 STEEL - 100% 1 Press (Tandem) Other Not relevant Other Not relevant no 0	120,000 80,000
197 3 3(coolant circuit heating support 51 STEEL - 100% 1 Pross (Tandem) Other - Not relevant Other - Not relevant 0 no no no no no no no no no no no no no	120,000 80,000
197 3 3 coolant circuit heating support 48 STEEL - 100% 1 Press (Tandem) Other - Not relevant Other - Not relevant no 0 197 3 3 coolant circuit heating Z coolant tube 967 AL EPDM 80% 2 Forming & Shaping Assembly Injection Molding no 0	
197 3 3 occiolant circuit heating 2 coolant tube 1,045 AL EPDM 90% 2 Forming & Shaping Assembly Injection Molding no 0 0 198 3 3 sheat and verificiation controls, control c resistor 149 PA66-6 100% 2 Assembly Other - Not relevant Other - Not relevant no 0 0	120,000 80,000 120,000 80,000
198 3 3 Aheat and ventilation controls, control classrew 1 STEEL - 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant no 0 198 3 3 heat and ventilation controls, control clemperature senso 8 PA6-GF - 100% 1 Molding Other - Not relevant Other - Not relevant no 0 198 3 3 heat and ventilation controls, control clemperature senso 8 PA6-GF - 100% 1 Molding Other - Not relevant Other - Not relevant no 0	120,000 80,000
196 3 3 heat and ventilation controls, control c screw 1 STEEL - 100% 1 Forming & Shaping Other - Not relevant no 0	
199 3 3 A/C, heat exchanger nut 9 STEEL EPDM 80% 1 Forming & Shaping Other - Not relevant Molding no 0	
199 3 SAC, heat exchanger screw 9 STEEL 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant no 0	120,000 80,000
1993 3 3 A/C, heat exchanger neat exchanger serve 1 STEEL 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant no 0 199 3 3 A/C, heat exchanger gasket 13 RUBBER 100% 1 Injection Moding Other - Not relevant Other - Not relevant no 0 199 3 3 A/C, heat exchanger gasket 13 RUBBER 100% 1 Injection Moding Other - Not relevant Other - Not relevant no 0	120,000 80,000
199 3 3 A/C, heat exchanger evaporator 2,206 AL - 100% 3 Electro-Mechanical Other - Not relevant 100 to 199 3 3 A/C, heat exchanger expansion valve 147 AL - 100% 1 100 c Casting Other - Not relevant Other - Not relevant 100 to 199 3 100 c Casting Other - Not relevant 100 c 199 3 100 c Casting Other - Not relevant 100 c 199 3 1	
199 3 3 A/C, heat exchanger screw 6 STEEL - 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant no 0 199 3 3 A/C, heat exchanger support 17 AL - 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant no 0	
199 3 3 A/C, heat exchanger gasket 35 RUBBER - 100% 1 Injection Molding Other - Not relevant Other - Not relevant no 0 199 3 3 A/C, heat exchanger Ian motor 1,499 PP - 100% 3 Electric Other - Not relevant Other - Not relevant no 0	
200 3 3 3 3 3 3 3 3 4 5 5 5 5 5 5 5 5 5	120,000 80,000 120,000 80,000
200 3 3 condenser, dryer screw 14 STEEL 100% 1 Forming & Shaping Other Not relevant One no training a shaping Other Not relevant Not relevant no 0	120,000 80,000 120,000 80,000
200 3 3 condensor, dryer refrigerant tube 239 EPDM - 100% 2 Assembly Other Not relevant one of O	120,000 80,000 120,000 80,000
200 3 Scondanser, dryer screw 16 STEEL 100% 1 Forming 8 Shaping Other - Not relevant Other - Not relevant 1 no 0	120,000 80,000 120,000 80,000
200 3 3 Condenser, dryer clamp 9 STEEL EPDM 80% 1 Forming & Shaping Other - Not relevant Molding no 0 200 3 3 Condenser, dryer screw 4 STEEL - 100% 1 Forming & Shaping Other - Not relevant 1 Other - Not relevant 1 on 0	120,000 80,000 120,000 80,000
200 3 3 Condenser, dryer screw 2 STEEL - 100% 1 Forming & Shaping Other - Not relevant Other - Not relevant no 0 200 3 3 Condenser, dryer refingerant tube 781 AL PE 80% 2 Forming & Shaping Assembly Molding no 0	# 120.000 80.000

2001 31 31	Incress T	10	ISTEEL		100%	-	Forming & Sheeing	Other - Not relevant	Other - Not relevant	I no 0 120,000 80,000
200 3 3 condenser, dryer 200 3 3 condenser, dryer	screw	6	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
200 3 3 condenser, dryer 200 3 3 condenser, dryer	clamp screw_		STEEL	EPDM -	80% 100%	+		Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
200 3 3 condenser, dryer	clamp	17	STEEL	EPDM	80%	٢	Forming & Shaping	Other - Not relevant	Molding	no 0 120,000 80,000
200 3 3 condenser, dryer 200 3 3 condenser, dryer	clamp		STEEL	EPDM	100%	H		Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
200 3 3 condenser, dryer	screw	23	STEEL	-	100%	r	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
200 3 3 condenser, dryer 201 3 3 A/C controls	AC control		PLASTIC	-	100%	1	Molding Electric	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
201 3 3A/C controls	push nut	1	STEEL		100%	Н	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
201 3 3 A/C controls 201 3 3 A/C controls	screw faceplate		STEEL ABS-PC	-	100%	-	Injection Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
201 3 3A/C controls	resistor	148	PA66-GF	E	100%	2	Electric	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
201 3 3 A/C controls 201 3 3 A/C controls	temperature senso		STEEL PA8-GF	-	100%	1 2	Forming & Shaping Electric	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
201 3 3 A/C controls	servomotor	128	PA6-GF	-	100%	2	Electric	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
201 3 3A/C controls 201 3 3A/C controls	servomotor servomotor		PA6-GF PA6-GF	-	100%	N	Electric Electric	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
201 3 3 A/C controls	servomotor	99	PA6-GF		100%	2	Electric	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
201 3 3 A/C controls 201 3 3 A/C controls	screw sun sensor		PLASTIC	-	100%	1 2	Forming & Shaping Electric	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
202 3 3 compressor	AC compressor	6,294	AL	STEEL	100%	3	Electric	Other - Not relevant		no 0 120,000 80,000
202 3 3 compressor 202 3 3 compressor	spacer bushing screw		AL STEEL	-	100%	1		Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
202 3 3 compressor	support	2,117	AL STEEL	-	100%	1	Die Casting	Milling Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
202 3 3 compressor 202 3 3 compressor	refrigerant	1,350			100%	-	Other - Not relevant	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
203 3 31 air distribution floor area, rear duct	air duct	1,620	PE PLASTIC	-	100%	7		Other - Not relevant Other - Not relevant		yes 3 120,000 80,000 yes 1 120,000 80,000
203 3 31 air distribution floor area, rear duct 203 3 31 air distribution floor area, rear duct	nut vent		PA86-GF	-	100%	1	Molding Injection Molding	Other - Not relevant		yes 3 120,000 80,000
203 3 31 air distribution floor area, rear duct	nut cover	1	PLASTIC ABS-PC		100%	1	Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000
203 3 31 air distribution floor area, rear duct	vent	107	PP		100%	2	Injection Molding	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000
203 3 31 air distribution floor area, rear duct	screw		STEEL PP	-	100%	1		Other - Not relevant Other - Not relevant		yes 1 120,000 80,000 yes 3 120,000 80,000
203 3 31 air distribution floor area, rear duct	bracket	1	STEEL		100%	+	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
204 3 32 air distribution switchboard 204 3 32 air distribution switchboard	air duct push nut	5,090	STEEL	=	100%		Injection Molding Forming & Shaping	Other - Not relevant Other - Not relevant		yes 3 120,000 80,000 yes 1 120,000 80,000
204 3 32 air distribution switchboard	screw	12	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
204 3 32 eir distribution switchboard 204 3 32 eir distribution switchboard	push nut screw	2	STEEL		100%	- -	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant		yes 1 120,000 80,000 yes 1 120,000 80,000
204 3 32 air distribution switchboard	air duct	34	PP	-	100%	-	Injection Molding	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000
204 3 32 air distribution switchboard 204 3 32 air distribution switchboard	vent		ABS PP	PET	100%	3	Injection Molding	Other - Not relevant Other - Not relevant		yes 3 120,000 80,000 yes 3 120,000 80,000
204 3 32 air distribution switchboard	vent	621	ABS	ABS	70%	3	Injection Molding	Assembly	Injection Molding	yes 3 120,000 80,000
204 3 32 air distribution switchboard 204 3 32 air distribution switchboard	push nut screw_	2	STEEL		100%	7	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
204 3 32 air distribution switchboard	vent		ABS-GF	- PAPER	100%	2	Injection Molding	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000
204 3 32 air distribution switchboard 204 3 32 air distribution switchboard	filter element support		ABS	-	100%	1	Injection Molding	Other - Not relevant Other - Not relevant		yes 1 120,000 80,000 yes 1 120,000 80,000
204 3 32 air distribution switchboard	filter housing		PP		100%	1	Injection Molding	Other - Not relevant Other - Not relevant		yes 1 120,000 80,000 yes 1 120,000 80,000
204 3 32 air distribution switchboard 204 3 3 air distribution switchboard	nut		PLASTIC	-	100%	1	Forming & Shaping Molding	Other - Not relevant		yes 1 120,000 80,000
205 3 3 ventilation side segment	ventilation frame		PP_ RUBBER	-	100%	1	Injection Molding Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
205 3 Sventilation side segment 1 4 41 grab handle roof	gasket grab handle	77	PP-GF		100%	1	injection Molding	Injection Molding	Other - Not relevant	yes 3 120,000 80,000
1 4 41 grab handle roof 1 4 41 grab handle roof	grab handle screw		PP-GF STEEL	-	100%	1	Injection Molding Forming & Shaping	Injection Molding Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000
2 4 42 arm rest rear door, pull handle	pull handle	112	ABS	-	100%	T	Injection Molding	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000
2 4 42 arm rest rear door, pull handle 2 4 42 arm rest rear door, pull handle	pull handle cover		ABS PP	-	100%	1	Injection Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000
3 4 42 arm rest front door, pull handle	pull handle	70	ABS	-	100%	1	Injection Molding	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000
3 4 42 arm rest front door, pull handle 4 4 43 grab and pull handle tailgate	cover pull handle		ABS	-	100%	1	Injection Molding Injection Molding	Other - Not relevant Other - Not relevant		yes 1 120,000 80,000 yes 3 120,000 80,000
4 4 43 grab and pull handle taligate	nut insert		PLASTIC		100%	7	Molding	Other - Not relevant		yes 1 120,000 80,000 yes 1 120,000 80,000
4 4 43 grab and pull handle tailgate 5 4 44 visor, interior rear view mirror	visor		POM	STYROPO	100% 80%	1	Forming & Shaping Injection Molding	Other - Not relevant Compression Molding	Glass Processing	yes 3 120,000 80,000
5 4 44 visor, interior rear view mirror	support		POM	STEEL	50% 100%		Molding Molding	Molding Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000
5 4 44 visor, interior rear view mirror 5 4 44 visor, interior rear view mirror	faceplate screw	1	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
5 4 44 visor, interior rear view mirror	rear view mirror		ABS	PLASTIC-G	55% 55%	1	Injection Molding Injection Molding	Glass Processing Other - Not relevant	Molding Injection Molding	yes 3 120,000 80,000 yes 3 120,000 80,000
7 4 45 console, storage tray on tunnel	cover	231	ABS	PC	55%	1	Injection Molding	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000
7 4 45 console, storage tray on tunnel 8 4 46 glove compartment w/ lid, storage tra	screw violove comparimen		ABS-PC	STEEL	100%		Forming & Shaping injection Molding	Other - Not relevant Precision Mechanics		yes 1 120,000 80,000 yes 3 120,000 80,000
8 4 46 glove compartment w/ lid, storage tra	y glove compartmen	875	ABS-PC	ABS-PC	50%	1	Injection Molding	injection Molding	Injection Molding	yes 3 120,000 80,000
8 4 46 glove compartment w/lid, storage tre 8 4 46 glove compartment w/lid, storage tre	y storage compartme		ABS-PC ABS	<u> </u>	100%		Molding Injection Molding	Other - Not relevant Other - Not relevant		yes 3 120,000 80,000 yes 3 120,000 80,000
8 4 46 glove compartment w/ lid, storage tra	storage compartme	1,150	ABS-PC-GF	E	100%	2	Injection Molding	Injection Molding	Other - Not relevant	yes 3 120,000 80,000
8 4 46 glove compartment w/lid, storage tra 8 4 46 glove compartment w/lid, storage tra	y storage compartme		ABS-PC-GF STEEL		100%		Injection Molding Forming & Shaping	Injection Molding Other - Not relevant	Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 1 120,000 80,000
8 4 46 glove compartment w/ lid, storage tra	y push nut		STEEL	-	100%	.1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
8 4 46 glove compartment w/lid, storage tra 8 4 46 glove compartment w/lid, storage tra		100	POM	AL	50%	1	Die Casting	Other - Not relevant	Die Casting	yes 1 120,000 80,000
9 4 47 glasses compartment, cup holder, va		127	PC PP-PE-T20	ABS	100%	1	Injection Molding Injection Molding	Injection Molding Other - Not relevant	Injection Molding Other - Not relevant	yes 3 120,000 80,000 yes 3 120,000 80,000
10 4 48 storage compartment door, rear 10 4 48 storage compartment door, rear	storage compartme	2	ABS-PC	-	100%	1	Molding	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
10 4 48 storage compartment door, rear 10 4 48 storage compartment door, rear	hinge pin		PLASTIC	:	100%		Molding Forming & Shaping	Other - Not relevant Other - Not relevant		yes 1 120,000 80,000 yes 1 120,000 80,000
10 4 48 storage compartment door, rear	spring	1	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
10 4 48 storage compartment door, rear 10 4 48 storage compartment door, rear	cushion bumper		STEEL EPDM	-			Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000
11 4 48 storage compartment door, front	latching actuator	39	ABS	ABS	75%	1	Molding	Other - Not relevant	Molding	yes 1 120,000 80,000
11 4 48 storage compartment door, front 12 4 49 storage tray trunk	storage compartme		ABS	PUR	80% 75%	1	Injection Molding	Other - Not relevant Compression Molding		yes 3 120,000 80,000 yes 3 120,000 80,000
12 4 49 storage tray trunk	push nut	4	STEEL	<u> </u>	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000
12 4 49 storage tray trunk 12 4 49 storage tray trunk	push nut screw	_	STEEL	<u> </u>	100%		Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
12 4 49 storage tray trunk	acrew	- 2	STEEL PLASTIC	-	100%	1 1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000 no 0 120,000 80,000
15 4 410 ashtray, middle console 15 4 410 ashtray, middle console	ashtray retainer	106	ABS	Ė	100%	1	Injection Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
13 4 4 safety belts, belt tensioner 13 4 4 safety belts, belt tensioner	safety belt safety belt 2	698 524	STEEL	POM	40% 80%	3	Press (Tandem)	Press (Tandem) Other - Not relevant	Press (Tandem) Injection Molding	no 0 120,000 80,000 no 0 120,000 80,000
13 4 4 safety belts, belt tensioner	safety belt 3	175	AL	E	100%	11	Nonwoven	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
13 4 4 safety belts, belt tensioner 13 4 4 safety belts, belt tensioner	safety belt 4 support	349	POM	-	100%	1+	Precision Mechanics Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
13 4 4 safety belts, belt tensioner	safety belt height a	266	STEEL	STEEL	70%	2	Press (Tandem)	Other - Not relevant	Press (Tandem)	no 0 120,000 80,000
13 4 4 safety belts, belt tensioner 13 4 4 safety belts, belt tensioner	shoulder bolt		STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
13 4 4 safety belts, belt tensioner	spacer bushing	36	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
13 4 4 safety belts, belt tensioner 13 4 4 safety belts, belt tensioner	washer end cap	1	PAPER PLASTIC	Ė	100%	1		Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
13 4 4 safety belts, belt tensioner	guide yoke	33	STEEL	-	100%	1	Forming & Shaping		Other - Not relevant	
13 4 4 safety belts, belt tensioner 13 4 4 safety belts, belt tensioner	shoulder bolt	47	STEEL	Ē	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
13 4 4 safety belts, belt tensioner	end cap seat belt lock	11	PP STEEL	- PLASTIC	100% 70%	1		Other - Not relevant Press (Tandem)		ne 0 120,000 80,000 ne 0 120,000 80,000
13 4 4 safety belts, belt tensioner 13 4 4 safety belts, belt tensioner	screw	19	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
13 4 4 safety belts, belt tensioner	washer	1	PAPER	ŀ	100%	1	Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000

	safety belts, belt tensioner	safety belt		STEEL	STEEL	40%	1	Press (Tandem)	Press (Tandem)	Press (Tandem)	no	0	120,000	80,000
13 4 4 13 4 4	safety belts, belt tensioner safety belts, belt tensioner	safety belt 2 safety belt 3	230 77	AL	POM -	80% 100%	1	Forging Nonwoven	Other - Not relevant Other - Not relevant	Injection Molding Other - Not relevant	no	0	120,000 120,000	80,000 80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	safety belt 4 safety belt height a	153 268	AL STEEL	STEEL	100%	1 2	Precision Mechanics Press (Tandem)	Other - Not relevant Press (Tandem)	Other - Not relevant Other - Not relevant	no no	0	120,000	80,000 80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	screw guide yoke	11 33	STEEL		100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000	80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	screw shoulder bolt	1 33	STEEL	<u> </u>	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no	0	120,000	80,000
13 4 4	safety belts, belt tensioner	spacer bushing	11	STEEL		100%		Other - Not relevant	Other - Not relevant	Other - Not relevant	no	0	120,000	80,000
13 4 4 13 4 4	safety belts, belt tensioner safety belts, belt tensioner	washer end cap	1	PLASTIC	-	100%	1	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000	80,000 80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	screw shoulder bolt		STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no	0	120,000	80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	end cap waist safety belt	11 249	PP STEEL	- STEEL	100%	1	Molding Press (Tandem)	Other - Not relevant Press (Tandem)	Other - Not relevant Press (Tandem)	no no	0	120,000	80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	safety belt 2 safety belt 3		STEEL	POM -	80% 100%	1	Forging Nonwoven	Other - Not relevant Other - Not relevant	Injection Molding Other Not relevant	no	0	120,000	80,000 80,000
13 4 4 13 4 4	safety belts, belt tensioner safety belts, belt tensioner	safety belt 4	125	AL STEEL	<u> </u>	100%		Precision Mechanics Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000	80,000
13 4 4	safety belts, belt tensioner	washer	1	PAPER	- efeci	100%	1	Molding	Other - Not relevant	Other - Not relevant	no	0	120,000	80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	safety belt safety belt 2	250	STEEL	POM	40% 80%	1	Press (Tandem) Forging	Press (Tandem) Other - Not relevant	Press (Tandem) Injection Molding	no no	0	120,000 120,000	80,000 80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	safety belt 3 safety belt 4	167		-	100%	1	Nonwoven Precision Mechanics	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000 120,000	80,000 80,000
13 4 4 13 4 4	safety belts, belt tensioner safety belts, belt tensioner	guide yoke screw	33 1		<u> </u>	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0 0	120,000	80,000 80,000
13 4 4 13 4 4	safety belts, belt tensioner safety belts, belt tensioner	shoulder bolt washer	49 3	STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	00	120,000	80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	washer screw	1 32	PAPER STEEL	-	100%	1	Molding Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no	0 0	120,000	80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	end cap seat belt lock	11		- PLASTIC	100%	1	Molding	Other - Not relevant	Other - Not relevant	no	0	120,000	80,000
13 4 4 13 4 4	safety belts, belt tensioner	screw	19	STEEL	-	100%	1	Forging Forming & Shaping	Other - Not relevant	Other - Not relevant	no no	900	120,000	80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	washer cover	38	ABS	STEEL	100% 80%	1	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000	80,000 80,000
13 4 4 13 4 4	safety belts, belt tensioner safety belts, belt tensioner	button button		PA-6	STEEL -	75% 100%	+	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000 120,000	80,000 80,000
13 4 4 13 4 4	safety belts, belt tensioner safety belts, belt tensioner	end cap safety belt	226	ABS STEEL		100% 100%	1	Molding Press (Tandem)	Other - Not relevant Press (Tandem)	Other - Not relevant Other - Not relevant	no no	00	120,000 120,000	80,000 80,000
13 4 4 13 4 4	safety belts, belt tensioner safety belts, belt tensioner	safety belt 2 safety belt 3	169 56	STEEL AL	POM -	80% 100%	1	Forging Nonwoven	Other - Not relevant Other - Not relevant	Injection Molding Other - Not relevant	no no	0	120,000	80,000 80,000
13 4 4 13 4 4	safety belts, belt tensioner safety belts, belt tensioner	safety belt 4	113	AL	-	100%	1	Precision Mechanics Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000	80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	cover		ABS	<u> </u>	100%	+	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no	0	120,000	80,000
13 4 4	safety belts, belt tensioner	seat belt lock	65 11	STEEL	PLASTIC	40%	1	Forming & Shaping Forging	Precision Mechanics		no no	0	120,000	80,000
13 4 4	safety belts, belt tensioner safety belts, belt tensioner	wire fixture support	15	PA-GF	-	100% 100%	1	Other - Not relevant Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000 120,000	80,000 80,000
13 4 4 14 4 4	safety belts, belt tensioner passive restraining system, airbag	nut air bag driver side	593	STEEL	-	100%	1	Forming & Shaping Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000	80,000 80,000
14 4 4 14 4 4	passive restraining system, airbag passive restraining system, airbag	air bag driver side retainer	890 208	PA6-GF STEEL	PLASTIC	100% 90%	1	Precision Mechanics Press (Tandem)	Electronics Other - Not relevant	Other - Not relevant Molding	no no	0	120,000	80,000
14 4 4 14 4 4	passive restraining system, airbag passive restraining system, airbag	shoulder bolt return ring	9 236	STEEL ABS-PC-PO	Electronics	100%	1	Forming & Shaping Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Electronics	no no	0	120,000	80,000
14 4 4	passive restraining system, airbag passive restraining system, airbag	airbag passenger s airbag passenger s	1,283		-	100%	1 2	Press (Tandem) Precision Mechanics	Other - Not relevant Electronics	Other - Not relevant Other - Not relevant	no no	0	120,000	80,000
14 4 4	passive restraining system, airbag	support frame	1,052	STEEL	Ē	100%	1	Press (Tandem)	Other - Not relevant	Other - Not relevant	no	0	120,000	80,000
14 4 4	passive restraining system, airbag passive restraining system, airbag	nut nut	5		-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000	80,000
14 4 4 14 4 4	passive restraining system, airbag passive restraining system, airbag	screw	4	STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000 120,000	80,000
14 4 4 14 4 4	passive restraining system, airbag passive restraining system, airbag	screw angle piece	257	STEEL	-	100%	1	Forming & Shaping Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000	80,000
14 4 4 14 4 4	passive restraining system, airbag passive restraining system, airbag	screw electronic control n	19 239	STEEL -	-	100%	1	Forming & Shaping Electric	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000	80,000
14 4 4 14 4 4	passive restraining system, airbag passive restraining system, airbag	acom nut crash sensor	8 34	STEEL -		100% 100%	1	Forming & Shaping Electric	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no no	0	120,000 120,000	80,000 80,000
14 4 4 26 4 411	passive restraining system, airbag damping floor, tunnel	screw floor covering	1,793	STEEL FABRIC		100%	1	Forming & Shaping Compression Molding	Other - Not relevant	Other - Not relevant	no	3	120,000	80,000
26 4 411 26 4 411	damping floor, tunnel	clip	2	PA-6		100%	1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes	1	120,000 120,000	80,000 80,000
26 4 411	damping floor, tunnel damping floor, tunnel	floor covering clip	1	FABRIC PLASTIC	-	100% 100%	1	Compression Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	1	120,000 120,000	80,000 80,000
26 4 411	damping floor, tunnel damping floor, tunnel	floor covering cover	11,434	PA6-GF	:	100%	1	Nonwoven Injection Molding	Compression Molding Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	1	120,000 120,000	80,000 80,000
26 4 411 26 4 411	damping floor, tunnel damping floor, tunnel	damper	12,666	PA-6 PET-PO-PF	- EPDM-PON	100%	1	Molding Compression Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Compression Molding	yes yes	1 2	120,000	80,000
26 4 411	damping floor, tunnel damping floor, tunnel	damper clip	15 2	CO-PF PA6 6	-	100%	1			Other - Not relevant Other - Not relevant		2	120,000	80,000
26 4 411 26 4 411	damping floor, tunnel damping floor, tunnel	damper damper	79 109	CO-PF		100%	1	Compression Molding Compression Molding		Other - Not relevant	yes	2	120,000	80,000
26 4 411	damping floor, tunnel damping floor, tunnel	melt-on mat melt-on mat	3,012	BITUMEN BITUMEN		100%	1	Deposition (plastices)	Other - Not relevant	Other - Not relevant	yes	2	120,000	80,000
	damping floor, tunnel damping floor, tunnel	melt-on mat	1,251	BITUMEN	-	100%		Deposition (plastices)	Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant	yes		120,000	80,000
26 4 411	damping floor, tunnel	melt-on mat	345	BITUMEN	-	100%	1	Deposition (plastices)	Other - Not relevant	Other - Not relevant Other - Not relevant	yes	2	120,000	80,000
27 4 412	damping floor, tunnel damping bulkhead	melt-on mat damper	374	PET-PO-PF		100%	1		Other - Not relevant		yes		120,000	80,000 80,000
27 4 412	damping bulkhead damping bulkhead	damper damper	186	PET-PO-PF		100%	1	Compression Molding		Other - Not relevant Other - Not relevant			120,000	80,000 80,000
27 4 412	damping bulkhead damping bulkhead	damper clamping washer	4	PET-PO-PF STEEL		100% 100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes	2	120,000 120,000	80,000 80,000
27 4 412 27 4 412	damping bulkhead damping bulkhead	clamping washer damper	1,979	STEEL PET-PO-PF	EPDM	100% 50%	1	Forming & Shaping	Other - Not relevant Other - Not relevant		yes		120,000	80,000
27 4 412 27 4 412	damping bulkhead damping bulkhead	clamping washer damper	2,008	STEEL CO-PF		100% 100%	1	Forming & Shaping		Other - Not relevant Other - Not relevant	yes	1	120,000 120,000	80,000
27 4 412	damping bulkhead damping bulkhead	clamping washer melt-on mat	2	STEEL BITUMEN		100%	İ	Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	yes	1	120,000	80,000
27 4 412	damping bulkhead damping bulkhead	melt-on mat melt-on mat	147	BITUMEN BITUMEN	-	100%	1	Deposition (plastices)	Other - Not relevant	Other - Not relevant	yes	2	120,000	80,000
27 4 412	damping bulkhead damping bulkhead damping bulkhead	meit-on mat meit-on mat meit-on mat	352	BITUMEN BITUMEN		100% 100% 100%	1	Deposition (plastices)	Other - Not relevant Other - Not relevant	Other - Not relevant	yes	2	120,000	80,000
27 4 412	damping bulkhead	melt-on mat	149	BITUMEN		100%		Deposition (plastices)	Other - Not relevant Other - Not relevant	Other - Not relevant	_	2	120,000 120,000	80,000
28 4 413		melt-on mat damper	355		EPDM	100% 50%	1	Compression Molding		Other - Not relevant Compression Molding	yes	2	120,000 120,000	80,000
28 4 413	damping side panel front, pillar A damping side panel front, pillar A	clamping washer damper	37		PUR	100% 50%		Compression Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes	2	120,000 120,000	80,000 80,000
28 4 413	damping side panel front, pillar A damping side panel front, pillar A	melt-on mat melt-on mat		BITUMEN BITUMEN		100%			Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant			120,000 120,000	80,000 80,000
28 4 413	damping side panel front, pillar A damping roof, roof member, moon roo	melt-on mat	400	BITUMEN PUR	:	100%	1	Deposition (plastices)	Other · Not relevant	Other - Not relevant Other - Not relevant	yes	2	120,000	80,000
29 4 414	damping roof, roof member, moon roo	damper	9	PUR PUR	-	100%	1	Molding		Other - Not relevant Other - Not relevant	yes	1	120,000	80,000
29 4 414	damping roof, roof member, moon roof					. ~~ /0							120,000	80,000
29 4 414	damping roof, roof member, moon roo damping roof, roof member, moon roo damping roof, roof member, moon roo	melt-on mat	366	BITUMEN	-	100%	+		Other - Not relevant	Other - Not relevant				90.000
29 4 414 29 4 414 30 4 415	damping roof, roof member, moon roo damping roof, roof member, moon roo damping rear door	melt-on mat melt-on mat melt-on mat	366 183 324	BITUMEN BITUMEN		100% 100%	1 1	Deposition (plastices) Deposition (plastices)	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	2	120,000 120,000	80,000
29 4 414 29 4 414 30 4 415 31 4 416 32 4 417	damping roof, roof member, moon roo damping roof, roof member, moon roo damping rear door damping front door damping side panel rear	melt-on mat melt-on mat	366 183 324 324 24	BITUMEN	- - -	100%		Deposition (plastices) Deposition (plastices) Deposition (plastices) Compression Molding	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant	yes yes yes	2 2 2 2	120,000	

	·									
32 4 417 damping side panel rear 32 4 417 damping side panel rear	damper clamping washer	1	CO-PF STEEL			1	Compression Molding Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes 2 120,000 80,000 yes 1 120,000 80,000
32 4 417 damping side panel rear 32 4 417 damping side panel rear	damper		CO-PF CO-PF	-				Other - Not relevant Other - Not relevant		yes 3 120,000 80,000
32 4 417 damping side panel rear	clip	1	PLASTIC	-	100%	1	Molding	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
32 4 417 damping side panel rear 32 4 417 damping side panel rear	damper		CO-PF PLASTIC	-	100%	₩		Other - Not relevant Other - Not relevant		
32 4 417 damping side panel rear	damper	258	CO-PF BITUMEN			1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000
32 4 417 damping side panel rear	melt-on mat melt-on mat	192	BITUMEN		100%	1	Deposition (plastices)	Other - Not relevant	Other - Not relevant	yes 2 120,000 80,000
32 4 417 damping side panel rear 32 4 417 damping side panel rear	melt-on mat		BITUMEN	-		+		Other - Not relevant Other - Not relevant		yes 2 120,000 80,000 yes 2 120,000 80,000
32 4 417 damping side panel rear	melt-on mat	403	BITUMEN	-	100%	1	Deposition (plastices)	Other - Not relevant	Other - Not relevant	yes 2 120,000 80,000
33 4 418 damping hood 33 4 418 damping hood	damper bracket		PLASTIC	-		+	Compression Molding Molding	Other - Not relevant Other - Not relevant		
34 4 419 damping taligate, trunk lid	insulation sheet	165	BITUMEN		100%	1	Molding	Other - Not relevant	Other - Not relevant	yes 2 120,000 80,000
35 4 420 damping / insulating engine cor	melt-on mat	215	PLASTIC PLASTIC	- PUR	50%	1.	Compression Molding	Other - Not relevant Other - Not relevant		yes 2 120,000 80,000 yes 2 120,000 80,000
35 4 420 damping / insulating engine cor	npartm clip	410	PLASTIC PP-TV			1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	
36 4 421 cover floor, side member interior	or trim	427	PP-TV	-	100%	2	Injection Molding	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000
38 4 421 cover floor, side member interior 38 4 421 cover floor, side member interior			PP-TV STEEL	-			Injection Molding Press (Tandem)	Other - Not relevant Other - Not relevant		yes 3 120,000 80,000 yes 3 120,000 80,000
36 4 421 cover floor, side member interior	or support bearing	8	PA-66		100%	1	Molding	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
36 4 421 cover floor, side member interior 38 4 421 cover floor, side member interior			PA-66 STEEL	-		1	Molding Forming & Shaping	Other - Not relevant Other - Not relevant		yes 1 120,000 80,000 yes 1 120,000 80,000
36 4 421 cover floor, side member interior 37 4 422 trim side panel front, pillar A	or screw trim		PP-PE-T20	-		1	Forming & Shaping	Other - Not relevant Other - Not relevant		yes 1 120,000 80,000 yes 3 120,000 80,000
37 4 422 trim side panel front, pillar A	clip	1	PLASTIC	-	100%	1	Molding	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
37 4 422 trim side panel front, piller A 38 4 423 trim instrument panel, instrume	grommet nt paneinstrument panel	7.235	PLASTIC PLASTIC	FOAM				Other - Not relevant Other - Not relevant		yes 1 120,000 80,000 yes 3 120,000 80,000
38 4 423 trim Instrument panel, instrume	nt pandinstrument panel	1,627	ABS-PC		100%	3	Injection Molding	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000
38 4 423 trim instrument panel, instrume 38 4 423 trim instrument panel, instrume	nt pane cover	476	ABS-PC ABS-PC	-		1	Injection Molding	Other - Not relevant Other - Not relevant		yes 3 120,000 80,000 yes 3 120,000 80,000
38 4 423 trim instrument penel, instrume 38 4 423 trim instrument penel, instrume	nt pane trim	273	ABS-PC ABS-PC	-		1	Injection Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 3 120,000 80,000
38 4 423 trim instrument panel, instrume	nt pane push nut	1	STEEL	-	100%	1.	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
38 4 423 trim instrument penel, instrume 38 4 423 trim instrument penel, instrume	nt pand screw nt pand retainer		PLASTIC	STEEL		+		Other - Not relevant Other - Not relevant		yes 1 120,000 80,000 yes 1 120,000 80,000
38 4 423 trim instrument panel, instrume	nt pane support	354	ABS-PC		100%	2	Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000
38 4 423 trim instrument panel, instrume	nt pane screw	2	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
38 4 423 trim instrument panel, instrume 38 4 423 trim instrument panel, instrume	nt pandend cover	5 35	ABS-PC	:		1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	
38 4 423 trim instrument panel, instrume	nt pane switchboard cross	5,675	STEEL	-	100%		Other - Not relevant	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
38 4 423 trim instrument panel, instrume 38 4 423 trim instrument panel, instrume			STEEL	STEEL -				Press (Tandem) Other - Not relevant	Welding and Cutting Other - Not relevant	yes 3 120,000 80,000 yes 3 120,000 80,000
38 4 423 trim instrument panel, instrume	nt pane switchboard cross		STEEL	·	100%	1	Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000 yes 3 120,000 80,000
38 4 423 trim instrument penel, instrume 38 4 423 trim instrument penel, instrume		113	STEEL	-	100%	1		Other - Not relevant		yes 3 120,000 80,000
38 4 423 trim instrument panel, instrume 38 4 423 trim instrument panel, instrume			STEEL	- STEEL			Press (Tandem) Press (Tandem)	Other - Not relevant Press (Tandem)	Other - Not relevant Welding and Cutting	yes 3 120,000 80,000 yes 3 120,000 80,000
38 4 423 trim instrument panel, instrume	nt pane drag strut	384	STEEL	-	100%	7	Press (Tandem)	Other - Not relevant	Other - Not relevant	yes 3 120,000 80,000
38 4 423 trim instrument panel, instrume 38 4 423 trim instrument panel, instrume			STEEL	-	100%	+		Other - Not relevant Other - Not relevant		yes 1 120,000 80,000 yes 3 120,000 80,000
38 4 423 trim instrument panel, instrume	nt pane screw	18	STEEL	F	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000 yes 1 120,000 80,000
38 4 423 trim instrument panel, instrume 38 4 423 trim instrument panel, instrume	nt pane nut	12	STEEL	-	100%	1	Press (Tandem)	Other - Not relevant	Other - Not relevant	yes 1 120,000 80,000
38 4 423 trim instrument panel, instrume	nt panelscrew	18	STEEL	-	100%	1		Other - Not relevant	Other - Not relevent	ves 1 120,000 80,000
		120	PP-T30	FOAM						
38 4 423 trim instrument panel, instrume 39 4 424 roof liner	nt pane step protector molded roof liner	120 3,594	PP-T30 CELLULOSE	FOAM FOAM	100% 100%	1	Injection Molding Compression Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 2 120,000 80,000
38 4 423 trim instrument panel, instrume 39 4 424 roof liner 39 4 424 roof liner	nt pane step protector	120 3,594 1	PP-T30 CELLULOSE PA6.6		100% 100% 100%	1	Injection Molding Compression Molding Molding	Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 2 120,000 80,000 yes 1 120,000 80,000
38 4 423 frim instrument panel, instrume 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner	nt pand step protector molded roof liner snap button cover frame	120 3,594 1 4	PP-T30 CELLULOSE PA6.6 ASA PP-GF		100% 100% 100% 100%	1 1 1	Injection Molding Compression Molding Molding Molding Molding	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 2 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000
38 4 423 trim instrument panel, instrume 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner	nt pane step protector molded roof liner snap button cover	120 3,594 1 4 1 197	PP-T30 CELLULOSE PA8.6 ASA PP-GF ASA STEEL	FOAM - - - - -	100% 100% 100% 100% 100% 100%	1 1 1 1 1	Injection Molding Compression Molding Molding Molding Molding Molding Injection Molding Forming & Shaping	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 2 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000
38 4 423 from instrument panel, instrume 39 4 424 roof liner 39 4 425 door tim front	nt pane step protector molded roof liner snap button cover frame cover screw door trim	120 3,594 1 4 1 197 4 3,018	PP-T30 CELLULOSE PA6.6 JASA PP-GF ASA STEEL PVC		100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 3	Injection Molding Compression Molding Molding Molding Molding Injection Molding Forming & Shaping Injection Molding	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Compression Molding	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	yes 3 120,000 80,000 yes 2 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 1 120,000 80,000 yes 1 120,000 80,000 yes 3 120,000 80,000 yes 3 120,000 80,000 yes 3 120,000 80,000 yes 3 120,000 80,000 yes 3 120,000 80,000 yes 3 120,000 80,000 yes 3 120,000 80,000 yes 3 120,000 80,000 yes 3 120,000 80,000 yes 3 120,000 80
38 4 423 frim instrument panel, instrume 39 4 424 roof liner 39 4 425 door brim front 40 4 425 door brim front 40 4 425 door brim front	nt pand step protector molded roof liner snap button cover frame cover screw door bim clip screw	120 3,594 1 4 1 197 4 3,018	PP-T30 CELLULOSE PA8.8 ASA PP-GF ASA STEEL PVC POM STEEL	FOAM	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Compression Molding Molding Molding Molding Molding Injection Molding Forming & Shaping Injection Molding Molding Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	120,000 120,
38 4 423 frim instrument panel, instrume 39 4 424 roof liner 39 4 425 door trim front 40 4 425 door trim front 40 4 425 door trim front 41 4 426 door trim front 41 4 426 door trim rest	nt pane step protector molded roof liner snap button cover frame cover screw door trim oilp	120 3,594 1 4 1 197 4 3,018 1 5 2,893	PP-T30 CELLULOSE PA8.6 ASA PP-GF ASA STEEL PVC POM	FOAM - - - - -	100% 100% 100% 100% 100% 100% 100% 50% 100% 50%	1 1 1 1 1 3 1 1 3	Injection Molding Compression Molding Molding Molding Molding Molding Injection Molding Forming & Shaping Injection Molding Molding Molding Molding	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Compression Molding Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	120,000 120,
38 4 423 from instrument panel, instrume 39 4 424 roof liner 39 4 425 door tim front 40 4 425 door tim front 40 4 425 door tim front 41 4 426 door tim reer 41 4 426 door tim reer	nt pane step protector molded roof liner snap button cover frame cover door bim clip screw door trim clip screw door trim clip screw	120 3,594 1 4 1 197 4 3,018 1 5 2,693	PP-T30 CELLULOSE PA8.6 ASA PP-GF ASA STEEL PVC POM STEEL PVC POM STEEL	FOAM	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 3 1 1 3 1 1 1 1	Injection Molding Compression Molding Molding Molding Molding Molding Injection Molding Forming & Sheping Injection Molding Forming & Sheping Injection Molding Molding Forming & Sheping Injection Molding Molding Forming & Sheping Molding Molding	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Compression Molding Other - Not relevant Compression Molding Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	Yes 3 120,000 60,000 120,0
38 4 423 frim instrument panel, instrume 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner 40 4 425 door liner 40 4 425 door lim front 40 4 425 door lim front 41 4 426 door lim rest 41 4 426 door lim rest 41 4 426 door lim rest 41 4 426 door lim rest 42 4 427 adde trim	nt panel step protector molded roof liner snap button cover frame cover screw door bim clip screw door trim clip screw tirin tirin	120 3,594 1 4 1 197 4 3,018 1 5 2,893 1 335 146	PP-T30 CELLULOSE PA8.8 ASA PP-GF ASA STEEL PVC POM STEEL PVC POM STEEL PVC PCM PCM STEEL PVC PP-TS-ABS	FOAM	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Compression Molding Molding Molding Molding Molding Shaping Injection Molding Forming & Shaping Injection Molding Molding Forming & Shaping Injection Molding Molding Forming & Shaping Compression Molding Compression Molding Molding Compression Molding Molding Compression Molding	Other - Not nelevant Other - Not nelevant Other - Not nelevant Other - Not nelevant Other - Not nelevant Other - Not nelevant Other - Not nelevant Other - Not nelevant Compression Molding Other - Not nelevant Compression Molding Other - Not nelevant Other - Not nelevant Other - Not nelevant Other - Not nelevant Other - Not nelevant Other - Not nelevant Other - Not nelevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	Yes 3 120,000 60,000 Yes 2 120,000 80,000 Yes 1 120,000 80,000 Yes 1 120,000 80,000 Yes 1 120,000 80,000 Yes 1 120,000 80,000 Yes 3 120,000 80,000 Yes 3 120,000 80,000 Yes 3 120,000 80,000 Yes 1 120,000 80,000 Yes 1 120,000 80,000 Yes 1 120,000 80,000 Yes 3 120,000 80,000 Yes 4 120,000 80,000 Yes 4 120,000 80,000 Yes 5 120,000 80,000 Yes 6 120,000 80,000 Yes 6 120,000 80,000 Yes 2 120,000 80,000 Yes 2 120,000 80,000 Yes 3 120,
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38 4 429 froof liner 39 4 429 froof liner 39 4 429 froof liner 39 4 429 froof liner 39 4 429 froof liner 39 4 429 froof liner 39 4 429 froof liner 39 4 429 froof liner 39 4 429 froof liner 39 4 429 froof liner 39 4 429 froof liner 40 4 425 door trim front 40 4 425 door trim front 41 4 425 door trim front 41 4 425 door trim front 41 4 425 door trim front 42 4 427 sloor trim rear 42 1 427 sloor trim rear 42 1 427 sloor trim 42 2 427 sloor trim 42 2 427 sloor trim 42 2 427 sloor trim 42 4 427 sloor trim	nt panel step protector molded roof liner enap button cover frame cover screw door trim clip screw door trim clip screw identification clip screw identification clip screw identification clip screw identification clip screw identification clip screw identification screw identification screw identification screw identification screw washer bracket clip retainer screw cover clip iuggage compartification screw interes screw screw interes screw scr	120203 3,594 1 1 1 4 4 1 1 197 4 4 3,018 1 5 2,693 1 3 3,255 1 1 3 3 3,255 1 1 3 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3	PP-T30 CELLULOSE PA-9.6 PA-9.6 ASA STEEL PVC POM STEEL PVC PP-T30 STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PA-9.6 STEEL STEEL PA-9.6 STEEL PA-9.7 STEEL PA-9.7 PP-7.7 STEEL PUR PUR PUR PUR	FOAM TPU TPU TPU FOAM LEATHERF LEATHERF EPDM FOASTIC FLASTIC PLASTIC	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	injection Modding Compression Modding	Cither - Not nelevant Cither - Not nelevant Cither - Not nelevant Cither - Not nelevant Cither - Not nelevant Cither - Not nelevant Cither - Not nelevant Cither - Not nelevant Cither - Not nelevant Cither - Not nelevant Compression Modding Cither - Not nelevant Compression Modding Cither - Not nelevant Cith	Other - Not relevant. Other - Not relevant.	Yes 3 120,000 60,000 Yes 1 120,000 60,000 Yes 3 120,000 60,000 70,000 Yes 3 120,000 60,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,0
38 4 429 froof liner 39 4 424 roof liner 40 4 425 door liner 40 4 425 door brim front 40 4 425 door brim front 40 4 425 door brim front 41 4 426 door brim reer 41 4 426 door brim reer 41 4 426 door brim reer 41 4 426 door brim reer 42 4 427 addo brim 43 4 428 brink floor cover 43 4 428 brink floor cover 43 4 428 brink floor cover 43 4 428 brink floor cover 43 4 428 brink floor cover 43 4 428 brink floor cover 43 4 428 brink floor cover 43 4 428 brink floor cover 43 4 428 brink floor cover 43 4 428 brink floor cover 43 4 428 brink floor cover 44 4 428 brink floor cover 45 4 427 brink floor cover 46 4 428 brink floor cover 47 4 428 brink floor cover 48 4 428 brink floor cover 49 4 429 brink floor cover 49 4 429 brink floor cover 49 4 429 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover 49 4 420 brink floor cover	nt panel step protector molded roof liner snap button cover frame cover screw door trim clip screw trim subject clip retainer screw	1202 3,594 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	PP-T30 CELLULOSE PA-9.8 PA-9.8 PA-9.7 STEEL PVC POM STEEL PVC POM STEEL PVC POM STEEL PVC POM STEEL STEEL PV-T STEEL STEEL STEEL STEEL STEEL PA-9.8 STEEL STEEL STEEL STEEL STEEL STEEL PA-9.8 STEEL S	FOAM TPU TPU TPU FOAM LEATHERF LEATHERF FOAM LEATHERF FOAM PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	injection Modding Compression Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Forming & Shaping injection Modding Forming & Shaping injection Modding Forming & Shaping Modding Forming & Shaping Modding Forming & Shaping Modding Forming & Shaping Modding Forming & Shaping Injection Modding Forming & Shaping Injection Modding Forming & Shaping Modding Forming & Shaping Injection Modding Forming & Shaping Modding Forming & Shaping Modding Forming & Shaping Injection Modding Forming & Shaping Injection Modding Forming & Shaping Injection Modding Forming & Shaping Injection Modding Forming & Shaping Injection Modding Forming & Shaping Injection Modding Forming & Shaping Injection Modding Forming & Shaping Injection Modding Forming & Shaping Injection Modding Forming & Shaping Ill MForm Modding RiMForm Modding	Cither - Not nelevant Cither - Not nelevant	Other - Not relevant. Other - Not relevant.	Yes 3 120,000 60,000 Yes 1 120,000 60,000 Yes 3 120,000 60,000 Yes 1 120,000 60,000 Yes 3 120,000 60,000 Yes 3 120,000 60,000 Yes 1 120,000 60,000 Yes 1 120,000 60,000 Yes 3 120,000 60,000 70,000 Yes 3 120,000 60,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,0
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38 4 429 from Interument panel, Instrume 39 4 424 froof Inner 39 4 424 froof Inner 39 4 424 froof Inner 39 4 424 froof Inner 39 4 424 froof Inner 39 4 422 froof Inner 39 4 422 froof Inner 39 4 422 froof Inner 40 4 425 door tim front 40 4 425 door tim front 40 4 425 door tim front 41 4 426 door tim rear 41 4 426 door tim rear 41 4 426 door tim rear 42 4 427 side trim 43 4 428 trim side trim 44 4 427 side trim 45 4 427 side trim 46 4 427 side trim 47 4 427 side trim 48 4 427 side trim 49 4 427 side trim 40 4 427 side trim 41 4 428 side trim 42 4 427 side trim 43 4 428 trim silipate, trunk id 44 4 429 side trim 45 4 427 side trim 46 4 428 trunk floor cover 47 4 429 side trim 48 4 428 trunk floor cover 49 4 429 side trim silipate, trunk id 40 4 429 trim silipate, trunk id 41 4 428 trim silipate, trunk id 42 4 427 side trim silipate, trunk id 43 4 428 trunk floor cover 44 4 429 side trim silipate, trunk id 46 4 429 trim silipate, trunk id 47 4 429 trim silipate, trunk id 48 4 429 trim silipate, trunk id 49 4 429 trim silipate, trunk id 40 4 429 trim silipate, trunk id 41 4 429 trim silipate, trunk id 42 4 427 side trim silipate, trunk id 43 4 429 trim silipate, trunk id 44 4 429 trim silipate, trunk id 45 4 427 side trim silipate, trunk id 46 4 429 trim silipate, trunk id 47 4 429 trim silipate, trunk id 48 4 429 trim silipate, trunk id 49 4 429 trim silipate, trunk id 40 4 429 trim silipate, trunk id 41 4 429 trim silipate, trunk id 42 4 427 side trim silipate, trunk id 43 4	nt panel step protector molded roof liner snap button cover frame cover screw door trim clip screw door trim clip screw trim screw s	1202 3,594 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	PP-T30 CELLULOSE PAJ.9 PAJ.9 PAJ.9 FAJ.9 FAJ.9 FAJ.9 FOM STEEL PVC POM STEEL PVC POM STEEL PVC POM STEEL PVC POM STEEL PVC STEEL PVC PP-TV STEEL PP-TV STEEL PS-TV STEEL STEEL CR STEEL STEEL STEEL PA-86 FAJ.9 FAJ.9 STEEL S	FCAM TPU TPU TPU FOAM LEATHER- LEATHER- LEATHER- FOAM	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	injection Modding Compression Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Forming & Shaping injection Modding Forming & Shaping injection Modding Forming & Shaping Modding Forming & Shaping Modding Forming & Shaping Modding Forming & Shaping Modding Forming & Shaping Injection Modding Forming & Shaping Injection Modding Forming & Shaping Injection Modding Forming & Shaping Injection Modding Forming & Shaping Forming & Shaping Modding Forming & Shaping Modding Forming & Shaping Modding Forming & Shaping Modding Forming & Shaping Forming & Shaping Modding Forming & Shaping Modding Forming & Shaping Forming Forming & Shaping Forming Forming & Shaping Forming Forming Form	Cither - Not nelevant Cither - Not nelevant	Other - Not relevant Other - Not relevant	Yes 3 120,000 60,000 Yes 1 120,000 60,000 Yes 1 120,000 60,000 Yes 1 120,000 60,000 Yes 1 120,000 60,000 Yes 3 120,000 60,000 Yes 3 120,000 60,000 Yes 1 120,000 60,000 Yes 3 120,000 60,000 Yes 1 120,000 60,000 Yes 3 120,000 60,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70
38 4 420 from instrument panel, instrume 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner 39 4 424 roof liner 40 4 425 door tirm front 40 4 425 door tirm front 40 4 425 door tirm front 41 4 425 door tirm front 41 4 425 door tirm rear 41 4 425 door tirm rear 41 4 425 door tirm rear 42 4 427 side trim 4	nt panel step protector moled roof liner enap button cover frame cover screw door trim city screw door trim city screw door trim city screw trim trim screw trin screw trim screw trim screw trialiner screw trin screw screw trin screw screw trin screw tri	1202 3,594 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	PP-T30 CELLULOSE PA-9.6 PA-9.6 ASA STEEL PVC POM STEEL PVC PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL PVC STEEL STEEL PC STEEL STEEL PC STEEL STEEL PC STEEL STEEL PC STEEL STEEL PC STEEL	FCAM TPU TPU FCAM EATHER-F EPDM FASTIC PLASTIC	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	injection Modding Compression Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Modding Sheding Modding Forming Modding Modding Forming Modding	Cither - Not nelevant Cither - Not nelevant	Other - Not relevant Other - Not relevant	Yes 3 120,000 60,000 Yes 1 120,000 60,000 Yes 3 120,000 60,000 Yes 1 120,000 60,000 Yes 3 120,000 60,000 70,000 Yes 3 120,000 60,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,000 70,0

177 4 43 177 4 43		Z Seat rack	15,865 8,628		STEEL	70%	3	Press (Tandem) Press (Tandem)	GMAW/FCAW-MIG GMAW/FCAW-MIG	Press (Tandem)	yes ves	3	120,000	
177 4 43 177 4 43	0 seat rack front	Z Seat back rack abrasion protection	4,925		PLASTIC	80%	3	Press (Tandem) RIM/Foam Molding	GMAW/FCAW-MIG	Injection Molding Other - Not relevant	yes yes	3	120,000	80,000
177 4 43 177 4 43	0 seat rack front	trim trim	406	ABS		100%	_	Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	3	120,000	80,000
177 4 43 177 4 43	So seat rack front	trim trim	26		-	100%	1	Injection Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	3	120,000	80,000
177 4 43	Oseat rack front	screw	2	STEEL	1:	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	1	120,000	80,000
177 4 43 177 4 43	0 seat rack front	screw	2	STEEL		100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	1	120,000	80,000
177 4 43		screw	28	STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes	1	120,000	80,000
177 4 43 177 4 43	0 seat rack front	bracket carrier plate	350	STEEL	-	100%	1	Forming & Shaping Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes	1 3	120,000	80,000
177 4 43	0 seat rack front	clip	17	PLASTIC	Ē	100%	1	Molding	Other - Not relevant	Other - Not relevant	yes yes	1	120,000	80,000
177 4 43	O seat rack front O seat rack front O seat rack front	bearing block bearing block screw	12	POM	-	100% 100%	1	Molding Molding	Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant	yes yes	1	120,000	80,000
	0 seat rack front	frame Z guide	712	STEEL	STEEL STEEL	70%	3	Forming & Shaping Press (Tandem) Molding	GMAW/FCAW-MIG	Other - Not relevant Bending Other - Not relevant	yes	3	120,000	80,000
177 4 43	O seat rack front O seat rack front O seat rack front	Z guide Z guide Z rack	18 633	PLASTIC	STEEL	100%	1 3	Molding	Other - Not relevant GMAW/FCAW-MIG	Other - Not relevant	yes	1	120,000	80,000
	0 seat rack front	trim adjusting wheel		PLASTIC	-	100%	1	Press (Tandern) Injection Molding Injection Molding	Other - Not relevant	Press (Tandem) Other - Not relevant	yes	3	120,000	80,000
177 4 43		end cap screw	3	ABS	ļ	100%	1	Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	yes		120,000	80,000
177 4 43	O seat rack front O seat rack front O seat rack front	screw	1		-	100% 100%	1 1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	1 3	120,000	80,000
177 4 43	0 seat rack front	trim	200	PP	ļ-	100%	1	Injection Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	3	120,000	
177 4 43	0 seat rack front	clip	1	POM	-	100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	1	120,000	80,000
177 4 43	0 seat rack front 0 seat rack front	adjusting lever	56	PA6-GF	-	100%	1	Injection Molding Injection Molding	Other - Not relevant	Other - Not relevant	yes	3	120,000	80,000
177 4 43		end cap screw	5	STEEL		100%	1	Molding Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	yes	1	120,000	80,000
177 4 43	0 seat rack front	adjusting wheel	8	ABS ABS	<u> </u>	100%	1	Injection Molding Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	1	120,000	80,000
177 4 43	0 seat rack front	adjusting wheel	26	ABS	<u>-</u>	100%	1	Injection Molding Injection Molding	Other - Not relevant	Other - Not relevant	yes	3	120,000	80,000
177 4 43	0 seat rack front 0 seat rack front	trim tnm	201	PP PP		100%	1	Injection Molding Injection Molding	Other - Not relevant	Other - Not relevant	yes	3	120,000	80,000
177 4 43 177 4 43	0 seat rack front	clip	1	POM	<u> </u>	100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes		120,000	
177 4 43 177 4 43	0 seat rack front	adjusting wheel end cap	1	PA6-GF PA	-	100%	1	Injection Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	3	120,000 120,000	80,000
177 4 43 177 4 43	0 seat rack front	screw adjusting wheel	37	STEEL PS	-	100%	1	Forming & Shaping Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes	3	120,000 120,000	80,000
177 4 43 177 4 43	0 seat rack front	adjusting wheel	19	ABS ABS	-	100%	1	Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	3	120,000 120,000	80,000 80,000
178 4 43	0 seat rack front 0 seat rack rear	frame	712		STEEL	100% 70%	3	Injection Molding Press (Tandem)	Other - Not relevant GMAW/FCAW-MIG	Other - Not relevant Bending	yes yes	3	120,000 120,000	
178 4 43		Z guide Z guide	17 17	STEEL	PLASTIC PLASTIC	100% 100%	1	Injection Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	3	120,000 120,000	80,000
178 4 434 178 4 434	0 seat rack rear	Z rail Z rail		STEEL	STEEL	70% 70%	2	Press (Tandem) Press (Tandem)		Press (Tandem) Press (Tandem)	yes yes		120,000 120,000	80,000 80,000
178 4 436 178 4 436	0 seat rack rear	screw	16		:	100% 100%	1	Injection Molding Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes		120,000 120,000	
	0 seat rack rear	Z Seat rack	10,422	STEEL	PLASTIC	100% 70%	3	Forming & Shaping Press (Tandem)	Other - Not relevant GMAW/FCAW-MIG	Other - Not relevant Press (Tandern)	yes yes	3	120,000 120,000	80,000
178 4 430		seat tray Z Seat back rack	1,577 2,257	STEEL	STEEL	70% 70%		Press (Tandem) Press (Tandem)	GMAW/FCAW-MIG	Press (Tandem) Press (Tandem)	yes yes	3	120,000 120,000	80,000
178 4 430 178 4 430	0 seat rack rear	carrier plate clamping pate	485 129	ABS ABS	-	100% 100%	1	Injection Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	3	120,000	80,000
178 4 430 178 4 430	0 seat rack rear	seat back seat cushion		ABS ABS	-	100% 100%		Injection Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	3	120,000 120,000	
178 4 430 178 4 430	0 seat rack rear	footrest adjusting unit	2,389	ABS STEEL	PLASTIC -	70% 100%	1	Injection Molding Electric	Assembly Other - Not relevant	Injection Molding Other - Not relevant	yes yes	3	120,000 120,000	80,000 80,000
178 4 430 178 4 430	0 seat rack rear	screw	6 10	STEEL	-	100% 100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	1	120,000 120,000	80,000 80,000
178 4 430		clip cable tie		PLASTIC PLASTIC	-	100%		Molding Molding		Other - Not relevant Other - Not relevant	yes yes	1	120,000 120,000	80,000 80,000
178 4 430 178 4 430	0 seat rack rear	acorn nut screw	7	PLASTIC STEEL	-	100%	1	Molding Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	1	120,000	80,000 80,000
178 4 430 178 4 430	0 seat rack rear	trim trim	270		-	100% 100%	1	Injection Molding Injection Molding		Other - Not relevant			120,000	80,000
178 4 430 178 4 430	D seat rack rear	trim screw	268 4		-				Other - Not relevant Other - Not relevant	Other - Not relevant	yes yes	3		
		washer			-	100%	1	Injection Molding Forming & Shaping	Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant	yes yes yes		120,000 120,000	80,000 80,000
	0 seat rack rear	nut	1	STEEL		100% 100% 100%	1	Injection Molding Forming & Shaping Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	yes yes yes yes yes	3	120,000 120,000 120,000 120,000	80,000 80,000 80,000 80,000
178 4 430	0 seat rack rear 0 seat rack rear	nut clip screw	1 1 4	STEEL STEEL POM STEEL		100% 100% 100% 100% 100%	1 1 1 1	Injection Molding Forming & Shaping Forming & Shaping Forming & Shaping Molding Forming & Shaping	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	yes yes yes yes yes yes	3 3 1 1 1 1	120,000 120,000 120,000 120,000 120,000 120,000	80,000 80,000 80,000 80,000 80,000
178 4 430 178 4 430	0 seat rack rear 0 seat rack rear 0 seat rack rear 0 seat rack rear	nut clip screw screw end cap	1 1 4 3	STEEL STEEL POM STEEL STEEL PP		100% 100% 100% 100% 100% 100%	1 1 1 1 1 1	Injection Molding Forming & Shaping Forming & Shaping Forming & Shaping Molding Forming & Shaping Forming & Shaping Forming & Shaping Molding Molding	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes	3 1 1 1 1 1 1 1 1 1 1 1	120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000	80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000
178 4 430 178 4 430 178 4 430 178 4 430	D seat rack rear D seat rack rear D seat rack rear D seat rack rear D seat rack rear D seat rack rear D seat rack rear	nut clip screw screw end cap Z Seat rack seat tray	1 4 3 10,088 1,477	STEEL STEEL POM STEEL STEEL PP STEEL STEEL	PLASTIC	100% 100% 100% 100% 100% 100% 70% 70%	1 1 1 1 1 3 1	Injection Molding Forming & Shaping Forming & Shaping Forming & Shaping Forming & Shaping Molding Forming & Shaping Molding Forming & Shaping Molding Forming & Shaping Molding Press (Tandem) Press (Tandem)	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not Relevant Other - Not Relevant Other - Not Relevant Other - Not Relevant Other - Not Relevant Other - Not Relevant Other - Not Relevant Other - Not Relevant Other - Not Relevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Press (Tandem) Press (Tandem)	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 1 1 3 3	120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000	80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000
178 4 430 178 4 430 178 4 430 178 4 430 178 4 430 178 4 430	Seaf rack rear Seaf rack rear Seaf rack rear Seaf rack rear Seaf rack rear Seaf rack rear Seaf rack rear Seaf rack rear Seaf rack rear	nut clip screw screw end cap Z Seat rack seat tray Z Seat back rack cover	1 1 4 3 1 10,088 1,477 1,711 379	STEEL STEEL POM STEEL STEEL PP STEEL STEEL STEEL STEEL STEEL ABS		100% 100% 100% 100% 100% 100% 70% 70% 70%	1 1 1 1 1 1 3 1 3 1	Injection Molding Forming & Shaping Forming & Shaping Forming & Shaping Molding Forming & Shaping Injection Molding	Olhor - Not relevant Olher - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not other Other - Not Other	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 1 3 3 3 3	120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000	80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000
178 4 430 178 4 430	Jeal rack rear Jeal rack rear Jeal rack rear Jeal rack rear Jeal rack rear Jeal rack rear Jeal rack rear Jeal rack rear Jeal rack rear Jeal rack rear Jeal rack rear Jeal rack rear	nut clip screw screw screw end cap Z Seat rack soat tray Z Seat back rack cover trim trim	1 4 3 1 10,088 1,477 1,711 379 358 269	STEEL STEEL POM STEEL STEEL STEEL STEEL STEEL STEEL STEEL ABS PP	STEEL	100% 100% 100% 100% 100% 100% 100% 70% 70% 100% 10	1 1 1 1 1 1 3 1 3 1 1 1 1 1	Inlection Molding Forming & Shaping Forming & Shaping Forming & Shaping Forming & Shaping Molding Forming & Shaping Molding Forming & Shaping Molding Press (Tandem) Press (Tandem) Injection Molding Injection Molding Injection Molding	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 3 3 3 3 3 3	120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000	80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000
178 4 430 178 4 430	O Beat rack rear D seat rack rear O seat rack rear O seat rack rear D seat rack rear D seat rack rear D seat rack rear D seat rack rear	nut clip screw screw screw end cap Z Seat rack seat Iray Z Seat back rack cover Inim Irim screw screw	1 1 4 3 1 10,088 1,477 1,711 379 358 269 6	STEEL STEEL POM STEEL STEEL STEEL STEEL STEEL STEEL STEEL ABS PP PP STEEL STEEL STEEL ABS	STEEL	100% 100% 100% 100% 100% 100% 70% 70% 100% 10	1 1 1 1 1 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shaping Molding Press (Tandem) Press (Tandem) Injection Molding Injection Molding Injection Molding Injection Molding Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 3 3 3 3 3 3 3	120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000 120,000	80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000 80,000
178 4 430 178 4 430	Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear	out clip sorrew sorrew sorrew sorrew and cap Z Seat rack seat tray Z Seat back rack cover trim trim screw screw screw screw end cap	1 1 4 3 1 10,088 1,477 1,711 379 358 269 6 10 3	STEEL STEEL POM STEEL STEEL STEEL STEEL STEEL ABS PP STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL	STEEL	100% 100% 100% 100% 100% 100% 70% 70% 100% 10	1 1 1 1 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shaping Forming & Shaping Forming & Shaping Forming & Shaping Molding Forming & Shaping Forming & Shaping Molding Forming & Shaping Molding Forming & Shaping Molding Press (Tandem) Press (Tandem) Injection Molding Injection Molding Injection Molding Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 3 3 3 3 3 3 1 1 1 1	120,000 120,000	80,000 80,000
178 4 43 178 4 43	Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear	nut clip sorew sorew sorew sorew sorew and cap Z Seat rack seat Iray Z Seat back rack cover Itim Itim screw screw screw screw end cap clip screw screw screw screw screw screw screw screw	1 1 4 3 1 10,088 1,477 1,711 379 358 269 6 10 3 1	STEEL STEEL POM STEEL STEEL PPP STEEL	STEEL	100% 100% 100% 100% 100% 100% 70% 70% 100% 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shaping Molding Forming & Shaping Molding Forming & Shaping Molding Forming & Shaping Molding Fress (Tandem) Fress (Tandem) Injection Molding Injection Molding Forming & Shaping Molding Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 1 1 3 3 3 3 3 1 1 1 1	120,000 120,000	80,000 80
178 4 430 178 4 430	Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear Deat rack rear	nut clip screw screw end cap Z Seat rack seat tray Z Seat back rack cover tinm timm screw screw screw screw screw screw screw screw screw	1 1 4 3 3 1 10,088 1,477 1,711 3799 358 269 6 10 3 1 1 1 4 3 3	STEEL STEEL POM STEEL STEEL PP STEEL	STEEL STEEL - - - - - - - - - - - - -	100% 100% 100% 100% 100% 100% 70% 70% 100% 10	1 1 1 1 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shaping Forming & Shaping Forming & Shaping Forming & Shaping Molding Forming & Shaping Molding Forming & Shaping Molding Press (Tandem) Press (Tandem) Injection Molding Injection Molding Injection Molding Forming & Shaping Molding Forming & Shaping Molding Forming & Shaping Molding Forming & Shaping Molding Molding Molding Molding Shaping Molding Forming & Shaping Molding Molding Forming & Shaping Molding Molding Forming & Shaping Molding	Other - Not relevant Other - N	Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 1 1 3 3 3 3 3 3 1	120,000 120,000	80,000 80,000
178 4 430 178 4 430	Deat rack rear Deat rack rear	nut clip screw screw end cap Z Seat rack seat tray Z Seat back rack cover linin screw screw screw screw screw screw screw screw screw screw screw screw screw screw screw screw screw screw	1 1 4 3 3 1 10,088 1,477 1,711 379 358 269 6 10 3 1 1 4 4 3 3 1	STEEL STEEL POM STEEL	STEEL STEEL	100% 100% 100% 100% 100% 70% 70% 100% 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shaping Molding Molding Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Press (Tandem)	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	120,000 120,000	80,000 80,000
178 4 430 178 4 430	Deat rack rear Deat rack rear	nut clip screw screw and cap Z Seat rack seat Irry Z Seat back rack cover litim screw screw screw screw screw screw screw screw screw screw screw screw screw screw screw screw screw screw Screw Screw Screw Screw Screw Screw Screw Screw Screw Screw Screw Screw Screw Screw Screw Screw	1 1 1 4 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1	STEEL STEEL POM STEEL POM STEEL	STEEL STEEL	100% 100% 100% 100% 100% 100% 70% 70% 100% 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shaping Molding Molding Forming & Shaping Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Shaping Formin	Other - Not relevant Other - N	Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 1 1 3 3 3 3 3 1 1 1 1	120,000 120,000	80,000 80
178	Deat rack rear Deat rack rear	nut clip screw screw and cap Z Seat rack seat Irry Z Seat back rack cover litim screw	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	STEEL STEEL POM STEEL	STEEL STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shaping Molding Forming & Shaping Injection Molding Injection Molding Injection Molding Injection Molding Forming & Shaping Molding Forming & Shaping Forming & Shaping Molding Forming & Shaping Other - Not relevant Other - N	Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 1 1 3 3 3 3 3 3 1	120,000 120,000	80,000 80	
178 4 435 178 4 43	Deat rack rear Deat rack rear	nut clip screw screw and cap Z Seat rack seat Iray Z Seat seat screw	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	STEEL STEEL POM STEEL	STEEL STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shaping Molding Molding Forming & Shaping Injection Molding Injection Molding Injection Molding Injection Molding Forming & Shaping Fress (Tandem)	Other - Not relevant Other - N	Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	120,000 120,000	80,000 80
178 4 435 178 4 435 178 4 435 178 4 436 178 4 43	Deat rack rear Deat rack rear	nut clip screw screw and cap Z Seat rack seat Iray Z Seat seat screw	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	STEEL STEEL FOM STEEL	STEEL STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shabing Molding Molding Forming & Shabing Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Shaping Molding Forming & Shaping	Other - Not relevant Other - N	Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 3 3 3 3 3	120,000 120,000	80,000 80
178 4 435 178 4 43	Deat rack rear Deat rack rear	nut clip screw screw and cap Z Seat rack seat Iray Z Seat seat screw	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	STEEL STEEL POM STEEL	STEEL STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shabing Molding Molding Forming & Shabing Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Shabing	Other - Not relevant Other - N	Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	120,000 120,00	80,000 80
178 4 435 178 4 43	Deat rack rear Deat rack rear	nut clip screw screw and cap Z Seat rack seat Irray Z Seat seat cack cover litim screw	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	STEEL STEEL POM STEEL	STEEL STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shabing Molding Molding Forming & Shabing Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Shabing	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes	3 3 1 1 1 1 1 1 1 1 1 1 3 3 3 3 3 3 1	120,000 120,00	80,000 80,000
178	Deat rack rear Deat rack rear	nut clip screw screw and cap Z Seat rack seat Iray Z Seat rack screw	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	STEEL STEEL POM STEEL	STEEL STEEL	100% 100% 100% 100% 100% 50% 50% 100% 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shaping Molding Molding Forming & Shaping Forming & Shaping Forming & Shaping Molding Forming & Shaping Forming & Shaping Forming & Shaping Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Shaping Other - Not relevant Other - N	Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 1 1 1 3 3 3 3 3 3 3 3	120,000 120,00	80,000 80,000	
178 4 43 178	Deat rack rear Deat rack rear	nut clip screw screw and cap Z Seat rack seat Iray Z Seat seat screw	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	STEEL STEEL POM STEEL	STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shaping Molding Molding Forming & Shaping Molding Forming & Shaping Forming & Shaping Molding Forming & Shaping Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Shaping Forming	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes yes yes yes yes yes yes yes yes	3 3 1 1 1 1 1 1 1 1 1 1 1 3 3 3 3 3 1	120,000 120,00	80,000 80,000
178 4 434 178 178 4 178 17	Deat rack rear Deat rack rear	nut clip screw screw and cap Z Seat rack seat Iray Z Seat sector lim lim screw	1 10,088	STEEL STEEL POM STEEL POM STEEL STEE	STEEL STEEL STEEL	100% 100% 100% 100% 100% 100% 100% 100%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Injection Molding Forming & Shaping Molding Molding Forming & Shaping Molding Forming & Shaping Molding Forming & Shaping Molding Fress (Tandem) Fress (Tandem) Fress (Tandem) Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Injection Molding Forming & Shaping	Other - Not relevant Other - N	Other - Not relevant Other - Not relevant	yes yes	3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	120,000 120,00	80,000 80

	spring cores, cushion layers, and foam			PUR		100%	1			Other - Not relevant Other - Not relevant	yes 3	120,000 80,000 120,000 80,000
180 4 430	spring cores, cushion layers, and foarn spring cores, cushion layers, and foarn spring cores, cushion layers, and foarn	foam part	1,040		- PLASTIC	100%	#	RIM/Foam Molding		Other - Not relevant Injection Molding	yes 3 yes 3	120,000 80,000 120,000 80,000
180 4 430	spring cores, cushion layers, and foam spring cores, cushion layers, and foam	fili cushlon	357	PUR	STEEL	100%		RIM/Foam Molding		Other - Not relevant	yes 3	120,000 80,000 120,000 80,000
180 4 430 180 4 430	spring cores, cushion layers, and foam	foam part	809	PUR	PLASTIC -	50% 100%	1	RIM/Foam Molding	Assembly	Injection Molding Other - Not relevant	yes 3 yes 3	120,000 80,000 120,000 80,000
	spring cores, cushion layers, and foem		1,366	PUR PLASTIC	STEEL AL	80% 40%	2		Other - Not relevant Injection Molding		yes 3 no 0	120,000 80,000 120,000 80,000
92 5 5 93 5 5		screw	801	STEEL	- PP-TV	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
93 5 5 93 5 5	door handle interior and exterior front door handle interior and exterior front	SCREW	238	STEEL PA6-GF	STEEL	100% 70%		Forming & Shaping Injection Molding	Other - Not relevant Injection Molding	Other - Not relevant Precision Mechanics	no 0 no 0	120,000 80,000 120,000 80,000
93 5 5 93 5 5	door handle interior and exterior front door handle interior and exterior front		1	POM	•	100%	1	Molding	Other - Not relevant		no 0 no 0	120,000 80,000 120,000 80,000
93 5 5 93 5 5	door handle interior and exterior front door handle interior and exterior front		1	PLASTIC EPDM	-	100%	1	Molding Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	na 0 na 0	120,000 80,000 120,000 80,000
93 5 5	door handle interior and exterior front door handle interior and exterior front	SCFEW	1	PA6-GF STEEL	AL -	70% 100%	1			Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
93 5 5 93 5 5	door handle interior and exterior front door handle interior and exterior front	threaded plate	31	STEEL	PLASTIC	100%	1			Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
93 5 5 94 5 5	door handle interior and exterior front door handle interior and exterior rear	door lock	793	PP-TV	STEEL	100%	1	Precision Mechanics	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
94 5 5 94 5 5	door handle interior and exterior rear	door handle	165	STEEL PA6-GF	PA6-GF	100% 70%	1	Injection Molding	Injection Molding	Other - Not relevant Precision Mechanics	no 0	120,000 80,000 120,000 80,000
94 5 5 94 5 5 94 5 5	door handle interior and exterior rear	screw bracket	. 1	PLASTIC		100% 100%	1	Forming & Shaping Molding Molding	Other - Not relevant	Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000 120,000 80,000
94 5 5		door opener	149	PA8-GF	AL	70% 100%	1	Injection Molding	Die Casting	Other - Not relevant	no 0	120,000 80,000
94 5 5 94 5 5	door handle interior and exterior rear	screw lock wedge	125	STEEL STEEL STEEL	PLASTIC	100%	1	Forming & Shaping Press (Tandem) Forming & Shaping	Other - Not relevant Surface treating Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000 120,000 80,000
94 5 5 95 5 5	door handle interior and exterior rear door handle interior and exterior rear lock hood	screw front hood lock	32	STEEL	- STEEL	100%			Other - Not relevant Press (Tandem)		no 0	120,000 80,000 120,000 80,000
95 5 5	lock hood	front hood lock - m latching rod	123	STEEL PAS-GF	STEEL	60% 100%	1	Forging Molding	Forging Other - Not relevant	GMAW/FCAW-MIG Other - Not relevant	no 0	120,000 80,000 120,000 80,000
	lock hood	screw push nut	10	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
95 5 5 95 5 5	tock hood	bumper operating lever	12	EPDM PA6-GF	STEEL	100%	1	Molding Molding	Other - Not relevant		no 0	120,000 80,000 120,000 80,000
95 5 5 95 5 5	lock hood	acrew gasket	. 3	STEEL	-	100%	1	Forming & Shaping Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
95 5 5 95 5 5	lock hood	control cable cover	58	STEEL PP-TV	PLASTIC PET-GF	70% 100%	7	Forming & Shaping Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
95 5 5 95 5 5		screw push nut	4	STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant		no 0	120,000 80,000 120,000 80,000
96 5 5 96 5 5		handle Z lock cylinder	419 212	PE	STEEL	60% 70%	1	Injection Molding Press (Tandem)	Injection Molding Press (Tandem)	Press (Tandem) Electro-Mechanical	no 0 no 0	120,000 80,000 120,000 80,000
96 5 5 96 5 5	lock taligate, trunk lid	acrew lock	3	STEEL	- PLASTIC	100%	1	Forming & Shaping Electro-Mechanical	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
96 5 5 96 5 5		acrew adjuster		STEEL PA66-GF		100%		Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
96 5 5 96 5 5	lock tailgate, trunk lid	screw lock wedge	85	STEEL	PLASTIC	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
96 5 5 96 5 5	lock tailgate, trunk lid lock tailgate, trunk lid	screw guide	71	STEEL	- PLASTIC	100% 70%	1		Other - Not relevant		no 0 no 0	120,000 80,000 120,000 80,000
96 5 5 96 5 5	lock taligate, trunk lid	cover	11	STEEL ABS		100%	1	Forming & Shaping Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
96 5 5 96 5 5	lock teligate, trunk lid	acrew guide	114	STEEL	- PLASTIC	100% 75%	1		Other - Not relevant		no 0 no 0	120,000 80,000 120,000 80,000
96 5 5 96 5 5	lock teligate, trunk lid	acrew bumper	15	STEEL PP-GF	- EPDM	100%		Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
141 5 51	window frame and control moon roof	Z frame support	67	STEEL	POM -	70% 100%	1	Press (Tandem) Press (Tandem)	Adhesive Bonding Other - Not relevant		yes 3 yes 3 yes 1	120,000 80,000 120,000 80,000 120,000 80,000
141 5 51 141 5 51	window frame and control moon roof	acrew	9	STEEL		100%	1	Forming & Shaping		Other - Not relevant	yes 1	120,000 80,000
	window frame and control moon roof window frame and control moon roof window frame and control moon roof		3	STEEL STEEL STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant	yes 1 yes 1 yes 1	120,000 80,000 120,000 80,000 120,000 80,000
142 5 5		window regulator	2,230	STEEL	PP-TV	100%	2	Electro-Mechanical Forming & Shaping	Assembly	Other - Not relevant	no 0	120,000 80,000
143 5 5	window frame and control door window window frame and control door window	window regulator	1,963	STEEL	PP-TV	100%	2	Electro-Mechanical	Assembly	Other - Not relevant Other - Not relevant	no 0	
144 5 5	window frame and control side window		303	PA-66 STEEL	STEEL	100%	3	Electric Forming & Shaping	Assembly	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
144 5 5	window frame and control side window window frame and control side window	screw		STEEL		100% 100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
144 5 5 162 5 52	window frame and control side window	spacer fender liner	682	PLASTIC PP/EPDM		100%	1	Molding Injection Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 yes 3	120,000 80,000 120,000 80,000
162 5 52 162 5 52	corrosion proofing, fender liners corrosion proofing, fender liners	fender liner screw		PP/EPDM STEEL		100%		Injection Molding Forming & Shaping		Other - Not relevant Other - Not relevant	yes 3 yes 1	
162 5 52 162 5 52	corrosion proofing, fender liners corrosion proofing, fender liners	push nut nut insert	1	STEEL PLASTIC		100% 100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 yes 1	120,000 80,000 120,000 80,000
163 5 5 164 5 5	body sealing body floor panel front	water drain footrest	55	PS PS	-	100%		injection Molding	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
164 5 5 165 5 5	front segment, end panel front	lock carrier	6,177	PLASTIC	STEEL	100%		Injection Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000 120,000 80,000
165 5 5 165 5 5	front segment, end panel front	crossbeam screw	30	STEEL STEEL	STEEL -	70% 100%	1	Press (Tandem) Forming & Shaping Forming & Shaping	GMAW/FCAW-MIG Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000 120,000 80,000
165 5 5 165 5 5	front segment, end penel front	screw screw web plate	11	STEEL			1	Forming & Shaping Forming & Shaping Press (Tandem)	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000
165 5 5 165 5 5	front segment, end panel front	acrew washer	. 7.	STEEL	-	100%	7	Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
166 5 5 166 5 5	fender front	fender screw	3,619	STEEL	-	100%	2	Press (Tandem) Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
187 5 5 168 5 5		door	18,982 16,645	STEEL	STEEL	100%	$\dot{=}$	Other - Not relevant	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
169 5 5 170 5 5	hood	front hood taligate	12,198 18,258	STEEL	STEEL	100%		Other - Not relevant	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
171 5 5 171 5 5	door hinge front, arrestor door hinge front, arrestor	door arrestor acrew	145 8	STEEL	-	100%	1	Forging Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
171 5 5 171 5 5	door hinge front, arrestor door hinge front, arrestor	bolt nut	11	STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 no 0	120,000 80,000 120,000 80,000
171 5 5 171 5 5	door hinge front, arrestor	screw set screw	8	STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000
171 5 5 171 5 5	door hinge front, errestor door hinge front, errestor	bearing block cover	16	STEEL PE	-	100%	1	Forging Injection Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
171 5 5 172 5 5	door hinge front, arrestor door hinge rear, arrestor	protective cover door arrestor	151	PP STEEL		100%	1	Forging	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000
172 5 5 172 5 5	door hinge rear, arrestor door hinge rear, arrestor	screw bolt	11	STEEL			1		Other - Not relevant	Other - Not relevant	no 0	120,000 80,000 120,000 80,000
172 5 5 172 5 5	door hinge rear, arrestor door hinge rear, arrestor	nut pillowblock	49	STEEL		100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant	no 0	120,000 80,000 120,000 80,000 120,000 80,000
172 5 5 172 5 5	door hinge rear, arrestor door hinge rear, arrestor	threaded plate acrew	9	STEEL	-	100%		Forging	Other - Not relevant	Other - Not relevant	no 0	120,000 80,000 120,000 80,000 120,000 80,000
172 5 5 172 5 5	door hinge rear, arrestor	protective cover	17	PP PE	EPDM	100%	1.	Injection Molding	Other - Not relevant	Other - Not relevant Other - Not relevant Other - Not relevant	no 0	
172 5 5	door hinge rear, arrestor	set screw	2	STEEL	r	100%	1	Forming & Shaping	Tother - Mot relevant	Other - Not relevant	<u> </u>	120,000 00,000

173 5 5	hood hinge, gas spring	hinge	445	STEEL	ļ	100%	1	Press (Tandem)	Assembly	Other - Not relevant	no	0 120,0	000.00
173 5 5 173 5 5	hood hinge, gas spring hood hinge, gas spring	screw		STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant		0 120,0 0 120,0	
173 5 5 173 5 5	hood hinge, gas spring hood hinge, gas spring	screw gas spring	14	STEEL	- PLASTIC	100%	1	Forming & Shaping Assembly	Other - Not relevant	Other - Not relevant	no	120,0	00 80,000
173 5 5	hood hinge, gas spring	support	74	STEEL	-	100%	1	Press (Tandem)	Other - Not relevant	Other - Not relevant	no	120,0	00,000
173 5 5 173 5 5	hood hinge, gas spring hood hinge, gas spring	bracket		STEEL		100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant		0 120,0 0 120,0	
173 5 5 173 5 5	hood hinge, gas spring hood hinge, gas spring	bracket cushion bumper		EPDM	-	100%	1	Forming & Shaping Injection Molding	Other - Not relevant Other - Not relevant			0 120,0	
174 5 5 174 5 5	hinge tailgate, trunk lid hinge tailgate, trunk lid	hinge		STEEL	-	100%	1	Press (Tandem) Forming & Shaping		Other - Not relevant Other - Not relevant		120,0	
174 5 5 174 5 5	hinge tailgate, trunk lid	acrew	13	STEEL	- PLASTIC	100%	1	Forming & Shaping Press (Tandem)	Other - Not relevant	Other - Not relevant	no	120,0	00 80,000
174 5 5	hinge tallgate, trunk lid hinge tallgate, trunk lid	gas spring bracket	1	STEEL	-	100%	1	Forming & Shaping	Assembly Other - Not relevant	Injection Molding Other - Not relevant	no	120,0	00,000
174 5 5 174 5 5	hinge tailgate, trunk lid hinge tailgate, trunk lid	support ball joint stud	13	STEEL	-	100%	1	Press (Tandem) Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant		120,0	
	hinge tailgate, trunk lid exterior rear view mirror	Z mirror casing		STEEL GLASS	PE .	100%	1	Forming & Shaping Glass Processing	Other - Not relevant Press (Tandem)	Other - Not relevant Injection Molding		120,0	
		Z mirror casing 2 Z mirror casing 3		HDPE Electronics	E	100%	1 2	Injection Molding Electronics	Injection Molding Other - Not relevant	Other - Not relevant	yes	120,0 120,0	00,000
6 6 61		screw	4	STEEL		100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes	120,0	000,008
6 6 61	exterior rear view mirror	cover panel damper	2	PE	-	100%	1	Molding Molding	Other - Not relevant	Other - Not relevant		120,0	00,000
6 6 61	exterior rear view mirror exterior rear view mirror	damper bushing		PUR	:	100%	1	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	120,0	
97 6 62 97 6 62	floor gaskets, plugs floor gaskets, plugs	plug		TEEE	PP -	100%	1	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	120,0	
97 6 62	floor gaskets, plugs floor gaskets, plugs	plug plug	5	PLASTIC EPDM	-	100%	1	Molding Molding	Other - Not relevant		yes yes	120,0	00,000
97 6 62	floor gaskets, plugs	plug	3	TPE	<u> </u>	100%		Forming & Shaping	Other - Not relevant	Other - Not relevant	yes	120,0	000,08
98 6 62	gaskets front segment, seal for antenn	plug gasket		EPDM	STEEL	100% 70%	3	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Forming & Shaping	yes yes	120,0	80,000
98 6 62		plug	1	EPDM EPDM	-	100% 100%	1	Molding Molding	Other - Not relevant Other - Not relevant		yes	120,0	
98 6 62 98 6 62	gaskets front segment, seal for antenn gaskets front segment, seal for antenn	plug	1	EPDM PP/EPDM		100%	1	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	120,0	
98 6 62		cap	339	PP TEEE	EPDM -	80%	1	Injection Molding Molding		RIM/Foam Molding	yes	120,0	00,000
99 6 62	gasket side segment front	plug	3	PLASTIC	-	100%	1	Molding	Other - Not relevant	Other - Not relevant	yes	120,0	00,000
99 6 62	gasket side segment front	plug plug	1	EPDM	-	100%	1	Molding Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	120,0 120,0	000,008
100 6 62	seal door rear seal door rear	door seal		EPDM	EPDM	100% 50%	1	Extrusion (plastic) Extrusion (plastic)	Compression Molding Compression Molding		yes :	120,0	
100 6 62	seal door rear seal door rear	clip splash foil	165	PLASTIC PE	-	100%	1	Molding Compression Molding	Other - Not relevant Other - Not relevant		yes	120,0	
	seal door front seal door front	door seal		EPDM EPDM	STEEL EPDM	100% 50%	2	Extrusion (plastic) Extrusion (plastic)	Compression Molding Compression Molding	Other - Not relevant	yes :	120,0	
101 6 62	seal door front	clip	. 1	PLASTIC		100%	Ť	Molding	Other - Not relevant	Other - Not relevant	yes	120,0	00,000
101 6 62	seal door front	door seal splash foil	146		EPDM -	50% 100%	1	Extrusion (plastic) Compression Molding	Compression Molding Other - Not relevant	Other - Not relevant	yes yes	120,0	000,008
102 6 62	seal side segment rear seal side segment rear	plug cover		TEEE	-	100%	1	Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes yes	120,0	
	seal hood seal hood	gasket clip		PLASTIC	-	100%	1	Extrusion (plastic) Molding	Compression Molding Other - Not relevant		yes 2	120,0	
103 6 62 103 6 62	seal hood seal hood	gasket	332 12	EPDM PUR	AL -	70% 100%	1	Extrusion (plastic) Compression Molding	Other - Not relevant Other - Not relevant	Compression Molding Other - Not relevant	yes :	120,0	000,08
	seal tailgate, trunk lid Windshield	gasket windshield	1,894	EPDM GLASS	STEEL	100%	2	Extrusion (plastic) Glass Processing	Compression Molding Other - Not relevant	Other - Not relevant	yes 2	120,0	80,000
146 6 6	door window front	door window	4,286	GLASS		100%	2	Glass Processing	Other - Not relevant	Other - Not relevant	no (120,00	000,08
148 6 6	door window rear side window, swing window	door window side window	620	GLASS GLASS	PP	100% 90%	1	Glass Processing Glass Processing	Other - Not relevant Adhesive Bonding	Other - Not relevant Injection Molding	no (120,00	000,008
148 6 6	side window, swing window side window, swing window	nut swing window		STEEL GLASS	STEEL	100% 100%	2	Forming & Shaping Glass Processing	Other - Not relevant Press (Tandem)	Other - Not relevant Other - Not relevant	no (120,00	
148 6 6 149 6 6	side window, swing window tail gate window	swing window rear windshield	4,533 6,588	GLASS GLASS	STEEL	100%	3	Glass Processing Glass Processing	Press (Tandem) Press (Tandem)	Other - Not relevant Other - Not relevant	no (
	seal windshield seal windshield	cover profile	122 489	EPDM -	-	100%	7	Molding Other - Not relevant	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes :	120,00	
	seal moon roof	gasket water drain hose	324	EPDM PLASTIC	STEEL EPDM	70% 100%	3	Molding Molding	Other - Not relevant Other - Not relevant		yes 2	120,00	000,000
151 6 62	seal moon roof seal moon roof	water drain hose water drain valve	256	PLASTIC EPDM	EPDM	100%	1	Injection Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes	120,00	000,008
151 6 62	seal moon roof_	bracket	3	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	yes	120,00	00,000
152 6 6	seal door window back seal door window back	window slide window chute seal	635 139	EPDM	AL PLASTIC	80% 100%	1	injection Molding Molding	Assembly Other - Not relevant		no C	120,00	0 80,000
	seal door window back seal door window front	window chute seal window slide		EPDM EPDM	PLASTIC PLASTIC	100% 70%	1	Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Injection Molding	no (
	seal door window front seal door window front	window chute seal window chute seal		EPDM EPDM	PLASTIC .	100%	7	Molding Molding	Other - Not relevant Other - Not relevant		no C		
	seal side window seal side window	gasket gasket		EPDM EPDM	STEEL	100%	1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no C		0 80,000
155 6 6	seal tailgate	glue trim	336 6,082	-	-	100%		Other - Not relevant	Other - Not relevant Other - Not relevant	Other - Not relevant	no C	120,00	0 80,000
160 6 63	bumper front bumper front bumper front	guide	114	PP	EPDM	100%	\Box	Injection Molding	Other - Not relevant	Other - Not relevant	yes 3	120,00	0 80,000
160 6 63	bumper front	split rivet screw	5	PLASTIC STEEL		100% 100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1	120,00	0 80,000
160 6 63	bumper front bumper front	screw push nut	2	STEEL STEEL	-	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1	120,00	0 80,000
160 6 63	bumper front bumper front	split rivet trim strip	139			100%	-	Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	yes 1 yes 3	120,00	0 80,000
161 6 64	bumper rear	trim strip trim	156 5,125			100%		Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 3	120,00	80,000
161 6 64	bumper rear bumper rear	bumper support guide		STEEL		100%	2	Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 3	120,00	0 80,000
161 6 64	bumper rear	trim strip screw	107			100%	1	Injection Molding	Other - Not relevant	Other - Not relevant	yes 3	120,00	0 80,000
161 6 64	bumper rear	push nut	5	STEEL		100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1	120,00	0 80,000
161 6 64	bumper rear bumper rear	nut screw	9	STEEL	-	100% 100%	-	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1	120,00	0 80,000
161 6 64	bumper rear bumper rear	screw washer		STEEL	-	100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant		yes 1		
161 6 64	bumper rear bumper rear	split rivet_		PLASTIC PLASTIC		100%	1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1		0 80,000
216 6 65	trim frame windscreen, radiator grill	trim frame cover profile	494	ASA ASA	-	100%	1		Other - Not relevant Other - Not relevant	Other - Not relevant	yes 3	120,00	0 80,000
216 6 65	trim frame windscreen, radiator grill	emblem sight glass	83	ABS PLASTIC		100%	1	Injection Molding	Other - Not relevant	Other - Not relevant	yes 1	120,00	0 80,000
216 6 65	trim frame windscreen, radiator grill	bracket	2	PLASTIC		100%	1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1	120,00	0 80,000
216 6 65	trim frame windscreen, radiator grill	nut screw	5	STEEL	-	100% 100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 yes 1	120,00	0 80,000
216 6 65	trim frame windscreen, radiator grill	angle support angle support	359	STEEL STEEL		100% 100%	2	Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 1 yes 1	120,00	0 80,000
216 6 65	trim frame windscreen, radiator grill	ventilation grill ventilation grill	156	ASA ASA	-	100% 100%	. 1	Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 3 yes 3		
217 6 6		roof trim		EPDM	AL EPDM	50% 50%	2	Injection Molding Injection Molding	Other - Not relevant Other - Not relevant	Press (Tandem)	no 0	120,00	0 80,000
219 6 6	trim strips door window and door rear trim frame side window, trim frame sid	trim strip trim strip	334 42	PP TP	EPDM EPDM	50% 50%	Ξ		Other - Not relevant Other - Not relevant	Injection Molding		120,00	0 80,000
221 6 6	trim strip hood	faceplate screw	33	PLASTIC STEEL		100%	1	Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0	120,00	0 80,000
<u> </u>	1			O'LLL	·	10076		wanning a Snaping	Culer - NUC relevant	Outer - Not relevant	no 0	120,00	0 80,000

222 6 6	Bitrim strip tailgate, trunk lid	emblem	25	IABS	ASA	100%	1	Injection Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
222 6	Strim strip teilgate, trunk lid Strim strip hood	writing trim strip	10	ABS ABS	PC-GF	100%	1-	Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
223 6 (Strim strip hood	trim strip	166	PLASTIC	-	100%	1	Injection Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
224 6 6		bracket apoller	579	PP	-	100%	1	Forming & Shaping Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	yes 3 120,000 80	0,000 0,000
224 6 64 22 7	S spoiler front starter	spoiler starter		PP STEEL	AL	100% 60%	1	Injection Molding Other - Not relevant		Other - Not relevant	no 0 120,000 80	0,000 0,000
22 7	etarter Satarter	HOUSING LOV	563 36	AL STEEL		100%		Die Casting Forming & Shaping	Milling Other - Not relevant	Other - Not relevant Other - Not relevant		0,000
22 7	starter Starter	HOUSING CEN	833 19	STEEL	-	100%	-	Sand Casting Forming & Shaping		Other - Not relevant Other - Not relevant		0,000
22 7 22 7	starter Starter	GEARS SHAFT	12	STEEL	-	100%	3		Other - Not relevant Milling		no 0 120,000 80	0,000
22 7 22 7	starter Starter	SHAFT ARMATURE		STEEL	- CU	100% 75%	٢	Forming & Shaping	Other - Not relevant Milling	Other - Not relevant Electro-Mechanical	no 0 120,000 80	0,000
22 7	7 starter	GEARS	53	PA-66 STEEL	-	100%		Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
22 7 22 7	starter starter	CLUTCH	٥	STEEL		100%	1		Milling Other - Not relevant		no 0 120,000 80	0,000
22 7	starter datarter	PIVOT		PA-66 STEEL		100%	1		Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000 0,000
22 7	7 starter 7 starter	RETAINER STOP	5	PA-66 PVC		100%	1	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000 0,000
22 7	atarter starter	HOLDER SOLINOID		PA-66 STEEL	- CU	100% 75%		Injection Molding Investment Casting	Other - Not relevant Milling	Other - Not relevant Electric		0,000 0,000
22 7	starter starter	SOLINOID PLATE		STEEL	- STEEL	100%	2	Forming & Shaping Press (Tandem)	Other - Not relevant Milling	Other - Not relevant Press (Tandem)		0,000
22 7	starter Satarter	PLATE PIN	1	PA-66 STEEL		100%	2	Molding Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
22 7	7 starter 7 generator	screw alternator		STEEL	-	100%	1	Roll forming Other - Not relevant	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
23 7	generator	HOUSING LOV	420	AL	-	100%	1	Die Casting	Milling	Other - Not relevant	no 0 120,000 80	0,000
23 7	generator generator	STATOR	1,400	STEEL	cu	75%	2	Forming & Shaping Press (Tandem)	Other - Not relevant Welding and Cutting	Electro-Mechanical	no 0 120,000 80	0,000
23 7	generator generator	ROTOR BEARING	106	STEEL	CU -	80% 100%	2	Sand Casting Forging	Milling Milling	Electro-Mechanical Other - Not relevant	no 0 120,000 80	0,000
23 7	generator generator	CONTACT HOLDER	332 68	AL	25	75% 75%	1			Other - Not relevant	no 0 120,000 80	0,000
23 7	generator generator	HOLDER RETAINER	19	STEEL		100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80	0,000
23 7	generator generator	RETAINER CONTACT	2	STEEL PBT	- STEEL	100%	2	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000 0,000
	generator generator	CONTACT	10	STEEL		100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
23 7	generator generator	HOUSING UPP PULLEY	420			100%	1		Milling	Other - Not relevant Other - Not relevant	no 0 120,000 80	0,000
23 7	7 generator	PULLEY	23	STEEL		100%		Forming & Shaping Press (Tandem)	Other - Not relevant Milling		no 0 120,000 80	0,000
23 7	generator generator	screw	41	STEEL		100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
	generator generator	multi vee belt tensioner	631		STEEL	100% 70%	2	Vulcanization Die Casting	Other - Not relevant Assembly	Press (Tandem)	no 0 120,000 80	0,000
23 7	7 generator 7 generator	Idler pulley screw	26	PA6-GF STEEL	-	100%	1	Injection Molding Forming & Shaping		Other - Not relevant Other - Not relevant	no 0 120,000 80	0,000
23 7	generator generator	washer screw	17	STEEL	-	100%	7		Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant		0,000
24 7	Fignition distributor, encoder, ignition of ignition distributor, encoder, ignition of		1,024	AL STEEL	PLASTIC -	80% 100%	2	Die Casting Forming & Shaping	Electric Other - Not relevant	Injection Molding		0,000
24 7	ignition distributor, encoder, ignition co ignition distributor, encoder, ignition co		119	AL STEEL	-	100%	1	Die Casting	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
24 7	fanition distributor, encoder, ignition of fanition distributor, encoder, ignition distributor, encoder, ignition co	SCFBW	9	STEEL		100%	1		Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
24 7	fignition distributor, encoder, ignition of fignition distributor, encoder, ignition of	screw	10	STEEL		100%		Forming & Shaping Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
24 7	ignition distributor, encoder, ignition co	SCTOW	4	STEEL	PLASTIC	100%	1		Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
24 7	fignition distributor, encoder, ignition oc fignition distributor, encoder, ignition oc	screw	4	STEEL	-	75% 100%	1	Forming & Shaping	Other - Not relevant		no 0 120,000 80	0,000
24 7	lignition distributor, encoder, ignition of fignition distributor, encoder, ignition of	acrew	18	STEEL	PLASTIC -	100%	1	Electronics Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
25 7 25 7	sperk plugs, sperk plug cable, glow pl sperk plugs, sperk plug cable, glow pl	spark plug wire spark plug wire	87	VMQ	STEEL	50% 50%	1	Electric Electric	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
	spark pluge, spark plug cable, glow pl spark pluge, spark plug cable, glow pl			VMQ	STEEL	50% 50%	1	Electric Electric	Other - Not relevant Other - Not relevant			0,000
25 7 25 7	spark plugs, spark plug cable, glow pl spark plugs, spark plug cable, glow pl	connector	1 2	PLASTIC PLASTIC	-	100%	1	Molding Molding	Other - Not relevant Other - Not relevant			0,000
25 7	spark plugs, spark plug cable, glow pl	connector connector	2	PLASTIC POM		100%	1	Molding Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80	0,000
25 7	spark plugs, spark plug cable, glow pl		44 16,841	-		100%	1	Electric Electric	Other - Not relevant Electro-Mechanical	Other - Not relevant	no 0 120,000 80	0,000
45 7	Dattery Dattery	retainer	1,886	STEEL		100%	1	Press (Tendem)	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
45 7	battery	clamping plate	86	STEEL		100%	1	Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
45 7	battery battery	cover	307	PLASTIC		100%	7	Injection Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 60	0,000
45 7	battery battery	screw screw	5	STEEL		100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000 0,000 0,000
45 7		acorn nut	146	STEEL PLASTIC		100%	-	Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
45 7		cover	12	PP-TV		100%	1	Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
46 7	ignition switch	steering-starter loc ignition-starter swit	45	STEEL-AL		100%	3	Die Casting Electric	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
46 7	ignition switch	ignition key torque to break bol	23 10	STEEL	PLASTIC -	70% 100%	<u>3</u>		Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
47 7		horn horn	349	STEEL	ABS ABS	50% 40%	1	Injection Molding Press (Tandem)	Press (Tandem) Electro-Mechanical	Electro-Mechanical	no 0 120,000 80	0,000
47 7	Signal horn	support screw	112	STEEL	-	100%	1.	Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
47 7	signal horn combination instrument	nut combination instru	7	STEEL	-	100%	1		Other - Not relevant Other - Not relevant	Other - Not relevant		0,000
48 7	combination Instrument	push nut		STEEL		100%	Н	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
48 7	combination instrument combination instrument	screw distance sensor	35	PA66-GF		100%	1	Forming & Shaping Electronics	Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
48 7	combination instrument combination instrument	screw radial seal	1	STEEL EPDM		100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	
48 7	combination instrument combination instrument	water level switch gasket	3	POM EPDM		100%	-	Electro-Mechanical Molding	Other - Not relevant Other - Not relevant	Other - Not relevant		0,000
	combination instrument combination instrument	temperature senso radial seal	15 1	Electronics EPDM		100%		Electronics Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80	0,000
48 7		bracket oil pressure switch	1 31	PA6.6-GF PA6-GF	STEEL	100% 40%	1	Molding Electro-Mechanical	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant		0,000
	combination instrument combination instrument	switch ambient temperatu	6	PLASTIC PLASTIC		100%	1	Electro-Mechanical Electronics	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80 no 0 120,000 80	0,000
48 7	7 combination instrument 7 fuel gauge	bracket fuel level sensor	5	POM	STEEL	100%	1	Forming & Shaping Electronics	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000 0,000
	Thead lights, turn signal front Thead lights, turn signal front	headlight cover	2,139	PP-TV PLASTIC	PLASTIC	50% 100%	3	injection Molding		Injection Molding	no 0 120,000 8	0,000
50 7	Thead lights, turn signal front Thead lights, turn signal front	fog light lid	275	PBT-ASA-GI	GLASS	80%	۲	Electric	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
50 7	head lights, turn signal front	gasket	8	PUR		100%	۳	Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80	0,000
50 7	head lights, turn signal front	lid		PP-GF	<u> </u>	1 10076		" Apprint Molding	INVITORIALIT	ATIMI - IAN IGIOACII		-,

50 7 7	head lights, turn signal front head lights, turn signal front	gasket light bulb holder		PUR PA6-GF		100%	1	Molding Injection Molding		Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
50 7 7	head lights, turn signal front head lights, turn signal front	light bulb light bulb holder	8			100%	1	Electric Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
50 7 7	head lights, turn signal front	light bulb (glass ba	1 6	-	-	100%	1	Electric	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
50 7 7	head lights, turn signal front head lights, turn signal front	light bulb light bulb	12		Ė	100%	1	Electric Electric	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
50 7 50 7	head lights, turn signal front head lights, turn signal front	screw		STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
50 7 7	head lights, turn signal front head lights, turn signal front	push nut end cap	1	ABS	-	100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
50 7 7	head lights, turn signal front head lights, turn signal front	push nut	3	STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
51 7 7	SBBR - light, additional stop light SBBR - light, additional stop light	faceplate SBBR-switch		ABS ABS	PMMA PMMA	30% 70%	3	Injection Molding Injection Molding	Injection Molding Other - Not relevant	Other - Not relevant Injection Molding	no 0 120,000 80,000 no 0 120,000 80,000
51 7 7	SBBR - light, additional stop light SBBR - light, additional stop light	tail light faceplate	495	ABS PLASTIC	PMMA	70% 100%	3	Injection Molding Injection Molding	Other - Not relevant Other - Not relevant	Injection Molding	no 0 120,000 80,000 no 0 120,000 80,000
51 7	SBBR - light, additional stop light	light bulb holder gasket	76		STEEL	100%	1	Injection Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
51 7 7	SBBR - light, additional stop light SBBR - light, additional stop light	light bulb holder	41	PP-T20	STEEL	100%	1	Injection Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
51 7 7	SBBR - light, additional stop light SBBR - light, additional stop light	gasket gasket	4	RUBBER RUBBER	-	100%	1	Injection Molding Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
51 7 7 51 7 7	SBBR - light, additional stop light SBBR - light, additional stop light	license plate lamp gasket	2	PC RUBBER	<u>-</u>	100%	1	Electric Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
51 7 7	SBBR - light, additional stop light SBBR - light, additional stop light	stoplight retainer	116 42	PC-GF POM-PA6-G	PC -	70% 100%	1	Injection Molding Injection Molding	Injection Molding Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
51 7 7	SBBR - light, additional stop light SBBR - light, additional stop light	screw	1	PLASTIC		100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
51 7 7 51 7 7	SBBR - light, additional stop light SBBR - light, additional stop light	screw	1	STEEL	-	100%	1	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
51 7 7	SBBR - light, additional stop light SBBR - light, additional stop light	nut split rivet	1	STEEL PLASTIC	-	100%	1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
51 7 7 51 7 7	SBBR - light, additional stop light	light bulb	7	-	-	100%	1	Electric Electric	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
51 7 7	SBBR - light, additional stop light SBBR - light, additional stop light	light bulb light bulb 'soffit' typ	2	-	-	100%	1	Electric	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
52 7 7 52 7 7	side park and turn signal lights side park and turn signal lights	turn signal light bulb (glass ba	1	PC -	PMMA -	60% 100%	1	Injection Molding Electric	Injection Molding Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
53 7 7 53 7 7	light switch, hazard light switch light switch, hazard light switch	steering shaft swite steering shaft swite	136	POM-PA66-G	-	100%	1	Electric Electric	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
53 7 7	light switch, hazard light switch light switch, hazard light switch	clamp steering shaft		STEEL ABS-PC	<u>. </u>	100% 100%	1	Press (Tandem) Injection Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
53 7 7 53 7 7	light switch, hazard light switch light switch, hazard light switch	steering shaft ignition lock trim	225		-	100%	1	Injection Molding Injection Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
	light switch, hazard light switch light switch, hazard light switch	screw	4	STEEL	-	100%	7	Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
	light switch, hazard light switch light switch, hazard light switch	light rotary switch	127	PLASTIC PA6-GF	-	100%	1	Electric Electric	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
53 7 7	light switch, hazard light switch	switch	33	PA6-GF	-	100%	1	Electric	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
53 7 7	light switch, hazard light switch light switch, hazard light switch	switch switch	38	PA6-GF	-	100%	1	Electric Electric	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
53 7 7	light switch, hazard light switch light switch, hazard light switch	switch switch	27	PA6-GF PA6-GF	-	100% 100%		Electric Electric	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
53 7 7 53 7 7	light switch, hazard light switch light switch, hazard light switch	switch switch	40	PA6-GF PBT-GF	-	100%	1-1-	Electric Electric		Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
53 7 7 53 7 7	light switch, hazard light switch light switch, hazard light switch	switch unit switch		- PA6-GF	-	100%	1	Electric Electric	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
53 7 7 53 7 7	light switch, hazard light switch light switch, hazard light switch	switch screw	24		-	100%	1	Electric Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
	light switch, hazard light switch	switch switch		PA6-GF PA6.6-GF	-	100%	7	Electric Electric	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
54 7 7 55 7 7	brake switch light glove compartment, ashtray- and heat	switch	43	PA6-GF PC	STEEL	100%	1	Electric Injection Molding	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
55 7 7	glove compartment, ashtray- and heat glove compartment, ashtray- and heat	light bulb (glass ba	1		-	100%	1	Electric Molding	Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000
55 7 7	glove compartment, ashtray- and heat	Contact switch	5	PA-6 PA6-PUR		100%	1	Molding	Electric	Other - Not relevant	no 0 120,000 80,000
55 7 7 55 7 7	glove compartment, ashtray- and heat glove compartment, ashtray- and heat	ashtray light	1	PLASTIC	-	100%	1	Molding Molding	Other - Not relevant Electric	Other - Not relevant Other - Not relevant	no 0 120,000 80,000
56 7 7 56 7 7	Interior lights, reading light interior lights, reading light	interior and reading scatter disk	16	PA-66 PLASTIC	-	100%	1	injection Molding Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
56 7 7 56 7 7	interior lights, reading light interior lights, reading light	light bulb 'soffit' typ light bulb holder		- PLASTIC	- STEEL	100% 80%	1	Electric Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
56 7 7 56 7 7	interior lights, reading light interior lights, reading light	light bulb (glass ba interior light		PC	-	100%	1	Electric Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
56 7 7 56 7 7	interior lights, reading light Interior lights, reading light	scatter disk light bulb 'soffit' typ	17 3	PLASTIC -	-	100%	1	Injection Molding Electric	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
56 7 7 56 7 7	Interior lights, reading light Interior lights, reading light	interior light light bulb holder		PLASTIC PLASTIC	STEEL	100% 80%	1	Injection Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
56 7 7 56 7 7	interior lights, reading light interior lights, reading light	light bulb (glass ba touch sensitive swi	1 9	- PA66-GF	-	100%	1	Electric Molding	Other - Not relevant Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
56 7 7 57 7 7	interior lights, reading light trunk and engine compartment light, o	gasket	1	EPDM	AL.	100% 70%	1	Molding Injection Molding	Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
57 7 7	trunk and engine compartment light, or trunk and engine compartment light, or	light bulb (glass ba	. 1	PA6-GF	-	100%	1	Electric Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
57 7 7	trunk and engine compartment light, or trunk and engine compartment light, or trunk and engine compartment light, or	entry light		PC		100%	1	Injection Molding Electric	Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
57 7 7 57 7 7	trunk and engine compartment light, o	trunk light	13	PC		100%	1	Injection Molding	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
57 7 7	trunk and engine compartment light, or trunk and engine compartment light, or	door warning light		PC		100%	1	Electric Injection Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
57 7 7 57 7 7	trunk and engine compartment light, of trunk and engine compartment light, of	light bulb 'soffit' typ	3			100% 100%	1	Molding Electric	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
58 7 7 58 7 7	wiper frame, wiper motor	Z wiper frame Plate		STEEL		100% 100%	1	Press (Tandem)	Other - Not relevant Welding and Cutting	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
58 7 7	wiper frame, wiper motor wiper frame, wiper motor	Large Rod Small Rods 1	1,000		STEEL	100% 65%	1	Roll forming Press (Tandem)	Bending Press (Tandem)	Other - Not relevant Press (Tandem)	no 0 120,000 80,000 no 0 120,000 80,000
58 7 7	wiper frame, wiper motor wiper frame, wiper motor	Small Rods 2 Bracket	100	STEEL	STEEL .	70% 100%	2	Press (Tandem) Press (Tandem)	Other - Not relevant Other - Not relevant		no 0 120,000 80,000 no 0 120,000 80,000
58 7 7 58 7 7	wiper frame, wiper motor wiper frame, wiper motor	Joints 1 Joints 2	250 100	STEEL	STEEL -	75% 100%	3	Investment Casting Forming & Shaping	Forming & Shaping Other - Not relevant	Other - Not relevant Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
58 7 7	wiper frame, wiper motor	screw spacer bushing	21	STÉEL STEEL	- EPDM	100% 80%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
58 7 7	wiper frame, wiper motor	wiper motor HOUSING		STEEL-AL	PLASTIC .	100%			Other - Not relevant Milling		no 0 120,000 80,000 no 0 120,000 80,000
58 7 7	wiper frame, wiper motor	HOUSING ARMATURE	6	STEEL	- CU	100% 75%	1	Forming & Shaping	Other - Not relevant		no 0 120,000 80,000
58 7 7	wiper frame, wiper motor wiper frame, wiper motor wiper frame, wiper motor	BEARING SPRING	11	STEEL	-	100% 100%	2	Forming & Shaping	Other - Not relevant	Other - Not relevant	no 0 120,000 80,000
58 7 7	wiper frame, wiper motor	BUSHING	12	BR		100%	1	Forming & Shaping		Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
58 7 7	wiper frame, wiper motor	CONTACT GEARS	77		STEEL	100% 100%	3	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
58 7 7	wiper frame, wiper motor	HOLDER HOLDER	1	STEEL	CU -	100% 100%	1		Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
58 7 7	wiper frame, wiper motor	COVER_	51	POM PA-66		100% 100%	1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
58 7 7	wiper frame, wiper motor	WASHER WASHER	1	STEEL PA-66		100% 100%	1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
58 7 7	wiper frame, wiper motor wiper frame, wiper motor	O-RING RETAINER	1	EPDM POM	-	100%	1	Molding	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
58 7 7 58 7 7	wiper frame, wiper motor wiper frame, wiper motor	COVER COVER	562	STEEL STEEL	-	100% 100%	1	Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant	no 0 120,000 80,000 no 0 120,000 80,000
58 7 7		screw		STEEL	-	100%			Other - Not relevant		no 0 120,000 80,000

				·						
	7 wiper frame, wiper motor 7 wiper frame, wiper motor	nut wiper arm		STEEL	-	100%		Forming & Shaping Press (Tandem)	Other - Not relevant Painting	Other - Not relevant no 0 120,000 80,000 Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor	wiper arm spring	50 299	STEEL	- A1	100% 70%		Colling Die Casting		Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor 7 wiper frame, wiper motor	wiper arm back par wiper arm	149	STEEL	AL	100%	1	Press (Tandem)	Painting	Other - Not relevant no 0 120,000 80,000
	7 wiper frame, wiper motor 7 wiper frame, wiper motor	wiper arm spring wiper arm back par	50 299	STEEL	- AL	100% 70%		Coiling Die Casting	Other - Not relevant Milling	Other - Not relevant no 0 120,000 80,000 Die Casting no 0 120,000 80,000
58 7	7 wiper frame, wiper motor	nut	13	STEEL	Ē	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor 7 wiper frame, wiper motor	wiper blade - blade Stamping		POM STEEL	EPDM .	100%		Extrusion (plastic) Press (Tandem)	Vulcanization Other - Not relevant	Other - Not relevant no 0 120,000 80,000 Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor	Stamping	33	STEEL		100%	1	Press (Tandem)	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor 7 wiper frame, wiper motor	Stamping Stamping		STEEL	[100%	1	Press (Tandem) Press (Tandem)	Other - Not relevant Other - Not relevant	
	7 wiper frame, wiper motor 7 wiper frame, wiper motor	wiper motor HOUSING	894 200		-	100%	-	Other - Not relevant Press (Tandem)	Other - Not relevant Milling	Other - Not relevant no 0 120,000 80,000 Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor	HOUSING	6	STEEL	-	100%		Forming & Shaping	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor 7 wiper frame, wiper motor	ARMATURE BEARING		STEEL	CU	75% 100%		Sand Casting Forming & Shaping	Electro-Mechanical Other - Not relevant	Filament Winding (wird no 0 120,000 80,000 Other - Not relevant no 0 120,000 80,000
	7 wiper frame, wiper motor	SPRING BUSHING	_	STEEL BR	-	100%	2	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor 7 wiper frame, wiper motor	CONTACT		CU	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor 7 wiper frame, wiper motor	GEARS HOLDER	77 34	POM PA-66	STEEL	100%		Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor	HOLDER	1	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
	7 wiper frame, wiper motor 7 wiper frame, wiper motor	COVER		POM PA-66	-	100%	1	Molding Molding	Other - Not relevant Other - Not relevant	
58 7	7 wiper frame, wiper motor 7 wiper frame, wiper motor	WASHER WASHER		STEEL PA-66	-	100%	1 1	Forming & Shaping Molding	Other - Not relevant Other - Not relevant	
58 7	7 wiper frame, wiper motor	O-RING	1	EPDM		100%	1	Molding	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
58 7 58 7	7 wiper frame, wiper motor 7 wiper frame, wiper motor	COVER		POM PA-88	-	100%	1 1	Molding Molding	Other - Not relevant Other - Not relevant	
58 7	7 Wiper frame, wiper motor 7 Wiper frame, wiper motor	COVER		STEEL	-	100%	1 1		Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor	grommet		EPDM	-	100%	1	Molding	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
	7 wiper frame, wiper motor 7 wiper frame, wiper motor	wiper arm wiper arm spring		STEEL	-	100%	1	Press (Tandem) Coiling	Painting Other - Not relevant	Other - Not relevant no 0 120,000 80,000 Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor	wiper arm back par washer	42	AL STEEL	AL	70%	1	Die Casting	Die Casting	Other - Not relevant no 0 120,000 80,000 Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor 7 wiper frame, wiper motor	nut	2	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
58 7	7 wiper frame, wiper motor 7 wiper frame, wiper motor	wiper blade Stamping	26	- STEEL	<u>:</u>	100%	+	Other - Not relevant Press (Tandem)	Other - Not relevant Other - Not relevant	
58 7 58 7	7 wiper frame, wiper motor	Stamping	11	STEEL	-	100%		Press (Tandem)	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
56 7	7 wiper frame, wiper motor 7 wiper frame, wiper motor	Stamping Stamping	26	STEEL		100%	1	Press (Tandem) Press (Tandem)	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
	7 washer fluid, washer jets, pumps 7 washer fluid, washer jets, pumps	coolant tank		PLASTIC	-	100%		Blow Molding Molding	Other - Not relevant Other - Not relevant	
59 7	7 washer fluid, washer jets, pumps	сар	12	PP	-	100%	1	Injection Molding	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
59 7 59 7	7 washer fluid, washer jets, pumps 7 washer fluid, washer jets, pumps	nut		PLASTIC STEEL	-	100%		Molding Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
	7 washer fluid, washer jets, pumps 7 washer fluid, washer jets, pumps	push nut washer let		STEEL POM-PBT-G	E	100%	1 1		Other - Not relevant Other - Not relevant	
59 7	7 washer fluid, washer jets, pumps	pump	171	POM-GF_		100%	1	Electro-Mechanical	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
	7 washer fluid, washer jets, pumps 7 washer fluid, washer jets, pumps	gasket pump		EPDM PA6-GF	-	100%		Molding Electro-Mechanical	Other - Not relevant Other - Not relevant	
59 7	7 washer fluid, washer jets, pumps	gesket Z washer fluid line	_	PA-6	-	100%	.1.	Molding Extrusion (plastic)	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
59 7	7 washer fluid, washer jets, pumps 7 washer fluid, washer jets, pumps	Z washer fluid line	23	PA-6	Ē	100%	1	Extrusion (plastic)	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
59 7 59 7	7 washer fluid, washer jets, pumps 7 washer fluid, washer jets, pumps	washer jet Z hose		POM EPDM-POM	POM -	50% 100%	1 1	Injection Molding Extrusion (plastic)	Injection Molding Other - Not relevant	Other - Not relevant no 0 120,000 80,000 Other - Not relevant no 0 120,000 80,000
59 7	7 washer fluid, washer jets, pumps	Z hose	340	EPDM-POM		100%	1	Extrusion (plastic)	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
	7 washer fluid, washer jets, pumps 7 washer fluid, washer jets, pumps	washer jet support end cap	5	PBT PP-TV	-	100%	1	Molding Molding	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
	7 washer fluid, washer jets, pumps 7 washer fluid, washer jets, pumps	screw push nut		STEEL	-	100%		Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000 Other - Not relevant no 0 120,000 80,000
59 7	7 washer fluid, washer jets, pumps	washer fluid	1,000			100%		Other - Not relevant	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
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60 7	7 special equipment and other M - equip 7 cigarette lighter			PUR STEEL	- PLASTIC	100%		Molding Press (Tandem)	Other - Not relevant Electric	Other - Not relevant no 0 120,000 80,000 Other - Not relevant no 0 120,000 80,000
61 7	7 cigarette lighter	collet	3	PLASTIC	-	100%	1	Molding	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
	7 cigarette lighter 7 stereo, CD player, telematics	Cigarette lighter radio	1,359	STEEL Electronics	PLASTIC	100%	3	Electric Electronics	Other - Not relevant Electro-Mechanical	Other - Not relevant no 0 120,000 80,000 Electric no 0 120,000 80,000
	7 stereo, CD player, telematics 7 stereo, CD player, telematics	tweeter push nut		POM	-	100%			Other - Not relevant Other - Not relevant	
62 7	7 stereo, CD player, telematics	screw	2	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
62 7	7 stereo, CD player, telematics 7 stereo, CD player, telematics	speaker screw		PP-T40 STEEL	-	100%		Electro-Mechanical Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
62 7 62 7	7 stereo, CD player, telematics	tweeter speaker	61	ABS POM	<u> </u>	100%	1	Electro-Mechanical	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
62 7	7 stereo, CD player, telematics 7 stereo, CD player, telematics	nut	1	STEEL	Ē	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
62 7	7 stereo, CD player, telematics 7 stereo, CD player, telematics	Antenna cable screw	175 2	STEEL	<u> </u>	100%			Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
	7 ABS, traction control, FSR, engine dr		82	PA68-GF-EF	<u> </u>	100%	1.1		Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
63 7	7 ABS, traction control, FSR, engine dr 7 ABS, traction control, FSR, engine dr	rotational speed se	113	PA66-GF-EF	1-	100%	1	Electronics	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
63 7	 7 ABS, traction control, FSR, engine dr 7 ABS, traction control, FSR, engine dr 	cable duct	14	PA68-GF-EF PA6.6	-			Extrusion (plastic)	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
63 7	7 ADS treetion control ESD engine de	rotor	26	STEEL	E	100%	1.1	Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
63 7	7 ABS, traction control, FSR, engine dr 7 ABS, traction control, FSR, engine dr 7 ABS, traction control, FSR, engine dr 7 ABS, traction control, FSR, engine dr	tensioner disk	458	STEEL	STEEL	60%	2	Centrifugal Casting	Milling	Milling no 0 120,000 80,000
63 7	7 ABS, traction control, FSR, engine dr 7 ABS, traction control, FSR, engine dr	washer		STEEL		100%		Forming & Shaping Forming & Shaping	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000 Other - Not relevant no 0 120,000 80,000
63 7	7 ABS, traction control, FSR, engine dr	SCIEW	196	STEEL	-	100%	1	Forming & Sheping Electronics	Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000
63 7	 7 ABS, traction control, FSR, engine dr 7 ABS, traction control, FSR, engine dr 	acceleration sensor	284	Electronics Electronics	-	100%	1	Electronics	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
	7 ABS, traction control, FSR, engine dr 7 parking aids, distance control systems	screw		STEEL PA66-GF-PE	-	100%	1 3	Forming & Shaping Electronics	Other - Not relevant Other - Not relevant	
64 7	7 parking aids, distance control systems	acrew	2	STEEL	-	100%	1	Forming & Shaping	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
64 7	7 parking aids, distance control systems			PP PLASTIC			1	Injection Molding Molding	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
64 7	7 parking aids, distance control systems	nut		PLASTIC	Ŀ	100%	1	Molding Press (Tandem)	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
64 7	7 parking aids, distance control systems 7 parking aids, distance control systems	nut	1		l-					Other - Not relevant no 0 120,000 80,000
64 7 64 7	7 parking aids, distance control systems 7 parking aids, distance control systems 7 parking aids, distance control systems 7 parking aids, distance control systems	nut support nut	212 1	STEEL PLASTIC	-	100%	1	Molding	Other - Not relevant	Other - Not relevant no 0 120,000 80,000
64 7 64 7 64 7	Tperking aids, distance control systems perking aids, distance control systems	nut support nut support scorn nut	1 212 1 39 8	STEEL PLASTIC STEEL STEEL	:	100% 100%	1	Molding Press (Tandem) Forming & Shaping	Other - Not relevant Other - Not relevant Other - Not relevant	Other - Not relevant no 0 120,000 80,000 Other - Not relevant no 0 120,000 80,000 Other - Not relevant no 0 120,000 80,000
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67 7 7 Writing harnesses complete Dracket 5 STEEL 100% 1 Forming & Shaping Other - Not relevant		wiring harnesses complete				-		1						120,000	80,000
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67 7 Wiring harmesses complete clip 3 PA-66 100% 1 Molding Other - Not relevant Other - Not		wiring harnesses complete		5	PA-66		100%	1	Molding	Other - Not relevant	Other - Not relevant	no	0	120,000	80,000
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Appendix C: Results of the manufacturing costs for the customizable groups

• Influence of the number of parts within the groups

	Manufacturing		r	— ——	number of		Total
	Manufacturing	Manufacturing	Absolute	Percentage	number of	Number	
Groups considered as customizable	cost of the	cost of the A+	difference			of parts	weight of
	baseline	B product (\$)	(\$)	difference	within the	<10g	the group
	product (\$)				group		(g)
Damping rear door	0	0	(0)	-1%	1	0	
Damping front door	0	0	1.57	-1%	1	0	
Air distribution switchboard	105	106		1%	16		
Rims	42	43		3%	3		
Damping tailgate	2	4	2	130%	2	0	363
Damping / insulating engine	}		ł			ł	l
compartment	3	6			2		
Grab and pull handle tailgate	3	6		121%	3		
Damping hood	4	7	3				
Damping roof	2	6		162%			
Side trim	131	135		3%	19		
Fender liners	15	19		25%	5		
Trim side panel front	3		4	156%	3	2	
Damping side panel front	8	13		66%			
Spoiler	5	10		95%	2		
Trim tailgate	35	40			6		
Glasses compartment	3	9		152%	1	0	
Grab handle roof	5	12		139%	3		
Arm rest rear door	5	12		159%	5		
Console	8	16		88%	3		
Bumper rear	83	91					
Accelerator	5	13		155%			
Roof liner	24	32			6		
Storage tray trunk	16	26					
Visor	12	24		97%	5		
Cover floor	15	27	12	78%			
Air distribution floor area	16	28		74%			
Brake pedal	10	22	12	126%	5		
Damping side panel rear	15	29		93%	16		
Storage compartment door	13	28					
Roof rail	20	36					
Damping bulkhead	36	52	16	44%	17	4	
Window frame	83	100	17	21%	<u> </u>	- 4	11,839
Spring cores and foam cushions front		40	47	E40/	۱ ،	, ا	2 073
seat	32	49					
Exterior rear view mirror	11	29 65		158% 46%			
Fuel tank	20	45					
Radiator grill Trunk floor cover	51	76		49%	8		
Cover front seat	19	44					
	77	103		33%	18		
Damping floor Hitch assembly	59	90					
i :	40	00					2.500
Clutch pedal	28			127%		- 4	
Steering column	55						
Stick shifter	53						
Spring cores and foam cushions rear	- 33	- 30	7.0	 54 /8		 -	7,00
seat	85	133	48	57%	12	l c	7,65
Cover rear seat	52						
Trim instrument panel	181						
Front suspension	365						
Rear suspension	273						
Seat rack front	203						
Seat rack front	312						

• Influence of the complexity of parts within the groups

Groups considered as customizable	Manufacturing cost of the baseline product (\$)	Manufacturing cost of the A+ B product (\$)	difference (\$)	parts - complexity 1	parts - complexity 2	3
Damping rear door	0		\-\	1		
Damping front door	0		(-/	1		
Air distribution switchboard	105	106	1	0		C
Rims	42	43	1	2	1	C
Damping tailgate	2	4	2	_ 2	0	C
Damping / insulating engine						
compartment	3	6	3	2	0	l c
Grab and pull handle tailgate	3	6	3	3	0	C
Damping hood	4	7	3	2	0	C
Damping roof	2	6	4	5	0	C
Side trim	131	135	4	17	0	2
Fender liners	15	19	4	3	2	0
Trim side panel front	3		4	3		
Damping side panel front	8			6		
Spoiler	5			2		0
Trim tailgate	35	40		5	1	0
Glasses compartment	3			1	ö	
Grab handle roof	5			3		- 0
Arm rest rear door	5			5	- 6	<u> </u>
Console	8			3		- 0
Bumper rear	83	91	8	9		1
Accelerator	5	13		3		<u>'</u>
Roof liner	24	32		6		- 6
Storage tray trunk	16			5		- 0
Visor	12	24		5	0	- 0
Cover floor	15	27	12	6		0
Air distribution floor area	16	28		8	1	
Brake pedal	10	22	12	5	i	- 6
Damping side panel rear	15	29		16		0
Storage compartment door	13	28		9	Ö	- 6
Roof rail	20	36		4	1	- 0
Damping bulkhead	36	52	16	17	' ö	- 0
Window frame	83	100		6	0	-
Spring cores and foam cushions front	- 63	100	1/			
seat	32	49	17	9	4	,
Exterior rear view mirror	11	29		3 7	1	0
Fuel tank	44	65	21	3	1	0
Radiator grill	20	45	25	0	9	0
Trunk floor cover	51	76		8	0	0
Cover front seat			25 25	4		0
	19	44			0	0
Damping floor	77	103				
Hitch assembly	59			9		0
Glove compartment	46			9		0
Clutch pedal	28			18		0
Steering column	55			11	2	2
Stick shifter	53	98	45	0	0	0
Spring cores and foam cushions rear				, -	i	
seat	85	133	48	10		0
Cover rear seat	52	121	69	11	0	0
Trim instrument panel	181	250		25	1	3
Front suspension	365			27	3	8
Rear suspension	273	374	101	21	3	7
Seat rack front	203		148	46		5
Seat rack rear	312	602	290	52	1	8

• Influence of the tool modification of the parts within the group

	Manufacturing	Manufacturing	Absolute			
Ossuma samaidanad aa suudamisahla	cost of the	cost of the A+	difference	Number of parts	Number of parts -	Number of parts
Groups considered as customizable	baseline			no tool change	small tool change	new tool
	product (\$)	B product (\$)	(\$)			
Damping rear door	0	0	(0)	0	1	0
Damping front door	0	0	(0)	0	1	0
Air distribution switchboard	105	106	1	0	0	0
Rims	42	43	1	0	0	0
Damping tailgate	2	4	2	0	0	0
Damping / insulating engine						
compartment	3	6	3	0	0	l o
Grab and pull handle tailgate	3	6	3	2	0	1
Damping hood	4	7	3	0	0	0
Damping roof	2	6	4	0	0	0
Side trim	131	135	4	0	0	0
Fender liners	15	19	4	0	0	0
Trim side panel front	3	7	4	0	0	0
Damping side panel front	8	13	5	0	0	0
Spoiler	5	10	5	0	0	O
Trim tailgate	35	40	5	0	0	0
Glasses compartment	3	9	5	0	0	0
Grab handle roof	5	12	7	0	0	0
Arm rest rear door	5	12	7	0	0	0
Console	8	16	7	0	0	0
Bumper rear	83	91	8	0	0	0
Accelerator	5	13	8	0	0	0
Roof liner	24	32	8	0	0	O O
Storage tray trunk	16	26	10	0	0	0
Visor	12	24	12	0	0	0
Cover floor	15	27	12	0	0	0
Air distribution floor area	16	28	12	0	0	0
Brake pedal	10	22	12	0	0	0
Damping side panel rear	15	29	14	0	0	0
Storage compartment door	13	28	15	0	0	0
Roof rail	20	36	16	0		0
Damping bulkhead	36	52	16	0	C	
Window frame	83	100	17	0		0
Spring cores and foam cushions						
front seat	32	49	17	0	0	0
Exterior rear view mirror	11	29	18	0	0	0
Fuel tank	44	65		0	0	0
Radiator grill	20	45		0	0	
Trunk floor cover	51	76		0	0	
Cover front seat	19		25	0	0	
Damping floor	77	103		0	0	
Hitch assembly	59	90		0	0	
Glove compartment	46			0	0	0
Clutch pedal	28	64		0	0	0
Steering column	55	93		0		0
Stick shifter	53	98	45	0	0	0
Spring cores and foam cushions rear						
seat	85			0	0	
Cover rear seat	52	121	69	0		
Trim instrument panel	181	250	69	0	0	
Front suspension	365			25	2	
Rear suspension	273	374		0	C	
Seat rack front	203	351	148	27	0	
Seat rack rear	312	602	290	32		29

Appendix D: Interpreting Excel Regression Output

The population regression model is

$$Y = b_1 + b_2 * X + u$$

where the error term u has mean 0 and variance sigma-squared.

We wish to estimate the regression line

$$Y = b_1 + b_2 * X$$

There is quite a lot of regression output produced by Excel regression analysis: Regression statistics table, ANOVA table, Regression coefficients table. Here is an example of output:

SUMMARY OUTPUT

Regression Statistics								
Multiple R	0.81728							
R Square	0.667947							
Adjusted R Square	0.661682							
Standard Error	26.72588							
Observations	55							

ANOVA

	df	SS	MS	F	Significance F
Regression	1	76150.85	76150.85	106.6131	2.7135E-14
Residual	53	37856.45	714.2726		
Total	54	114007.3			

	Coefficien ts	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-8.6933	4.854576	-1.79074	0.079046	-18.43034979	1.043741
X Variable 1	2.965006	0.287157	10.32536	2.71E-14	2.38904081	3.540971

• Regression statistics table

<u>R-square</u> is the amount of total variance in Y explained by the X variable. Here the X's explain 66.7% of the total variance in Y.

Multiple R is the square root of R-square.

Adjusted R Square is used if there is more than one x variable.

Standard error is the standard deviation of the error u.

Observations are the number of observations used in the regression.

ANOVA table

The above ANOVA (analysis of variance) table splits the sum of squares into its components.

Total <u>sums of squares</u> = Residual (or error) sum of squares + Regression (or explained) sum of squares.

Thus
$$\sum (y_i - \bar{y})^2 = \sum (y_i - \hat{y}_i)^2 + \sum (\hat{y}_i - \bar{y})^2$$

For example, R-squared = 1 - Residual SS/Total SS = 1 - 0.4/2.0 = 0.8.

The "Significance F" number is the p-value for a hypothesis test whether the collection of independent variables predicts the dependent variable. The hypotheses test implied by this p-value is:

H0: None of the Xs predict Y

HA: At least one X predicts Y

Since in this case p<0.05, we reject Ho and conclude at least one X is a predictor of Y

• Regression coefficients table.

The "Coefficients" in the last table are estimated of the "betas". They are used to predict unknown values of Y using the estimated regression equation, which is:

Y = -8.6933 + 2.965006 X

Column "Standard error" gives the standard errors of the least squares estimated

Column "t Stat" gives the computed statistic for the implied hypotheses:

H0: the coefficient of the regressor equals 0

Ha: the coefficient of the regressor does not equal 0.

<u>P-values</u> for testing whether each individual X variable predicts Y. The intercept's p-value is never evaluated; ignore it. The implied hypotheses for each independent variable are:

H0: This X is not a significant predictor of Y

HA: This X is a significant predictor of Y

If p-values are less than 0.05. the null hypotheses for both should be rejected.

If p-values exceed 0.05, we accept the null hypothesis.

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http://automobiles.honda.com/tools/buildandprice/models.asp?RURL=/landing.asp

Nissan: "Design or Search for your Nissan"

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Toyota: "Build your Toyota"

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