Different female and male thorax protector sizes

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APROSYS SP 4

Different female and male thorax protector sizes

Technical report

Appendix of Deliverable "D 4.3.3. B"

AP-SP4-0022

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A.	17/12/2008	10	David Manzardo (Dainese)	√	Aquilino Molinero (Cidaut)	√		
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Publishable summary

This report was written within the Subproject 4 “Motorcycle Accidents” of APROSYS. It describes the deliverable 4.3.3 B (which is represented by the protectors themselves).

The aim of this deliverable is to develop a series of thorax protectors prototypes able to cover all the range of wearer sizes (male and female version). As the thorax development needs a mould to be built, the right balances between industrial and product costs and wearability has to be found. Three thorax dimensions were selected to cover all body dimensions.

Prototypes manufactured within this Task D-4.3.3B of the APROSYS Project are archived c/o Dainese S.p.A. via dell’Artigianato, 35 I-36060 Molvena (VI) Italy.

TABLE OF CONTENTS

1 INTRODUCTION

Inside APROSYS project, two devices, able to protect the thorax body region for male and female motorciclists have been developed. As final validation tests demonstrate that those devices recorded very good performance in the thorax protection, also the sizes coverage has been take into account in the prototype development. This report shows all the activities carried out in order to realize a range of protectors able to cover the widest range of the motorcyclists body proportion.

2 DEFINITION OF PROTECTOR SIZE

2.1 Wearer sizes

People have different body proportions and there are a lot of parameters that define the wearer body size: Height, Weight, Length from waist to neck, Waist to ground and so on. From the point of view of the thorax protection, the dimension that rappresents, in the closest way, the size of the area that should be protected is the 'thorax girth'. For female also the brest girth has to be taken into account in order to find the right protector's dimensions.

For developing a thorax size's range that is easy to understand, a correspondence between standard garment sizing and thorax dimension has to be defined. Table 1 shows, distinguished by country, the correspondence between the wearer garment size and the thorax girth (for male version).

Male size's chart										
I (Italy)	42	44	46	48	50	52	54	56	58	60
D (Deutschland)	42	44	46	48	50	52	54	56	58	60
F (France)	42	44	46	48	50	52	54	56	58	60
UK (United Kingdom)	32	34	36	38	40	42	44	46	48	50
USA	32	34	36	38	40	42	44	46	48	50
Int	XS	S	S	M	M	L	L	XL	XL	XXL
Thorax girth	84	88	92	96	100	104	108	112	116	120

Tab. 1 – Male sizes chart

Table 2 shows the same figure for female wearer but with also the brest girth dimension.

Female size's chart							
I	38	40	42	44	46	48	50
D	32	34	36	38	40	42	44
F	34	36	38	40	42	44	46
UK	6	8	10	12	14	16	18
USA	6	8	10	12	14	16	18
Int	XXS	XS	S	M	M	L	XL
Thorax girth	74	78	82	86	90	94	98
Brest girth	78	82	86	90	94	98	102

Tab. 2 – Female sizes chart

2.2 Protector sizes definition

The main economic effort to be faced along thorax protector development is represented by the mould development. Taking into account future protector's production, these investment cost must be shifted in all the production costs of the protector. Consequently, as the protector's size is strictly connected to the shell dimension, a high number of sizes means high product costs, and this can limit the protector's diffusion. So, in order to contain the fund and to contain the final product price, it has to be defined the right balance between number of sizes and product costs. As it has been mentioned before, maintain low final product price means aim to the maximum diffusion of the protector. For that reasons, the thorax sizes range was defined as it can be shown in table 3 (for the male version) and table 4 (for the female one).

Male size's chart										
	Thorax Size 1			**Thorax Size 2**				**Thorax Size 3**		
Int	XS	S	S	M	M	L	L	XL	XL	XXL
Thorax girth	84	88	92	96	100	104	108	112	116	120

Tab. 3 – Protector's measures

Female size's chart							
	Thorax Size 1		**Thorax Size 2**		**Thorax Size 3**		
Int	XXS	XS	S	M	M	L	XL
Thorax girth	74	78	82	86	90	94	98
Brest girth	78	82	86	90	94	98	102

Tab. 4 – Protector's measures

The protectors developed and validated in previous tasks in APROSYS (D4.3.3 'New thorax protector' and D4.3.3 A 'Female thorax protector') are both 'size 2'. The activities performed on this deliverable D4.3.3 B aims to develop a series of prototypes for 'size 1' and 'size 3'.

3 PROTOTYPES DEVELOPMENT

3.1 Cad files

From the tables showed in the previous chapter, and from the basic size developed on the mentioned previous tasks in APROSYS (D4.3.3 and D4.3.3 A), a percentage scale was defined to design the protective area of the female and male thorax protector for 'size 1' and 'size 3'. A huge work on CAD files modification was did reaching the final protector's shape. Figure 1 and 2 shows the proportion between the different male thorax sizes.

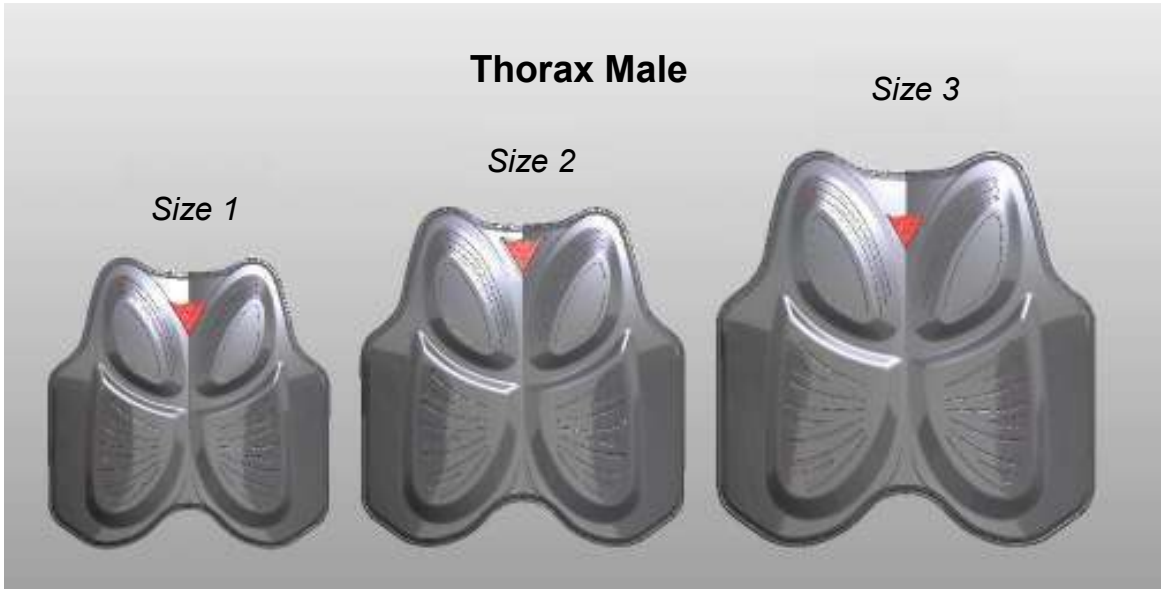

Fig. 1

Male protectors measures frontal overview

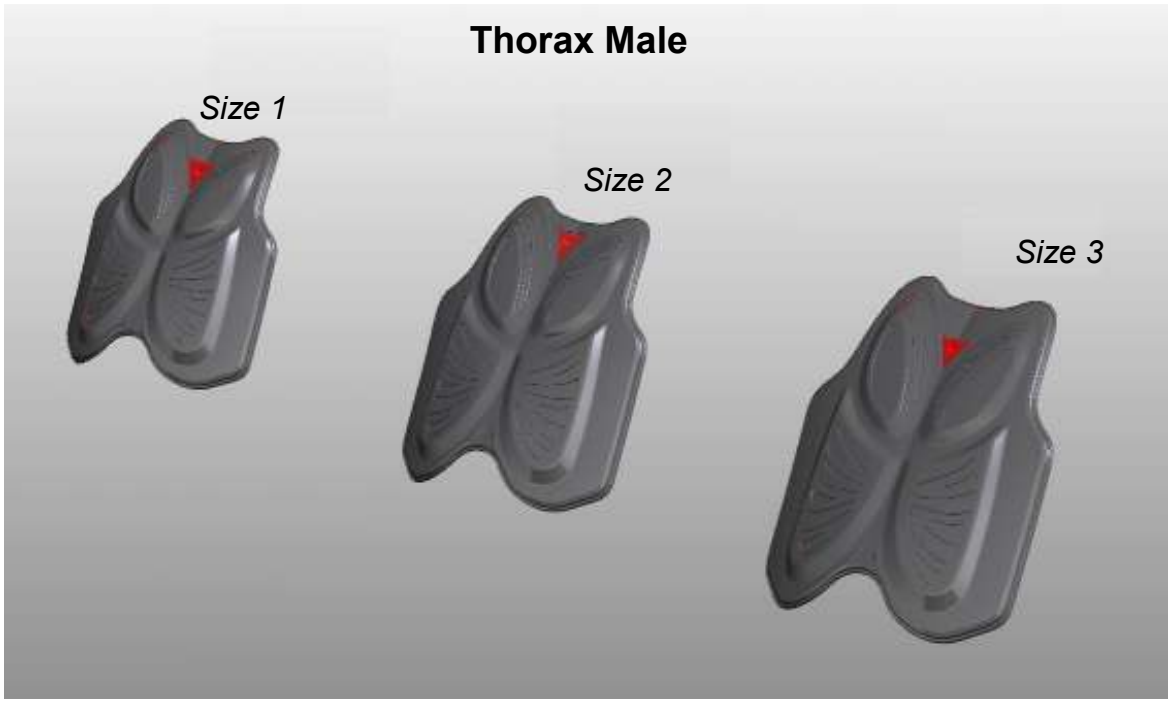

Fig. 2

Male protector's measures lateral overview

Figure 3 and 4 same demonstration for female thorax protector.

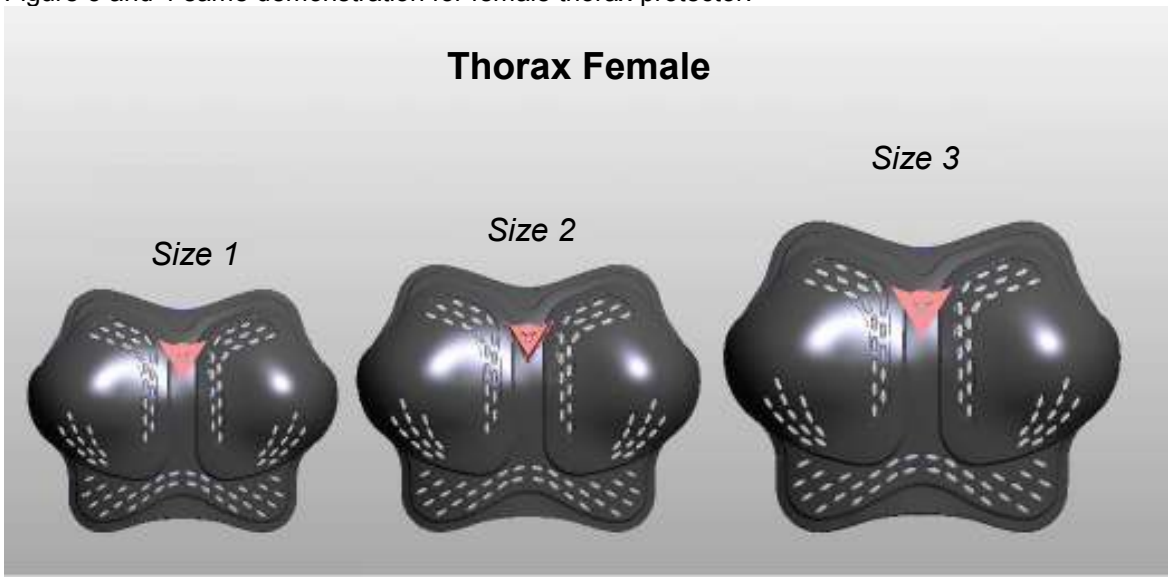

Fig. 3

Female protector's measures frontal overview

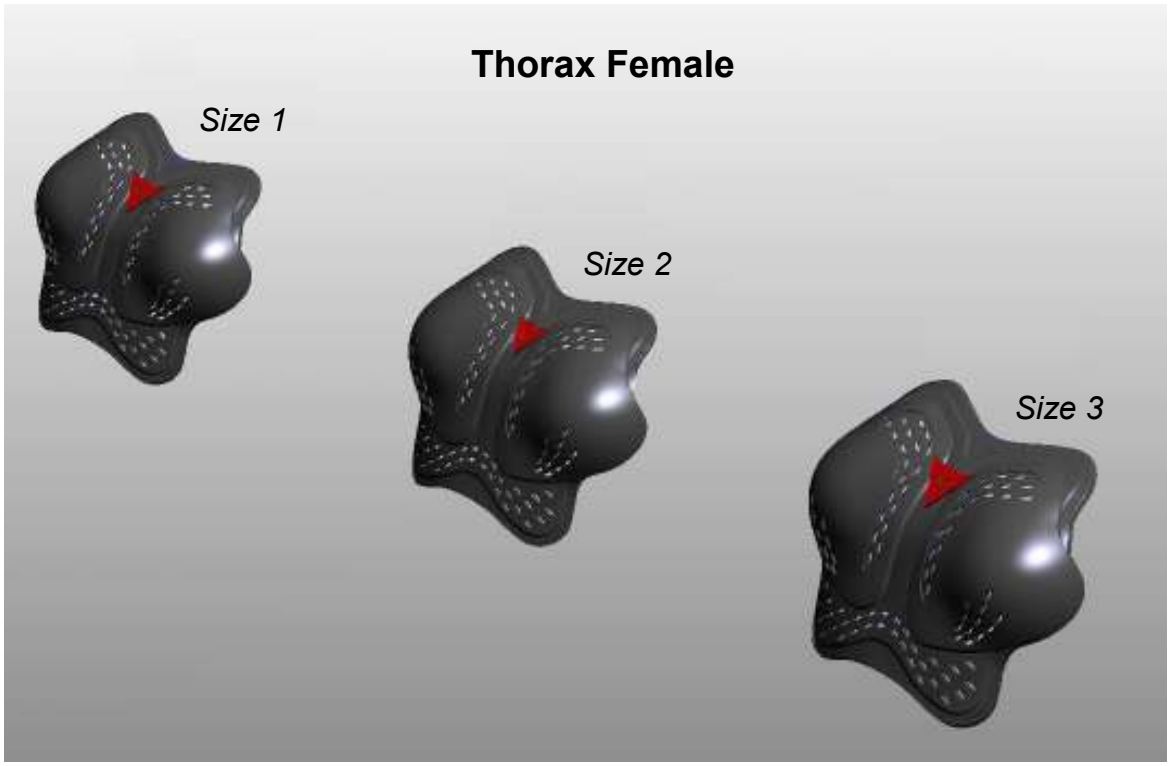

Fig. 4

Female protector's measures lateral overview

After the CAD design, protector's shapes were developed with cardboard and tested with different models in order to check the ergonomic and the area coverage. After this activity, a series of prototypes made with rapid prototyping methods were developed for the project and still tested with models. Figure 5 shows the male thorax protector prototypes in the complete range of sizes, meanwhile figure 6 shows the female thorax protector.

Fig. 5

Male protector's prototypes size range

Fig. 6 Female protector's prototype size range

4 CONCLUSION

The new Thorax protector developed within the Subproject 4 “Motorcycle Accidents” of the APROSYS IP, shows that its use increase the level of safety of a motorcycle riders by reducing the risk of sustaining thoracic injuries in case of accidents. The aim of this deliverable was to consider the size in order to have a complete market covering. The present work, together with D4.3.3C (“Demonstration of the implementation of thorax protector in existing garments”) has showed that the protection developed in APROSYS project is ready to be put on the market, covering all the type of two wheels users.