

EUROPEAN SECURITY
Ford Focus smart key system
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The Author

G. Acott

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SBD Ltd.

Overview

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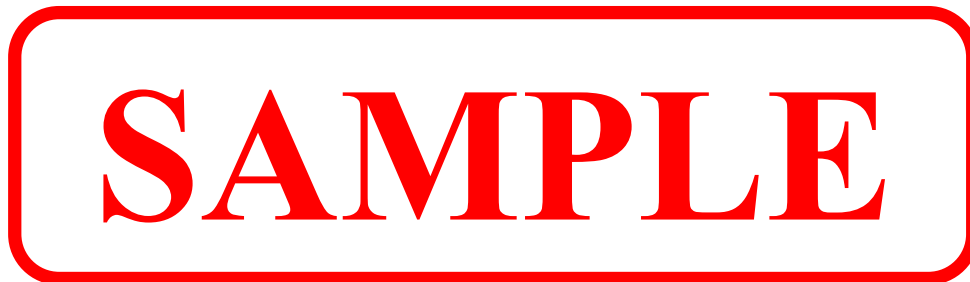
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- Technical Research**
- Strategic Planning**
- Program Management**
- Product Development.**

SBD also provides the industry with detailed market and technical reports on various technologies, market trends and competitor analysis.

The company has helped to develop many successful systems seen in the market today and is continuing to help manufacturers implement the next generation of systems with an emphasis on *Vehicle Security* and *Vehicle Telematics*.

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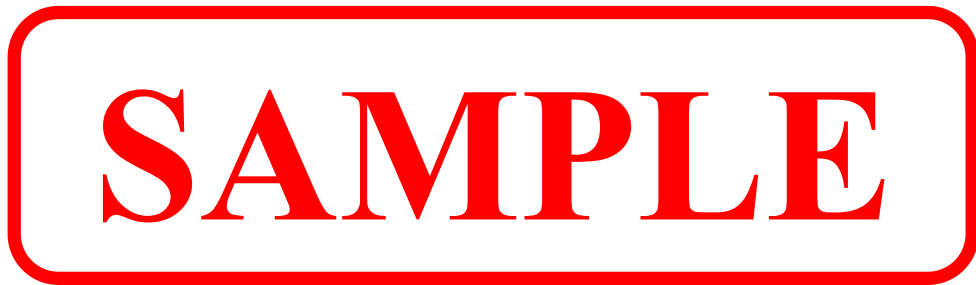
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1. Executive summary

1.1 Introduction

フォード・フォーカス車には、オートマ車、マニュアル車共にメーカーオプションとして、**キーフリーシステム**が用意されている。スマートキーシステムのことを、フォードでは**キーフリーシステム**と呼んでいる。xxx と xxxxxグレード用のオプション価格は英国では£xxである。xxxxxにはこのオプションはない。

キーフリーシステムには、**スマートエントリー機能**（ロック&アンロック）と**スマートスタート機能**（イモビライザ操作、エンジン始動、停止）が含まれている。

以下の防犯機能はフォーカス車では標準装備かグレードによるオプションとなっている。

- ダブルロック
- グローバル・オープン&クローズ
- セレクティブ・アンロック

SBDは、英国仕様、右ハンドルのフォード・フォーカス車のキーフリーシステムの機能性および性能について詳しい調査を行った。

試験に供した右ハンドル車と、同種の左ハンドル車では、いくらかの違いがある可能性がある。このレポートでは、下図1に示す右ハンドル車についての報告を行う。

The Ford Focus is available with the **Key Free system** as a factory fit option on both its automatic and manual transmission variants. **Key Free system** is the Ford name for their *smart key* system. The option costs €XXX in Europe on the XXX and XXXXX grades. The system is not available for the XXXXX or XXXXXX grades.

The **Key Free system** includes both **smart entry** (locking & unlocking) and **smart start** capability (immobiliser operation & engine start and stop).

The following security features of the Focus are either standard fit, or optional by grade:

- Doublelocking
- Global open and close
- Selective unlocking

SBD have conducted a detailed investigation of the functionality and performance of the **Key Free system** on a UK specification right-hand drive Ford Focus vehicle.

There may be some differences between the right-hand drive vehicle tested and the equivalent model in left-hand drive form. This report covers the right-hand vehicle as tested and shown in Figure 1 below.

図1 試験車両

モデル：フォード・フォーカス
仕向地：英国 右ハンドル
モデル：1.6
エンジン：ガソリン
トランスミッション：マニュアル
車両認識番号：
ナンバープレート：

Figure 1. Test vehicle



Model ~ Ford Focus
Market ~ UK RHD
Model ~ 1.6
Engine ~ Petrol
Transmission ~ Manual
VIN # ~
Registration ~

Source: SBD Ltd. 2005

1.2 Conclusion

The Focus is the first Ford vehicle in Europe to be equipped with a *smart entry* and *smart start* system. Overall the *smart entry* performs xxx and has xxxx operating zones. The system warning messages are excellent and provide good feedback to the user. However, the lack of direction indicator flash for a central door lock request could cause some confusion.

The *smart start* operating range was excellent and worked in all areas of the passenger compartment. The *average* bleed from the side of the vehicle was within Thatchams guidelines, however a number of areas rear of the vehicle exceeded the guidelines.

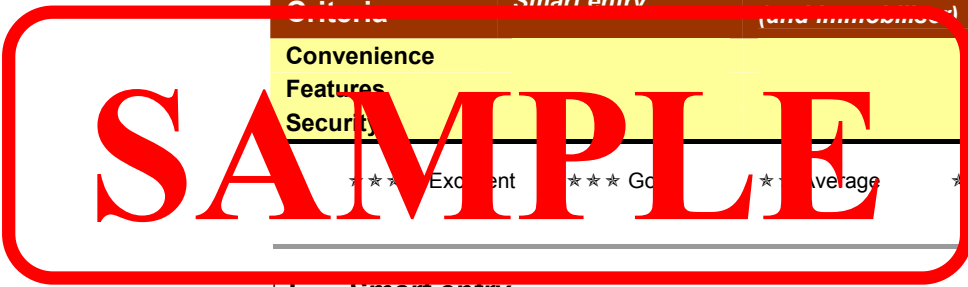
The Ford Focus has a transponder integral to a mechanical key which is removable from the remote control. XXXXXXXXXXXXXXXXXXXXXXXX
XXX
XXXXXXXXXXXX.

1.3 Summary of performance

Table 1. Summary of performance

Criteria	Smart entry	Smart start (and immobiliser)	Alarm
Convenience			
Features			
Security			
	*** Excellent	*** Good	* Average
			* Poor

Source: SBD Ltd. 2005



Smart entry

The system has an easy to use single pull handle movement to unlock and open the doors and has a simple push button on the two front door handles and a tailgate push button to lock the vehicle.

By default this vehicle centrally locks; an additional deliberate action is required to place the car in a double locked condition. The alarm system becomes set for both lock modes.

The smart entry system operates in precise, limited operation zones. The system can be easily set by a user into selective unlock mode. This is achieved by a press-and-hold button operation to change between modes.

❑ **Smart start**

The system can be operated with the remote control located anywhere inside the passenger cabin, or luggage compartment area and offers a very good level of performance. There is an ignition knob that must be pushed in order to release the steering lock; then rotated (clockwise) to turn on the ignition and start the engine. The engine will only start if the appropriate foot pedal is first depressed (this is the clutch pedal for manual transmission vehicles and the brake pedal for automatics).

The functionality is simple and based on a conventional key system, so it is easy for the user to understand and operate. If, however, the xxxxx, the steering lock will not become engaged; but an audible reminder tone will sound together with a display message when the driver door is opened.

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❑ **Alarm**

The alarm system is armed from either smart locking, keyless locking or mechanical key locking. It does not unset if the mechanical key is used to **unlock** the vehicle; in this case there is a xxx second delay to allow the user to insert the key into the ignition knob using the emergency mode to unset the alarm system before an alarm condition is sounded.

SBD considers that overall the features of the alarm are xxxx. The interior detection can be excluded, by pressing a deactivation switch. The perimeter protection is xxxxx and the hood release provides an xxxxxx level of security. The release is achieved by insertion and rotation of the key-blade in a dedicated key cylinder mounted on the front grill and therefore has no cable that can often be a vulnerable area open to attack.

Overall, SBD considers the performance of the alarm system to be xxxxx, it is however slightly compromised by xxxxx xxxxxx level of interior detection performance.

4. Summary of application

Table 3. Feature availability

Feature	Standard fit		Option fit
	Fixed	Configurable	
Key free system			
Double locking			
Perimeter alarm system			
Full alarm system			
Selective unlock			
Global open and close			

Source: SBD Ltd. 2005

4.1 UK insurance Group ratings

Table 4. UK group ratings

Model	Trim grades	Fuel type	Transmission	UK Group	Electrical security
1.4	Studio, LX or Sport	Petrol	Manual		
1.6	Low grades	Petrol & Diesel	Manual & Auto		
1.6	Ghia and Titanium	Petrol & Diesel	Manual & Auto		
2.0	Zetec-Climate and Ghia	Diesel	Manual & Auto		
2.0	Titanium	Diesel	Manual		

Source: Association of British Insurers

5. Attachments:

1. Smart entry system (31 pages)
2. Smart start (and immobiliser) system (17 pages)
3. Alarm system (10 pages)

The attachments include sections on **Features and Operation**, **Functionality**, and **Performance**.

3.1 External smart operation range

In general the lock and unlock ranges are almost identical. The tailgate open range is slightly smaller than the side door ranges. Both left-hand & right-hand side ranges are similar to each other.

The side door ranges are approximately semi-circular and centred on each side of the vehicle, indicating xxxx separate antenna locations, xxx in each side. A xxxx antenna is located at the centreline of the vehicle rear.

The maximum range measured perpendicular to the vehicle in all three directions is within the Thatcham guidelines.

❑ **Test conditions**

The range test was undertaken in a open area site, with no other vehicles present.

Battery voltage was approximately 12.8v with the engine off. The test was conducted with the remote control held vertically in front of the body at waist height consistently throughout the test.

❑ **Results**

It was established that there was one antenna on each side of the vehicle, which controlled both front & rear doors on that side of the car.

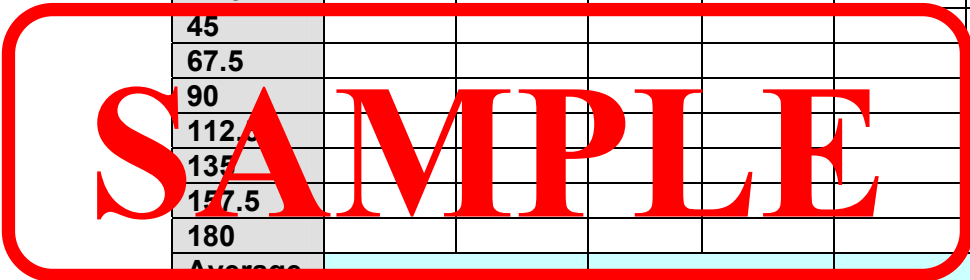
The lock and unlock ranges were taken as polar co-ordinates measured from the front door handles on each side of the car.

The results are shown in Table 5 below.

Note ~ the Thatcham criteria requires measurement *perpendicular* to the vehicle body. The polar measurements in the table below are taken from the driver's door handles. They all fall within Thatcham's requirement. As shown in Figure 15.

Table 5. External Smart entry operation range (m)

Angle (°)	Right hand side		Left hand side		Tailgate	
	Lock	Unlock	Lock	Unlock	Unlock	Lock
0						
22.5						
45						
67.5						
90						
112.5						
135						
157.5						
180						
Average						



Source: SBD Ltd. 2005

Figure 18. Flowchart showing **Lock** operation sequence

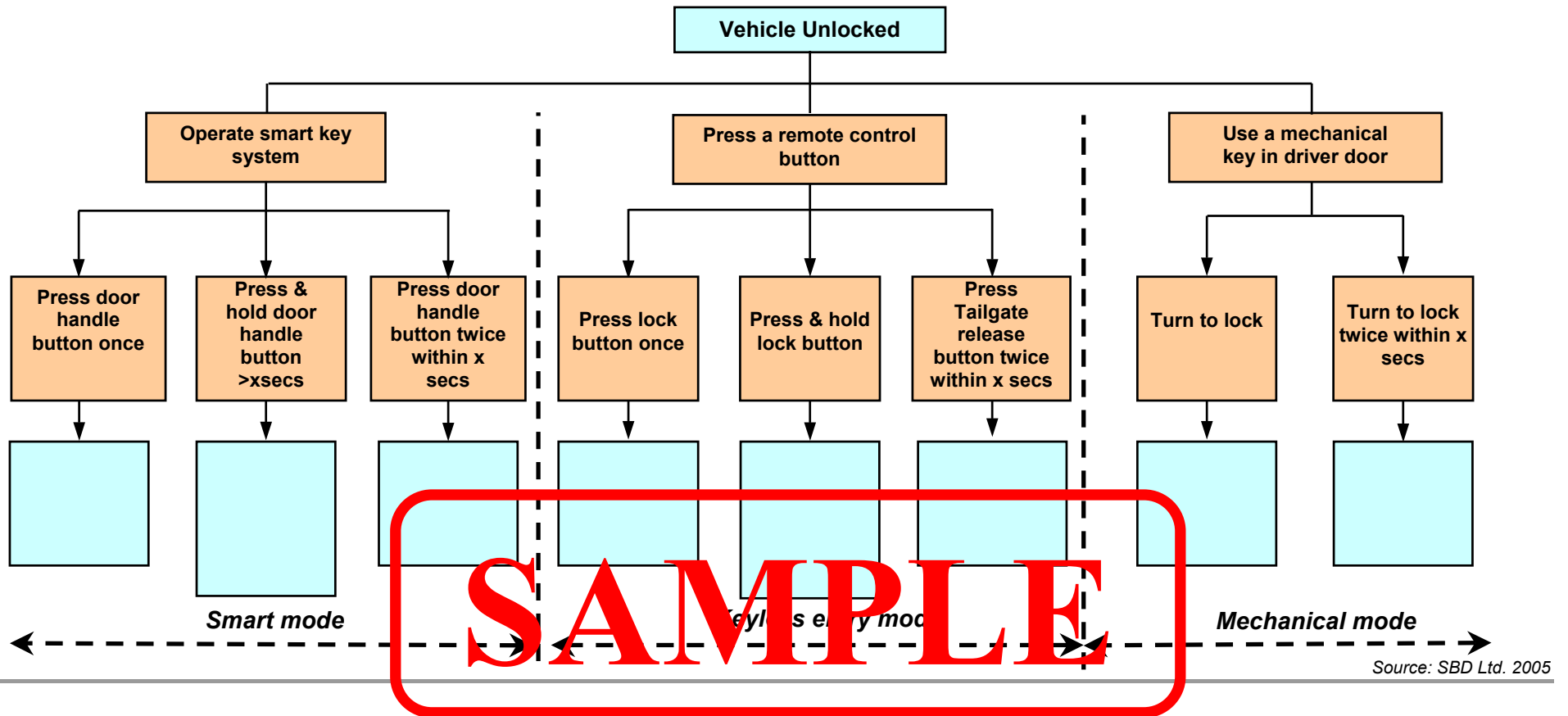
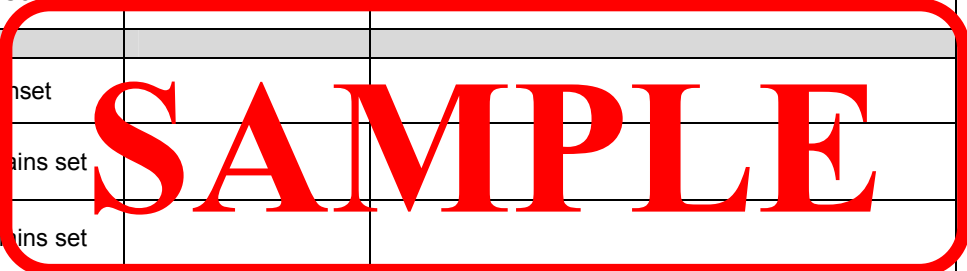


Table 14. *Locked to Unlocked* Selective unlock off

Action	Feedback	Alarm	Result	Comments
From Central or Double Locked state	Direction indicators	Status	All Doors	
Pull any outside door handle with remote in smart range	Flash once	Unset		
Lift tailgate handle with remote in smart range	None	Set		
Lift tailgate or outside handle with remote out of smart range	None	Set		
Press remote unlock button	Flash once	Unset		
Press remote lock button	Flash twice	Remains set		
Press remote tailgate release twice within 3 secs	None	Remains set		
Turn mechanical key in drivers door to unlock and open drivers door	None	Remains Set		
Turn mechanical key in drivers door to unlock and open other door	None	Remains Set		
Turn mechanical key in drivers door to unlock and open tailgate	None	Remains Set		



Source: SBD Ltd. 2005

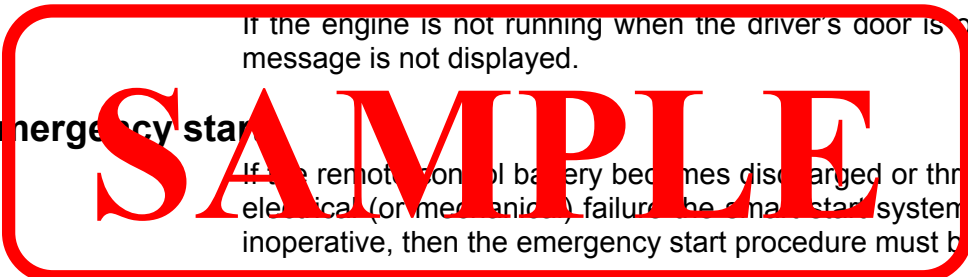
Figure 26. Warning–Passive key outside car



Source SBD Ltd 2005

If the engine is not running when the driver's door is opened, then the message is not displayed.

2.2 Emergency start



If the remote control battery becomes discharged or through some other electrical (or mechanical) failure, the smart start system should become inoperative, then the emergency start procedure must be used.

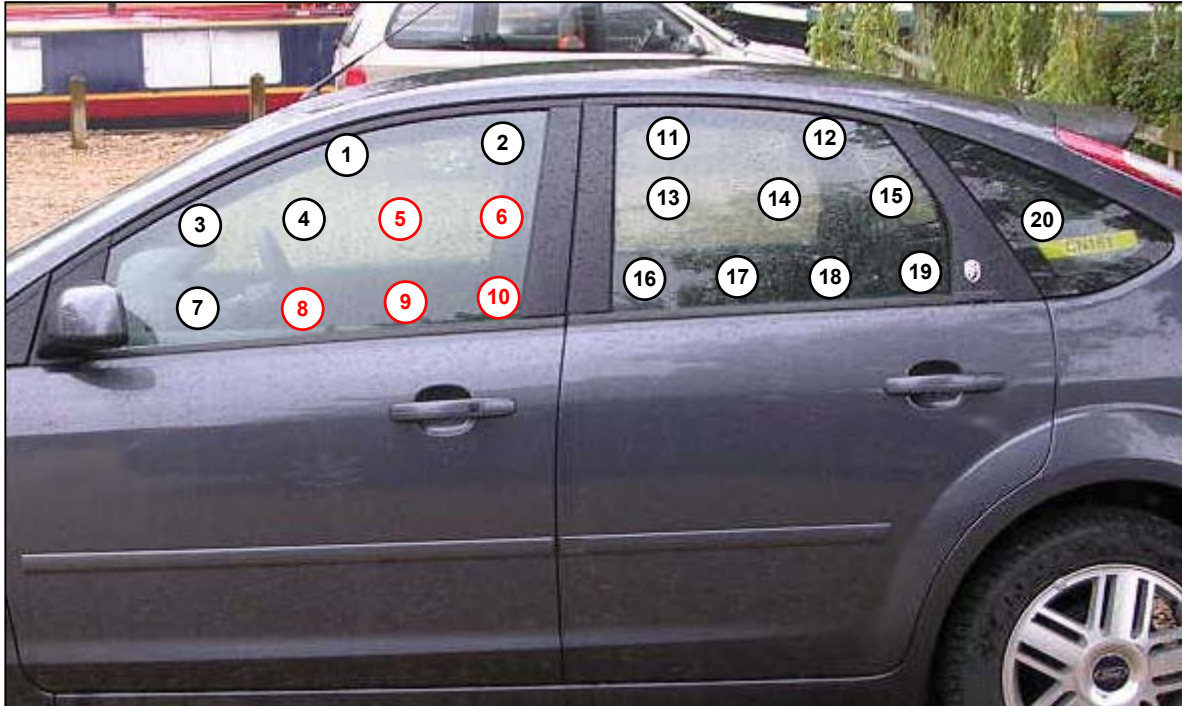
To start the vehicle by this method, the mechanical key must first be assembled by fitting the key inside the container, this then needs to be inserted into the ignition knob. Finally the knob with the key and container inside can be turned to start the engine. See Figure 27.

Figure 27. Emergency start procedure



Source: SBD Ltd. 2005

Figure 30. Exterior bleed – Side door measurement



Front door position	Bleed distance (mm)	Rear door position	Bleed distance (mm)
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	
Average		Average	

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Notes

- Both sides of the vehicle were tested and the results were found to be similar. The left hand results are shown above
- The side doors **did not meet Thatcham's criteria for exterior bleed** as the criteria is written; however, Thatcham are considering changing so that bleed results are then averaged. **The Focus would pass the criteria if the results are averaged.**

Source: SBD Ltd. 2005