

# Air Flow Sensor

## 空气流量计



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www.mtmems.com

## COMPANY INTRODUCTION

MT Microsystems Co., Ltd. is the leading MEMS technology and production company in China based on nearly 20 years R&D and innovation background. The first 6-inch pure MEMS Fab of China was established in MT Microsystems with MES and SPC quality control systems serving high yield MEMS fabrication.

MT Microsystems provides the customers total MEMS product solution including design, fabrication, packaging, module integration and testing. Our products cover Air flow sensors, Airbag sensors, Anthropomorphic test accelerometers, ESP sensor etc. Experienced engineers, world-class technology and advanced manufacture competence assure the best product quality. A team of outstanding sales and marketing group supplies the top-level service to the customers.

MT Microsystems is certificated by ISO9001:2008 and ISO/TS16949:2009.



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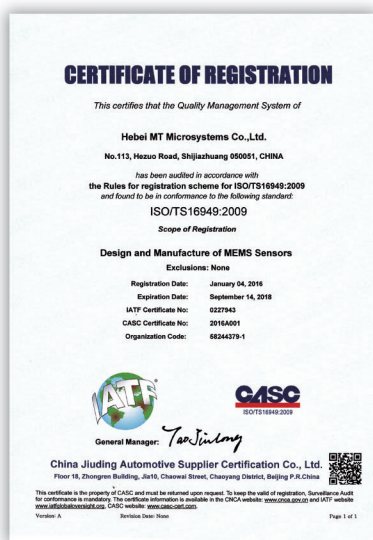
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[www.mtmems.com](http://www.mtmems.com)

# Sensing the World, Leading the Future.

ISO9001:2008 & ISO/TS16949:2009 Certification.





## Air Flow Sensor

World heading MEMS high technology in class 100 cleanroom  
 Fully automatic equipment and precise calibrated w/ the embedded MCU  
 High accuracy, short response time and large measurement range.  
 Inside MEMS chip, electronic module and complete sensor are available.

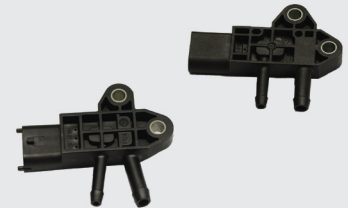


Model	Measuring range	Accuracy	Response time	Pressure drop	Frequency Output	Operating temp.
MFS07 Series Air Flow Sensor	10~1000kg/h	±2%	≤15ms	≤1.5kPa	2kHz~8kHz	-40°C~+120°C



## Differential Pressure Sensor

Linear output ratiometric with supply  
 Total error band ±2% full scale  
 Broad operating temperature range (-40°C to +125°C)  
 On board error diagnostics  
 Custom packages available



Model	Range (kPaD)	Accuracy(%FS)	OEM No.
MPS11-1-021	0~35	±2	Sensata 1MPP2-1
MPS11-1-022	0~100	±2	Sensata 1MPP2-2
MPS11-1-023	0~18	±2	Sensata 1MPP2-3
MPS11-1-207	0~100	±2	Bosch 0281 002 207 0281 002 772 0281 002 783

## Temperature Manifold Absolute Pressure Sensor

The manifold absolute pressure sensor provides instantaneous manifold pressure information to the engine's electronic control unit (ECU). The data is used to calculate air density and determine the engine's air mass flow rate, which in turn determines the required fuel metering for optimum combustion & influence the advance or retard of ignition timing.



Model	Range (kPa)	Accuracy(%FS)	OEM No.
MPS01-1-011	20~100	±2	280 860 11
MPS01-1-360	20~100	±2	282 343 360
MPS01-1-506	20~100	±2	280 825 06
MPS02-1-030	10~115	±2	0 261 230 030
MPS02-1-099	10~115	±2	0 261 230 099
MPS02-1-217	10~115	±2	0 261 230 217
MPS02-1-437	20~300	±2	0 281 002 437
MPS02-1-576	50~400	±2	0 281 002 576



# Air Flow Sensor

MFS series Air Flow Sensor (MAF) is made by world leading MEMS high technology in class 100 cleanroom. It is assembled with fully automatic equipment and precise calibrated using the embedded MCU which can fit to any customer output curve. It has the advantages of high accuracy, short response time and large measurement range. We can provide inside MEMS chip, electronic module and complete sensor independently.

- MEMS Sensor Chip
- Electronic Module
- Complete Sensor



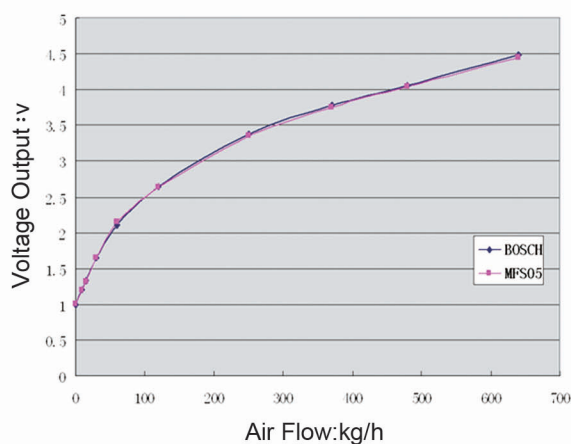
## MFS05 Air Flow Sensor

### ◆ Interchange BOSCH :

0 280 217 121                    0 280 218 060  
 0 280 218 063                    0 280 218 111  
 0 280 217 515                    ... ..



MFS05 Air flow Sensor Typical Curve (Ta=25°C)



Specification Parameter	MFS05 Air Flow Sensor
Measuring range	10~640kg/h
Accuracy	≤±3%
Response time	15ms
Pressure drop	≤1.5kPa
Rated supply voltage	14V
Voltage Input	7~18V
Voltage Output	0~5V
Current input	< 0.1A
Permissible vibration acceleration	150m.s <sup>-2</sup>
Operating temperature	-40°C~+120°C

All values are typical at +25°C, 14Vdc.

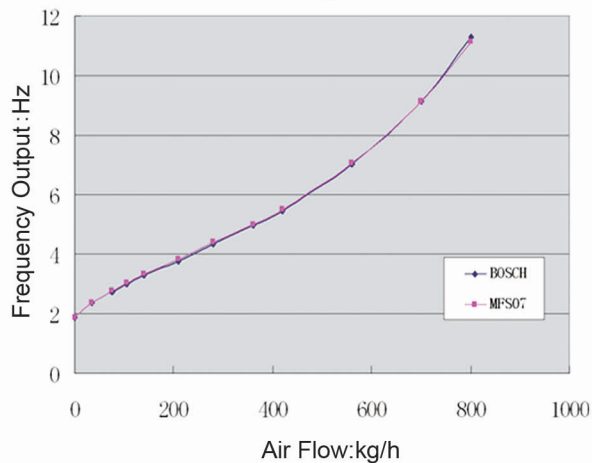
## MFS07 Air Flow Sensor

### ◆ Interchange BOSCH :

0 281 002 900                    0 281 002 923  
 0 281 002 914                    0 281 006 140  
 0 281 002 951                    ... ..



MFS07 Air flow Sensor Typical Curve (Ta=25°C)



Specification Parameter	MFS07 Air Flow Sensor
Measuring range	10~1000kg/h
Accuracy	≤±2%
Response time	≤15ms
Pressure drop	≤1.5kPa
Rated supply voltage	14V
Voltage Input	7~18V
Frequency Output	2kHz~8kHz
Current input	< 0.1A
Permissible vibration acceleration	≤150m.s <sup>-2</sup>
Operating temperature	-40°C~+120°C

All values are typical at +25°C, 14Vdc.



## AFS05 Air Flow Sensor Chip

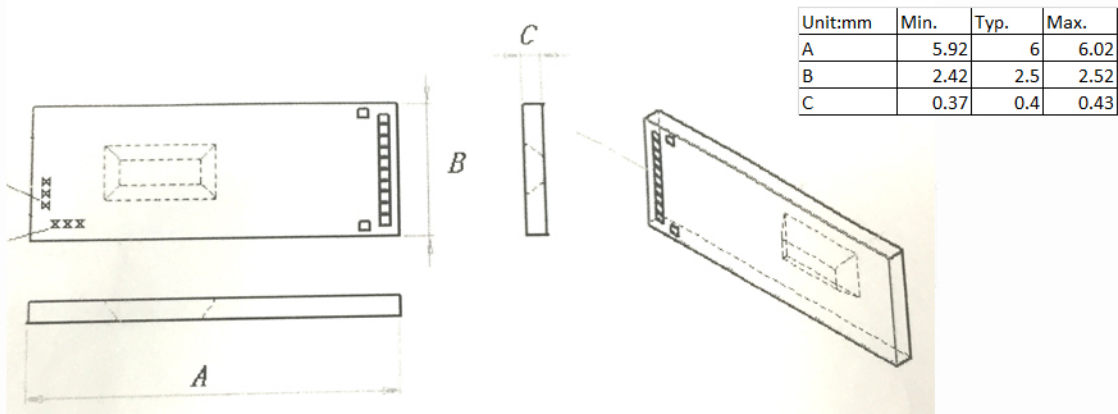
- ▶ Based on MEMS process
- ▶ Hot-film principle
- ▶ ≤15ms rapid response
- ▶ Temperature range: -55°C ~ 125°C



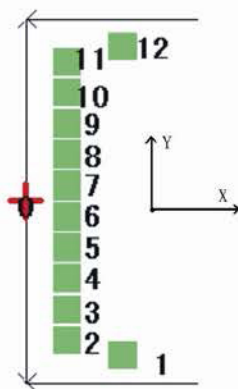
### Description

AFS07 chip is the core sensitive element of the whole module, the advanced MEMS chip provides the short response time and high accuracy. Attached passive thin film can resist dust and moisture, the bonding process is easily control. both gold and aluminum can be used for bonding.

### Structure



### Bonding Definition

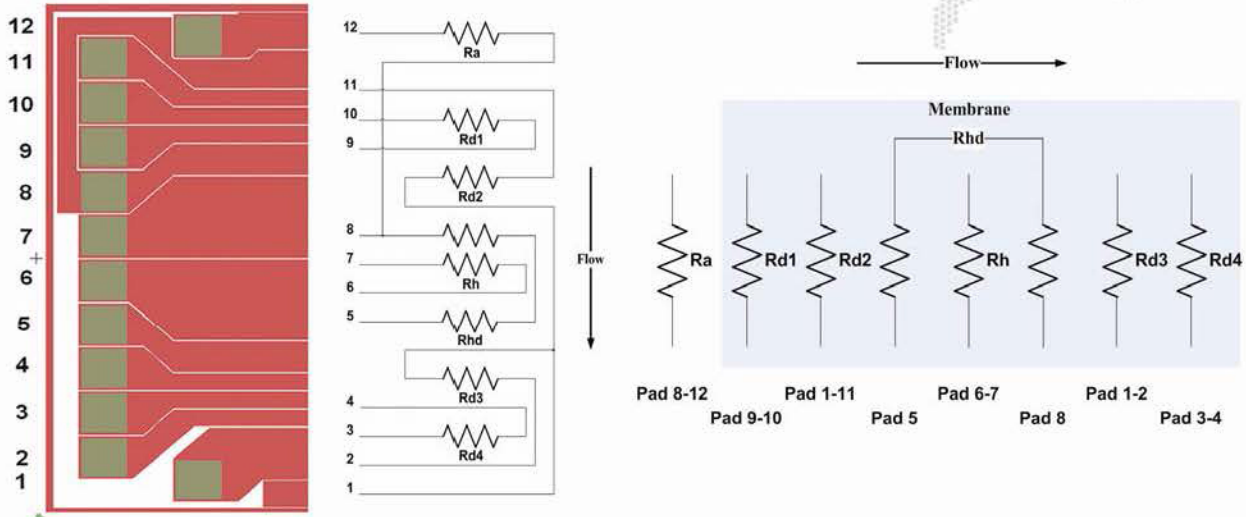


PDA Quantity : 12  
PDA Size : 190um×190um

PAD	X(um)	Y(um)
1	685	-1100
2	285	-990
3	285	-770
4	285	-550
5	285	-330
6	285	-110
7	285	110
8	285	330
9	285	550
10	285	770
11	285	990
12	685	1100



## Electrical Connection



## Resistance Definition

\*Scale Factor over Temperature  $>2.9 \times 10^{-3}/^{\circ}\text{C}$

	Min ( $\Omega$ )	Typ ( $\Omega$ )	Max ( $\Omega$ )
R12-08(R1)	1341	1490	1639
R08-05(R2)	520.2	578	635.8
R11-01(R3)	875.7	973	1070.3
R01-02(R4)	875.7	973	1070.3
R10-09(R5)	911.7	1013	1114.3
R04-03(R7)	911.7	1013	1114.3
R06-07(R8)	101	110	121

### \*Notes

1. AFS05 is vacuum package. Pls open it in the clean-room.
2. Pls complete the bonding process as soon as possible after open AFS05.
3. Pls avoid any pollution such as dust and oil in assembling process.



## AFS07 Air Flow Sensor Chip

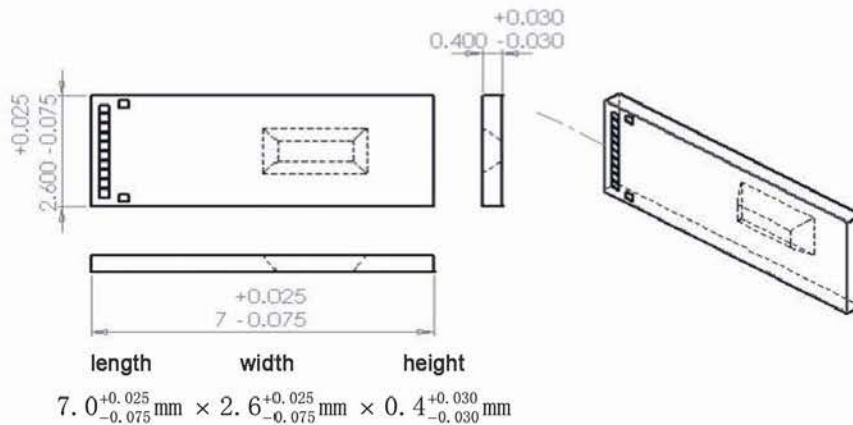
- ▶ Based on MEMS process
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- ▶ Temperature range: -55°C ~ 125°C



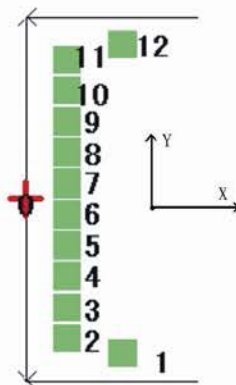
### Description

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### Structure



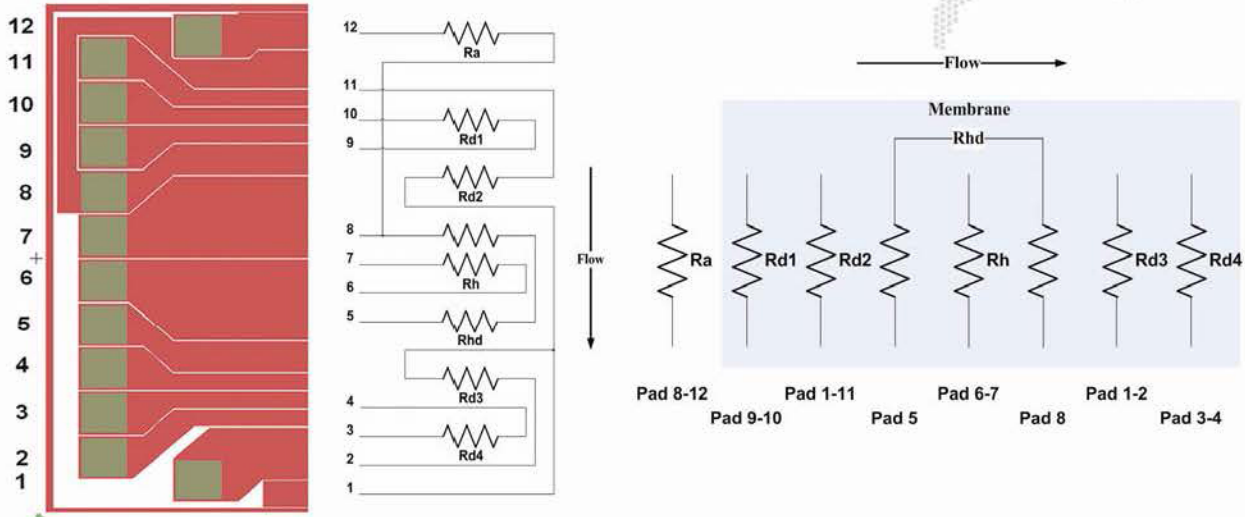
### Bonding Definition



PDA Quantity: 12  
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PAD	X(um)	Y(um)
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## Electrical Connection



## Resistance Definition

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R04-03(R7)	911.7	1013	1114.3
R06-07(R8)	101	110	121

### \*Notes

1. AFS07 is vacuum package. Pls open it in the clean-room.
2. Pls complete the bonding process as soon as possible after open ASF07.
3. Pls avoid any pollution such as dust and oil in assembling process.




ID	MT NO.	Photo	Application	OE No.	Relative BOSCH No.	Note
1	MFS07-1-900		Great Wall H3/H5/H6		0 281 002 900 0 281 002 923 0 281 006 223	
			Refine 2.8T		0 281 002 900 0 281 006 030	
2	MFS05-1-040		NISSAN MICRA (K12) 1.0 16V Hatchback NISSAN MICRA(K11)1.0i 16V Hatchback NISSAN MICRA(K11) 1.4i 16V Hatchback	22680 5U400 16119-1F700 16119-257502	0 280 218 040	
3	MFS05-1-060		AUDI A3 (8L1)1.8 VW BORA (1J2)1.6FSI/2.0 4motion VW BORA Estate (1J6)1.6FSI/2.0 4motion VW BORA (1J1)1.6FSI/2.0 4motion VW NEW BEETLE(9C1,1C1)2.0 SEAT CORDOBA(6L2) 2.0 SKODA FABIA Saloon(6Y3) 2.0 SKODA OCTAVIA Combi(1U5)2.0	06A 906 461G	0 280 218 060 0 280 218 061 0 280 218 122 0 986 280 216	
4	MFS05-1-121		VW BORA(1J2) 1.9TDI (4motion) VW BORA Estate(1J6) 1.9 TDI VW GOLF IV Variant(1J5) 1.9TDI VW NEWBEETLE(9C1,1C1) 1.9TDI VW POLO (9N) 1.4/1.9DI AUDI A3(8L1) 1.9TDI AUDI A4(8E2,B6) 1.9TDI FORD GALAXY(WGR) 1.9TDI SEAT LEON (1M1) 1.9TDI SKODA FABIA (6Y2) 1.9TDI SKODA OCTAVA91U2) 1.9TDI	06A 906 461 038 906 461C 95VW 12B529 BB 95VW 12B529 BC	0 280 217 121 0 280 217 122 0 281 002 757 0 986 280 202	
5	MFS05-1-122		VW		0 280 218 122	
6	MFS05-1-063		VW BORA (1J2) 1.8T VW GOLF (1J1) 1.8T VW PASSAT (3B3) 1.8T AUDI A3 (8L1)1.8T (Quattro) AUDI A4 (8D2,B5)1.8T/2.4/2.8 AUDI A6 (4B,C5)1.8T/2.4/2.8 AUDI A8 (4D2,4D8) 2.8(Quattro) AUDI TT(8N3) 1.8T (Quattro)	06A 906 461L 078 133 471E	0 280 218 063 0 280 218 064 0 986 280 217	

7	MFS07-1-914		HUATAI B11		0 281 002 914	
8	MFS05-1-132		VW PASSAT(3B3) AUDI A3 1.9 TDI SKODA Octavia Fabia 1.9TDI SEAT Alhambra 1.9 TDI	06B 906 461 06B 906 461X	0 280 218 132	
9	MFS07-1-618				0 281 002 618	Client need to provide original samples
10	MFS05-1-013		VW PASSAT Variant (3B5) 1.8 AUDI A4 (8D2,B5)1.8 (Quattro) AUDI A4 Avant (8D5,B5) 1.8(Quattro) AUDI A6 (4B,C5) 1.8 AUDI A6 Avant(4N,C5) 1.8	06B 133 471	0 280 218 013 0 280 218 014 0 280 218 471 0 986 280 206	
11	MFS05-1-111		HYUND SANTA F FE (SM)2.4 16V KIA SORENTO(JC) 2.4	28164-38200 28164-38210	0 280 218 111	
12	MFS05-1-447		KIA CARENS II(FJ) HYUNDAI TRAJET(FO)	28164 27000	0 281 002 447	
13	MFS05-1-166		Chery		0 280 218 166	
14	MFS05-1-152		NISSAN SENTRA 1.8	22680 5M000	0 280 218 152	
15	MFS07-1-951		JMC X6 X8		0 281 002 951	
16	MFS05-1-516		ISUZU 600P Engine 4KH1		0 281 002 516	
17	MFS05-1-515		MERCEDES C-CLASS (W202)C 240 (202.026) MERCEDES C-CLASS (W203)C 320 4-mati MERCEDES C-CLASS Coupe (CL203) C 320 MERCEDES C-CLASS Estate (S202) C 240 T MERCEDES C-CLASS T-Model (S203) C24 MERCEDES G-CLASS (W463) G320 MERCEDES VIANO (W639) 3.2	112 094 0048	0 280 217 515	

18	MFS07-1-140		Terracan		0 281 006 140	
19	MFS05-1-114		MERCEDES C-CLASS (W202)C180/C200/C220 MERCEDES C-CLASS Estate (S202)C MERCEDES CLK (C208)200/230 MERCEDES CLK Convertible (A208)200/230 MERCEDES E-CLASS (W210)E 200/230 MERCEDES C-CLASS(W163)ML 230 MERCEDES V-CLASS(638/2)V200/V230 MERCEDES VITO Box(638) 108/110	000 094 09 48	0 280 217 114 0 280 217 115	
20	MFS05-1-810		MERCEDES C-CLASS-C43AMG MERCEDES CLK-430 MERCEDES E-CLASS-E430 MERCEDES SL-500 MERCEDES S-CLASS-S600	113 094 00 48	0 280 217 810	
21	MFS05-2-516				0 280 217 516	Client need to provide original samples
22	MFS06-1-037				Hitachi 06J 906 461 D	
23	MFS05-1-517				0 280 217 517	
24	MFS05-1-814				0 280 217 814	
25	MFS05-1-216		AUDI A498D2,B5)1.9 TDI(Quattro) AUDI A4 Avant(8D5,B5) 1.9TDI AUDI A6(4B,C5)1.9TDI AUDI A6 Avant(4B,C5)1.9TDI SEAT CORDOBA(6K2/6KS)1.9TDI VW LT 28-35/28-46 II 2.5TDI VW PASSAT(3B2/3B5) 1.9TDI VW TRANSPORER IV	028 906 461 038906 461D	0 281 002 216 0 281 002 217 0 281 002 768 0986 284 001 0986 284 011	Client need to provide original samples
26	MFS05-1-090		KIA SORENTO(JC) KIA OPIRUS HYUNDAI XG	28100 39450	0 280 218 090	



27	MFS05-1-031		OPEL AGILA(H00) 1.0 12V OPEL ASTRA G Estate(F35_)1.2 16V OPEL CORSA C (F08 ,F68) 1.0 VAUXHALL AGILA 1.O 12V VAUXHALL CORSAVAN MK II 1.2 16V	91 93 149 92 27 760	0 280 218 031 0 986 280 230	Client need to provide original samples
28	MFS05-1-124		BMW 3 (E46)316I/318 I BMW 3 Compact (E36) 316 I BMW 3 Coupe (E46) 316ci/318ci BMW 3 Touring (E46) 318 I BMW 7 (E38) 740 d BMW Z3 1.9	13 621 433 565	0 280 217 124	
29	MFS05-1-523		MERCEDES-BENZ VITO Bus ( 638 ) MERCEDES-BENZ VITO Box ( 638 ) MERCEDES-BENZ V-CLASS ( 638/2 )	000 094 1348 071 906 461	0 280 217 523	Client need to provide original samples
30	MFS05-1-554		KIA SORENTO(JC) HYUNDAI H 200 Box HYUNDAI H 200 Bus(KMF) HYUNDAI TERRACAN(HP)	28164 4A000	0 281 002 554	Client need to provide original samples
31	MFS05-1-010		LANDR RANGE ROVER II(LP) 3.9 LANDR RANGE ROVER II(LP) 4.0 LANDR RANGE ROVER II(LP) 4.6	MHK 100800	0 280 218 010	
32	MFS05-1-002		SEAT LEON(1M1)1.8 20V AUDI A3(8L1)1.8(Quattro) GOLF IV(1J1)1.8/2.0 VW BORA(1J2)1.8/2.0 VW BORA Estate(1J6)1.8/2.0 VW NEW BEETLE(9C1,1C1)1.8/2.0	06A 906 461A	0 280 218 002 0 280 218 003 0 986 280 205	
33	MFS05-1-123				0 280 217 123	
34	MFS05-1-012		ROVER 200 (RF) 200SDi ROVER 45 (RF) 2.0 iDT FERRARI 360 MODENA (131)360 FI	171707 16400 PDD X00 MHK 101070	0 280 218 012	
35	MFS05-1-004		FIAT-MAREA(C185) 2.4JTD 130 FIAT -MAREA WEEKEND(C185)2.4JTD LADA 110/111/112 1.5 LADA NIVA (2121) 1700 I LADA SAMARA (2108,2109) LADA SAMARA FORMA(21099) 1500	46533308	0 280 218 004	
36	MFS05-1-088		VOLVO S60 2.0T VOLVO S80 2.0T VOLVO S80 2.4D VOLVO V70 II Estate 2.4T VOLVO V70 XC 90 D5	8627296 8670115 8670398	0 280 218 088	

37	MFS05-1-429		AUDI A4 (8D2,B5)2.5 TDI(Quattro) AUDI A4 Avant(8D2,B5)2.5 TDI (Quattro) AUDI A6 (4B,C5) 2.5 TDI (Quattro) AUDI A6 Avant(4B,C5)2.5 TDI (Quattro) AUDI A8 (4D2,4D8)2.5 TDI (Quattro)	059 906 461E 059 906 461A	0 281 002 429 0 281 002 430 0 281 002 224 0 986 284 005	
38	MFS05-1-032		VW PASSAT Variant(3B5)1.8T SKODA OCTAVIA(1U2)1.8T SEAT LEON(1M1)1.8T AUDI A3 (8L1)1.8T (Quattro) AUDI A4 (8D2,B5)1.8T (Quattro) AUDI A4 Avant(8D5,B5)1.8T (Quattro) AUDI A6 Avant(4B,C5)1.8T (Quattro)	06A 906 461D	0 280 218 032 0 280 218 033 0 986 280 210	
39	MFS05-1-109				0 280 218 109	
40	MFS05-1-527				0 928 400 527	
41	MFS07-1-270				0 281 006 270	
42	MFS07-1-063 (HuaYuan LaiDong)				0 281 006 063	
43	MFS07-1-202 (Chaoyang Diesel)				0 281 006 202	
44	MFS07-1-091				0 281 006 091	Client need to provide original samples
45	MFS07-1-202 (Chaoyang Diesel)				0 281 006 202	
46	MFS07-1-270 (Yunnei Power)				0 281 006 270	
47	MFS07-1-277				0 281 006 277	
48	MFS05-1-308				0 281 002 308	
49	MFS05-1-428				0 281 002 428	
50	MFS05-1-180				0 281 002 180	
51	MFS07-1-223				0 281 006 223	

52	MFS05-1-061				0 280 218 061	Client need to provide original samples
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# Electronic Module

Photo			MT No.	Relative No.
			M1	<p>0 280 218 088            0 280 218 090            0 280 218 111            0 280 218 166            0 280 218 167            0 281 002 447            0 281 002 516            0 281 002 554</p>
			M2	<p>0 280 218 060            0 280 218 063            0 280 217 122            0 280 218 132            0 281 002 429</p>
			M3	<p>0 281 002 900            0 281 002 923            0 281 002 914            0 281 006 140            0 281 002 951</p>
			M4	<p>0 280 217 114            0 280 218 010            0 280 217 124            0 280 217 515            0 280 217 517            0 928 400 520            0 280 217 810            0 280 217 814            0 280 217 516</p>
			M5	<p>0 280 218 060            0 280 218 063            0 280 217 122            0 280 218 132            0 281 002 429</p>



Photo			MT No.	Relative No.
			M6	0 280 218 002 0 280 218 013 0 280 218 032 0 280 217 121 0 281 002 180 0 281 002 216 0 280 217 523
			M7	0 280 218 031 0 280 218 004 0 280 218 012 0 280 218 109 0 280 217 123 0 281 002 182
			M8	0 280 218 040 0 280 218 152 0 280 218 154 22680-6N201 22680-4M511
			M9	MR985187 E5T60171
			M10	AFH60-37 06J 906 461D
			M12	AFH60-37 06J 906 461D