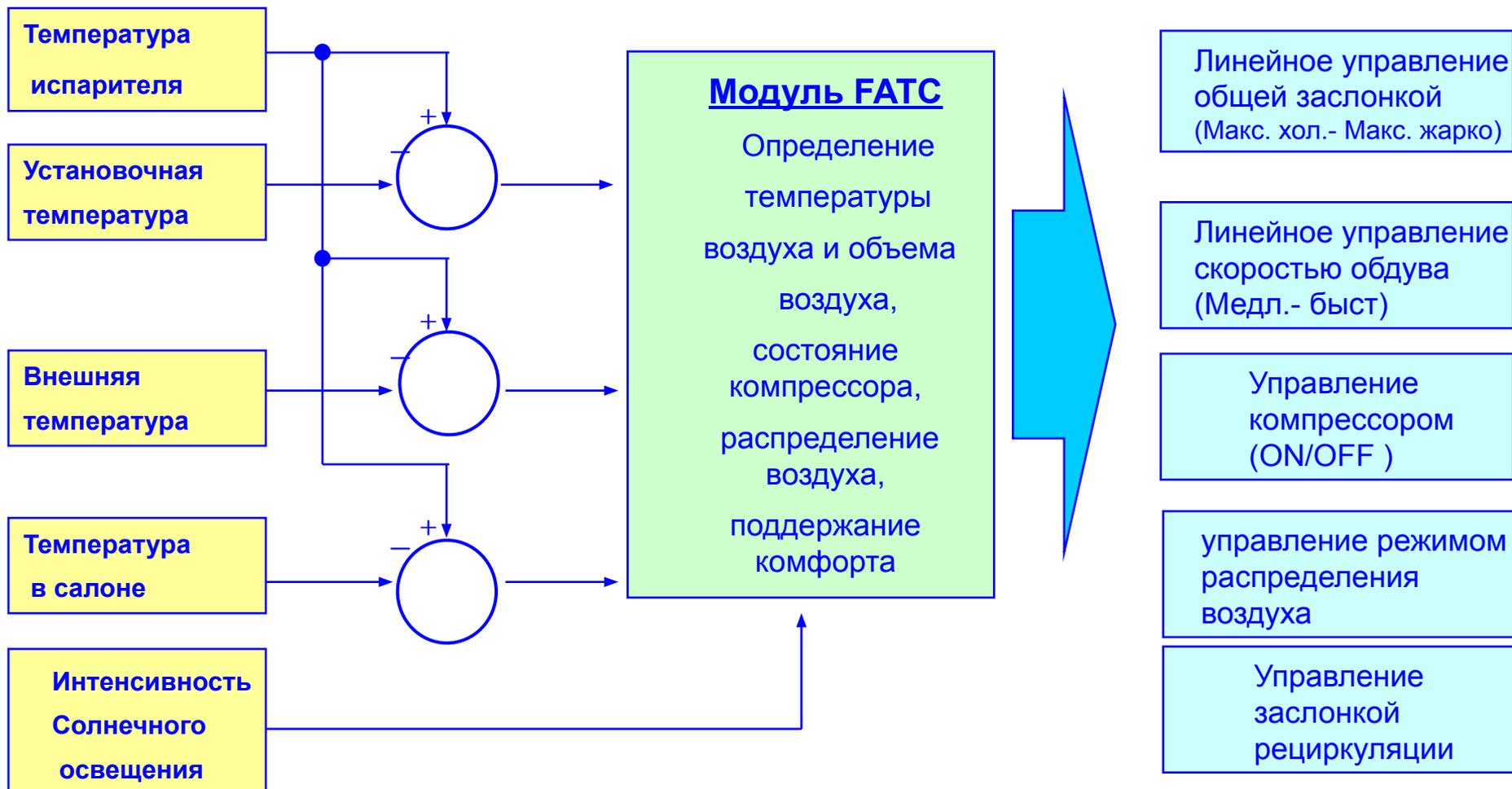


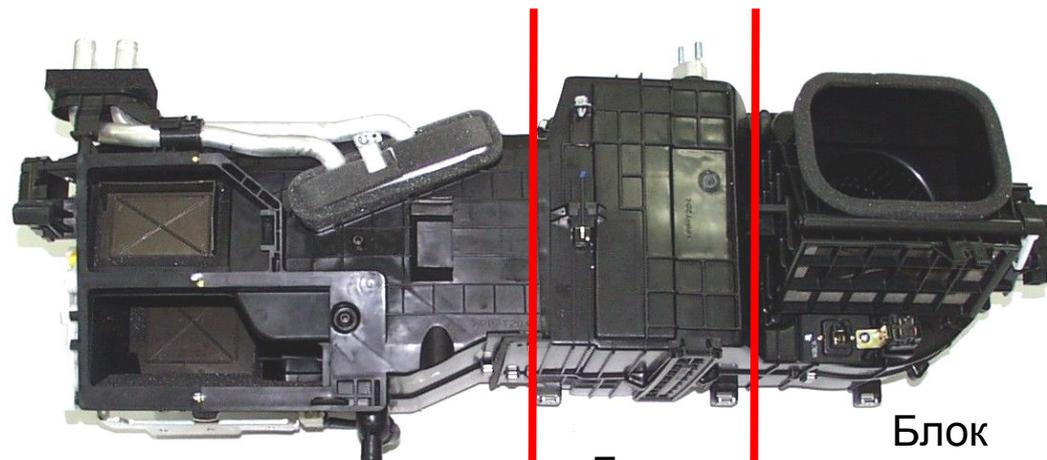
СИСТЕМА КОНДИЦИОНИРОВАНИЯ ВОЗДУХА

- ▶ СПЕЦИФИКАЦИЯ
- ▶ РАСПОЛОЖЕНИЕ
- ▶ ЦЕПЬ ОХЛАЖДЕНИЯ
- ▼ ДЕТАЛИ В ПОДКАПОТНОМ ПРОСТРАНСТВЕ
 - КОНДЕНСЕР
 - КОМПРЕССОР
- ▼ ДЕТАЛИ В САЛОНЕ
 - УЗЕЛ ОБОГРЕВАТЕЛЯ
 - УЗЕЛ ИСПАРИТЕЛЯ
 - * ВОЗДУШНЫЙ ФИЛЬТР
 - * ДВИГАТЕЛЬ ВЕНТИЛЯЦИИ САЛОНА
 - * СИЛОВОЙ ТРАНЗИСТОР
 - * РЕЛЕ ОБДУВА ДВИГАТЕЛЬ ВЕНТИЛЯЦИИ САЛОНА
- ▼ АКТИВАТОРЫ
 - АКТИВАТОР ВПУСКНОЙ ЗАСЛОНКИ
 - АКТИВАТОР ТЕМПЕРАТУРНОЙ ЗАСЛОНКИ
 - АКТИВАТОР ЗАСЛОНКИ РЕЖИМОВ
- ▼ ДАТЧИКИ
 - АРТ ДАТЧИК
 - FIN THERMO SENSOR
 - ВНУТРИСАЛОННЫЙ ДАТЧИК
 - ФОТО ДАТЧИК
 - AMBIENT SENSOR
 - AQS – ДАТЧИК КАЧЕСТВА ВОЗДУХА
 - ДАТЧИК ВЛАЖНОСТИ
- ▶ УЗЕЛ ИЗМЕНЕНИЯ ТЕМПЕРАТУРЫ
- ▶ УПРАВЛЕНИЕ ЛОГИКОЙ
- ▼ САМОДИАГНОСТИКА
 - СПИСОК PTC И САМОСОХРАНЕНИЕ
 - ▶ PTC ОТОПИТЕЛЬ HEATER

• Стратегия автоматического управления температурой в автомобиле



Наименование	EF Sonata	NF(Sonata)
Компрессор	HS тип (постоянный)	VS тип (изменяемый)
Конденсер	Condenser, Receiver Drier Seperated	Condenser, Receiver Drier Integrated
Pressure Detecting	Triple switch	APT (Automotive Pressure Transducer)
Cooling Fan	2 Fan (Raiditor, Condenser)	1 Fan
Cooling Fan Control	Relay	PWM(Pulse Width Modulation)
Diagnosis	Controller	Controller or Hi-Scan pro



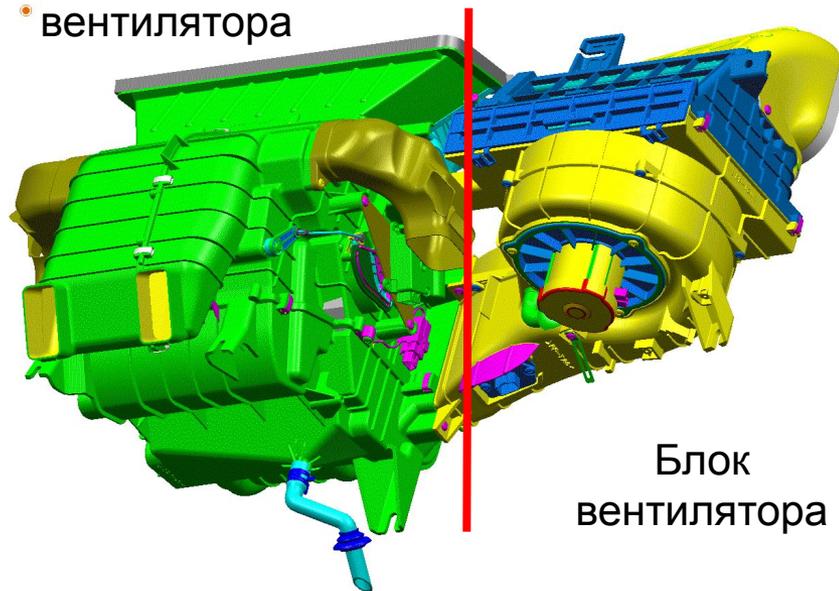
EF SONATA
HVAC UNIT

Блок
нагревателя

Блок
испарителя

Блок
вентилятора

NF HVAC UNIT

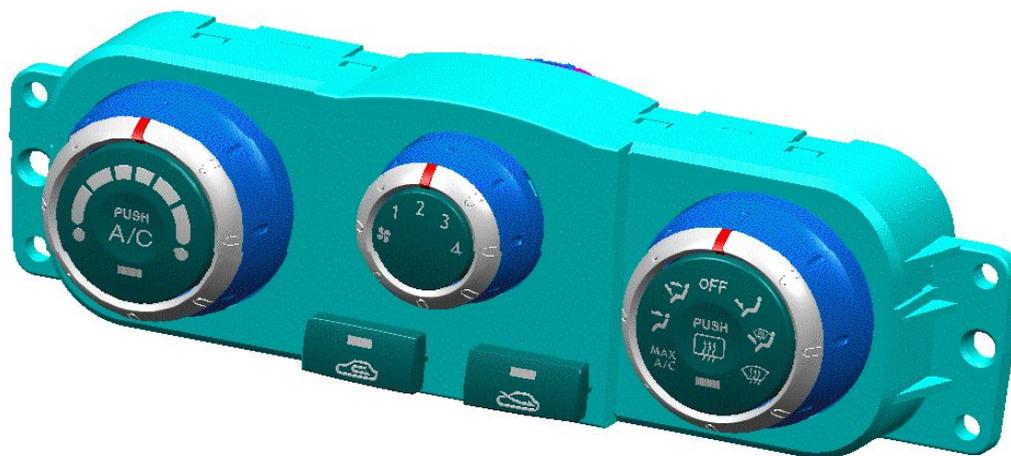


Блок
вентилятора

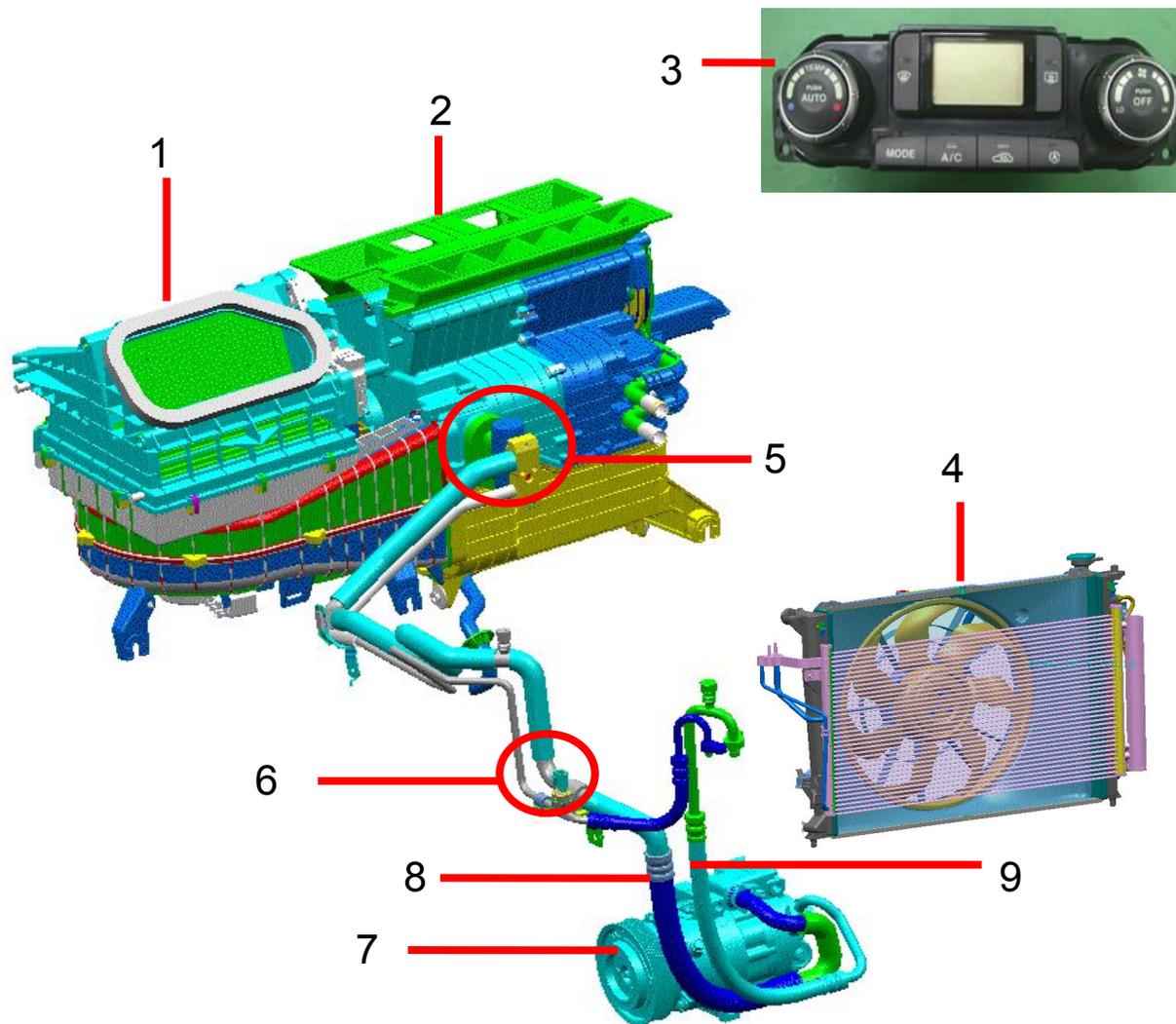


Блок управления
FATC

Блок управления
кондиционером

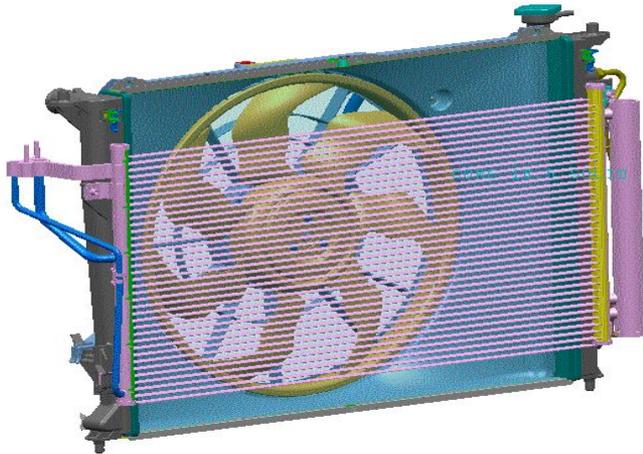


Items		ø 2.0	ø 2.4
Компрессор	Type	VS (Variable Swash Plate)	VS (Variable Swash Plate)
	Рабочий объем	180cc	180cc
	Oil	PAG 150g	PAG 150g
APT Sensor	Тип	Multi step	Multi step
Расширительный клапан	Тип	Block	Block
Хладагент	Тип	R-134a	R-134a
	Емкость(g)	550	550



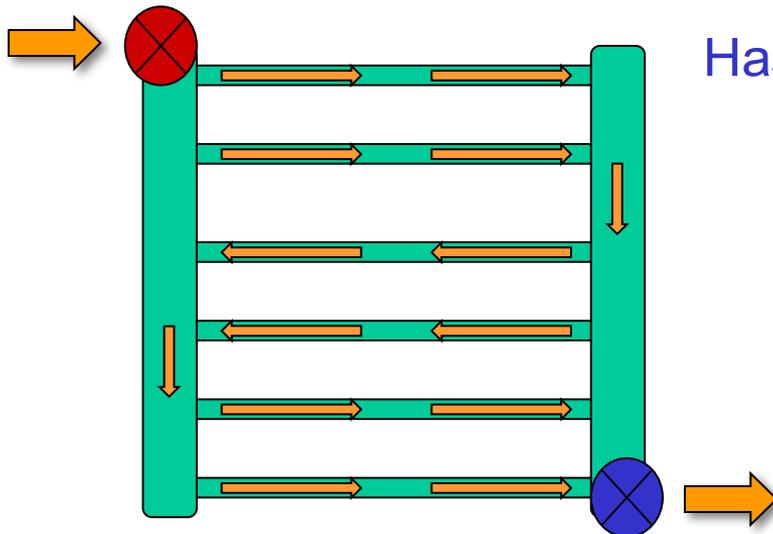
NO	Parts Name
1	Blower Assembly
2	HAVC Assembly
3	Air conditioner Controller(FATC)
4	Condenser and Cooling Fan Assembly
5	Expansion valve(Block type)
6	APT Sensor
7	Compressor Assembly
8	Low Pressure Horse
9	High pressure Horse

КОМПОНЕНТЫ

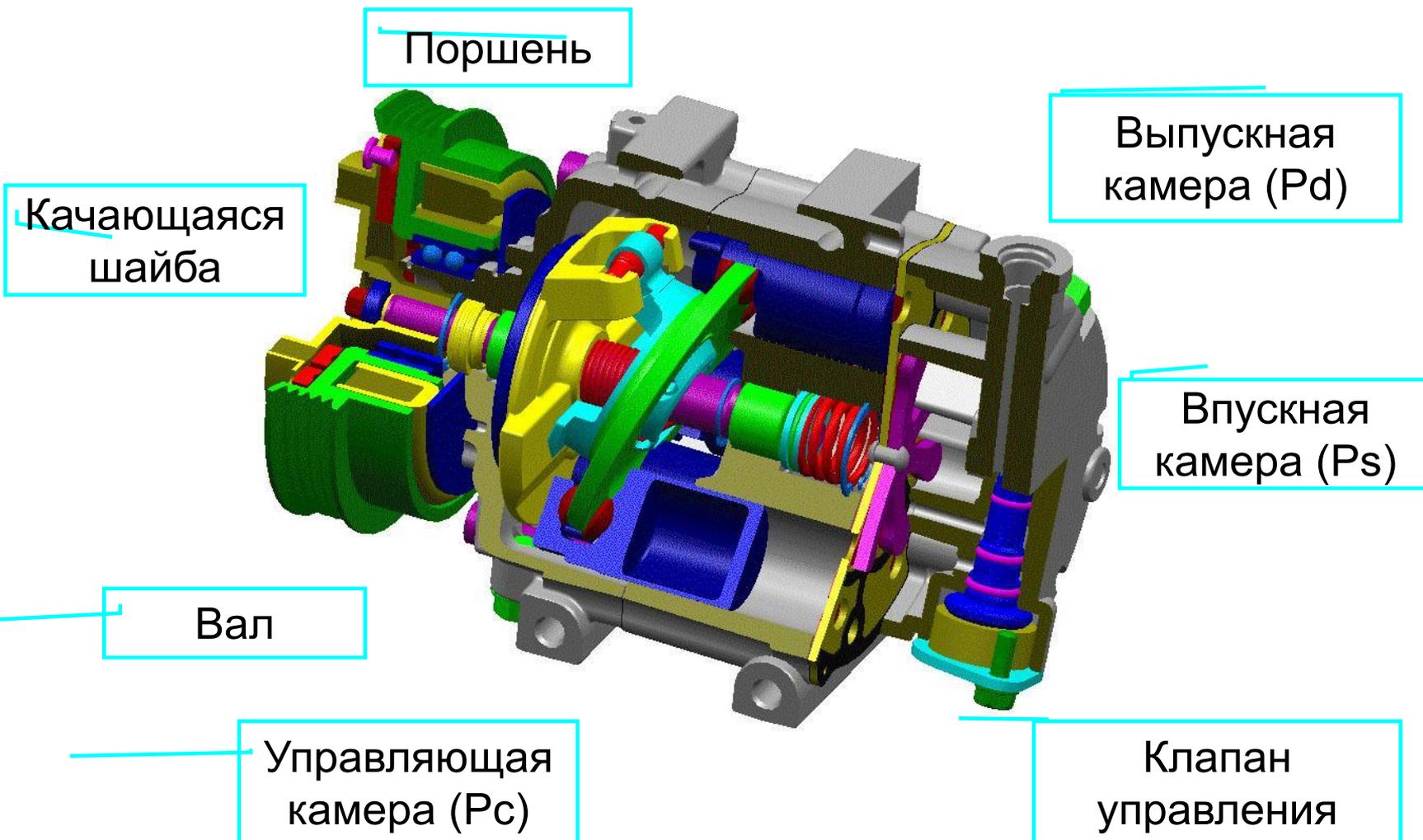


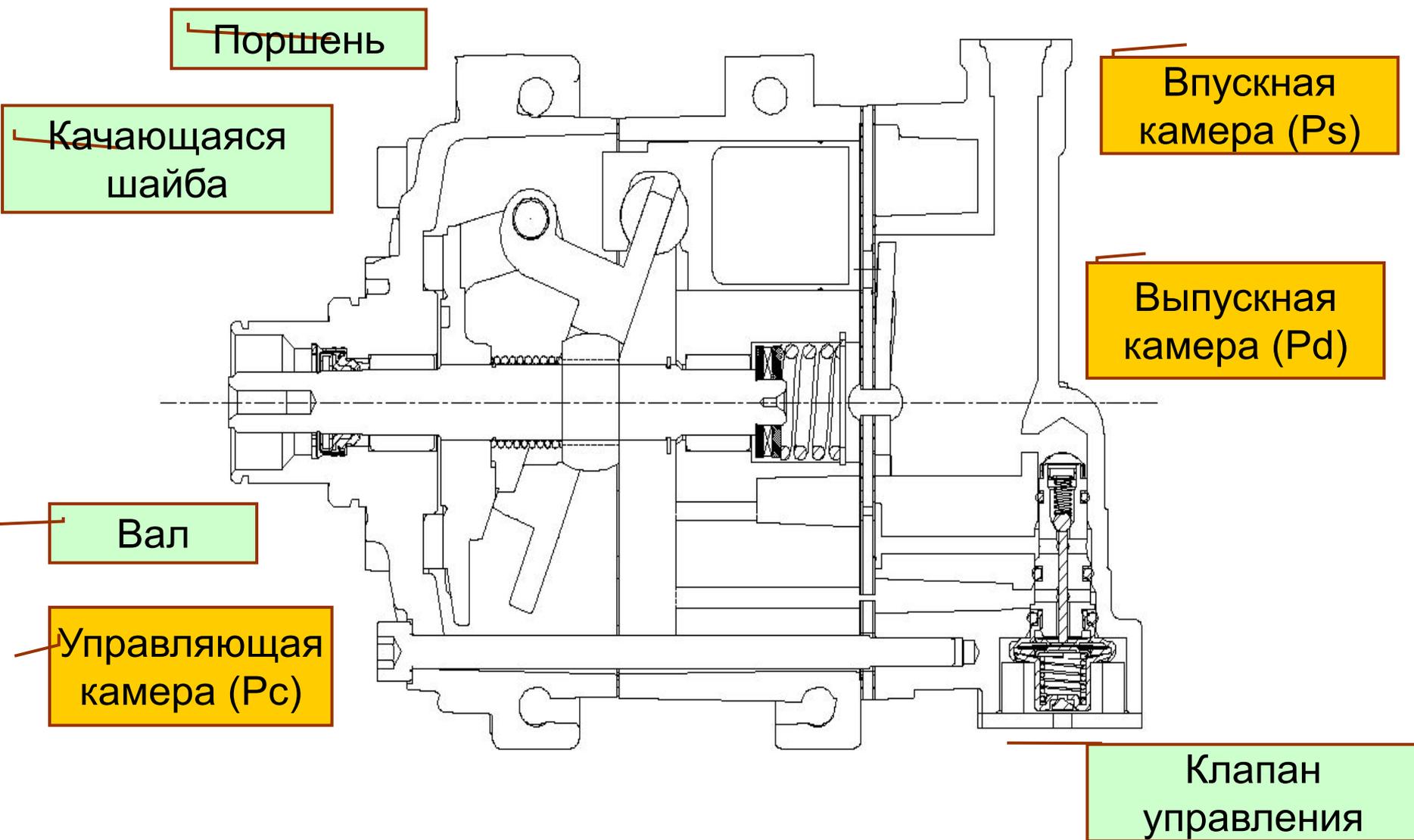
R-134A, с параллельными потоками

Параллельные потоки

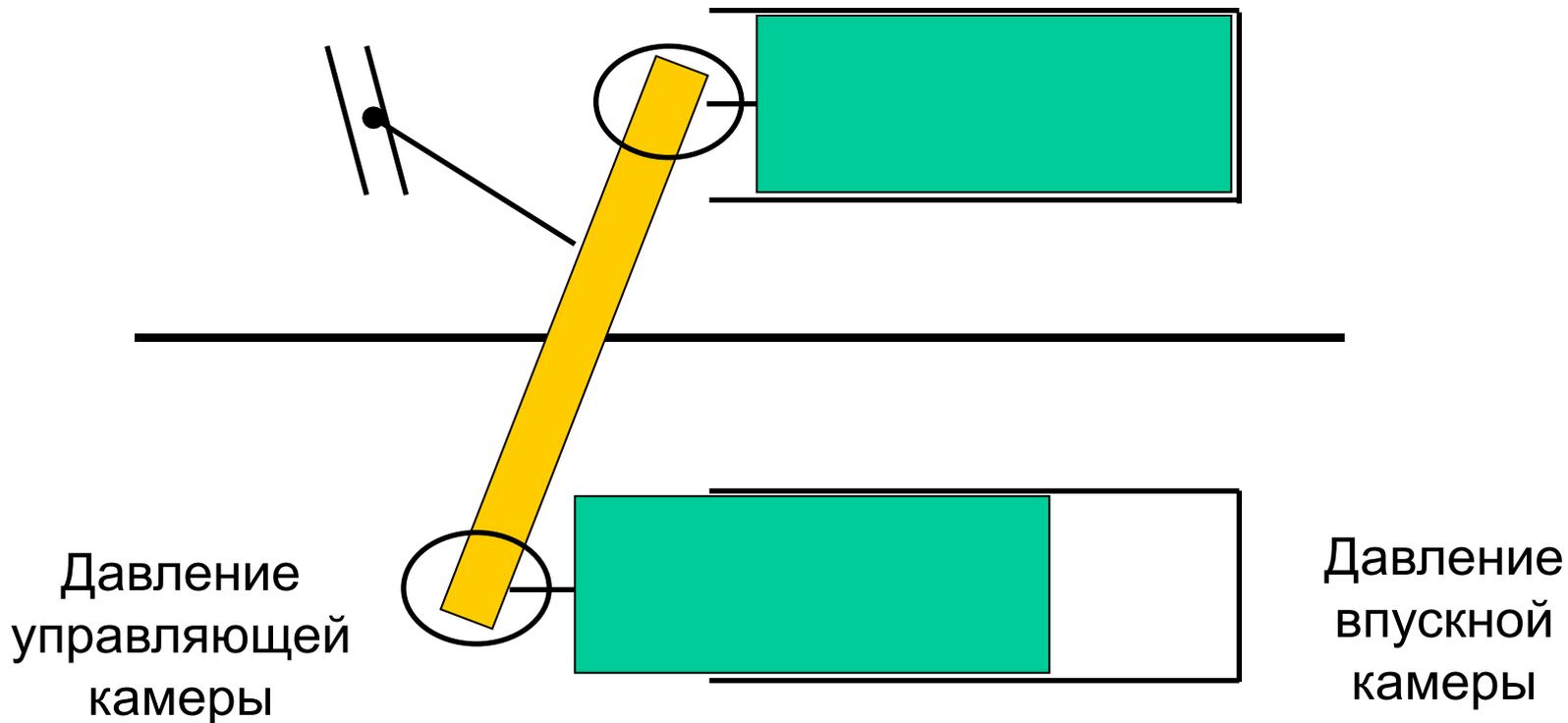


Назначение : для фазового перехода хладагента из газообразного состояния при высокой температуре и высоком давлении в хладагент в жидком состоянии при высокой температуре и высоком давлении .



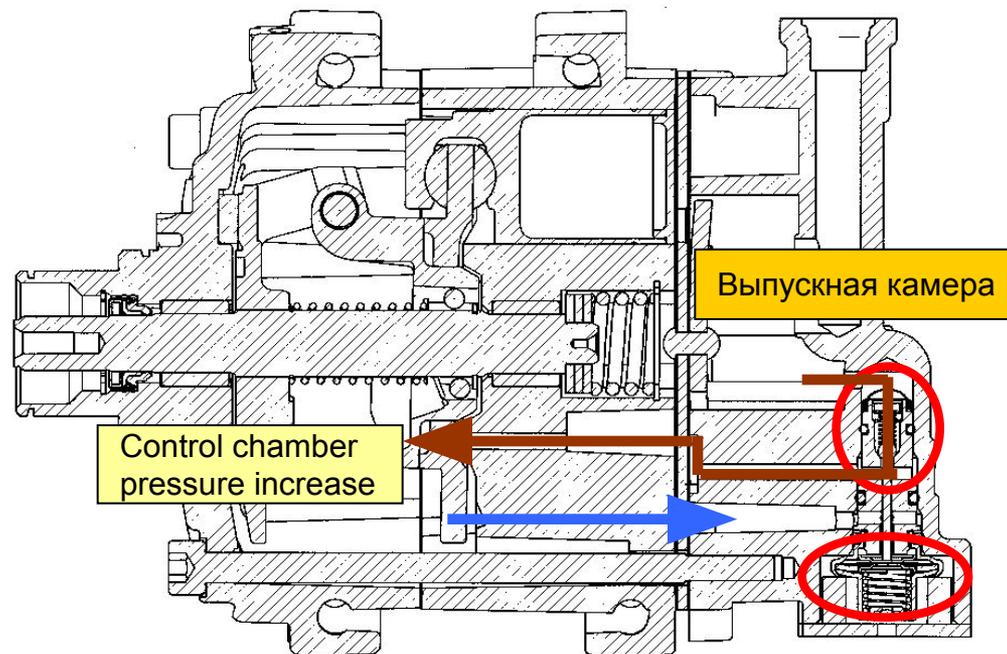
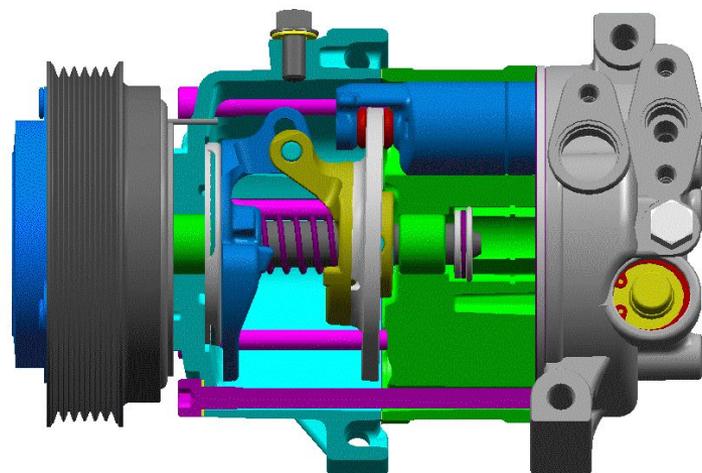


Принцип работы



- давление управл. камеры > давление впуск. камеры: угол шайбы уменьшается
- давление управл. камеры = давление впуск. камеры: угол шайбы увеличивается

Принцип работы

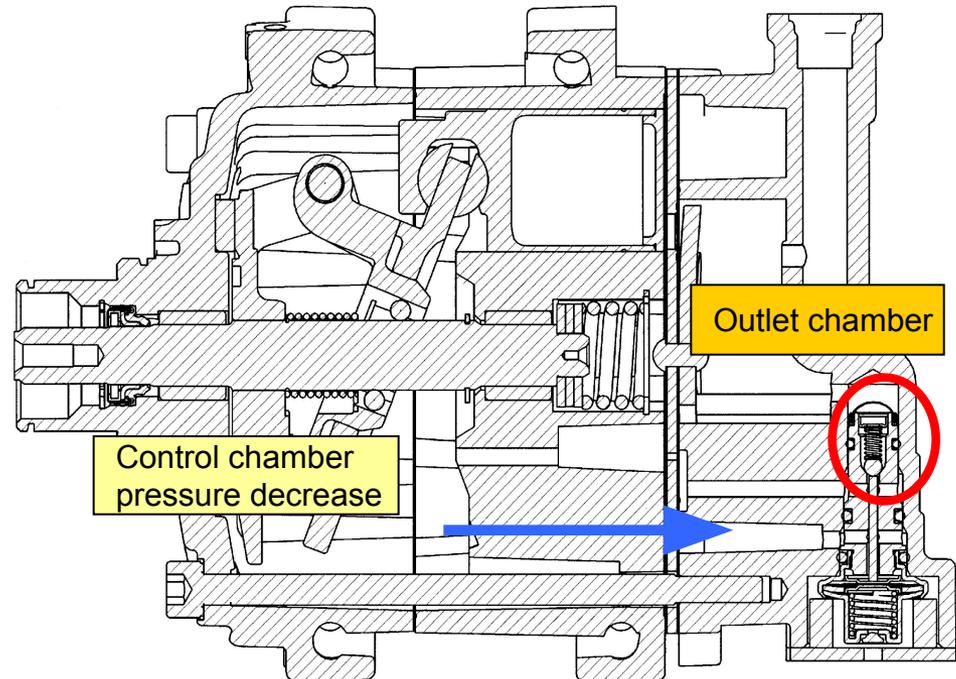
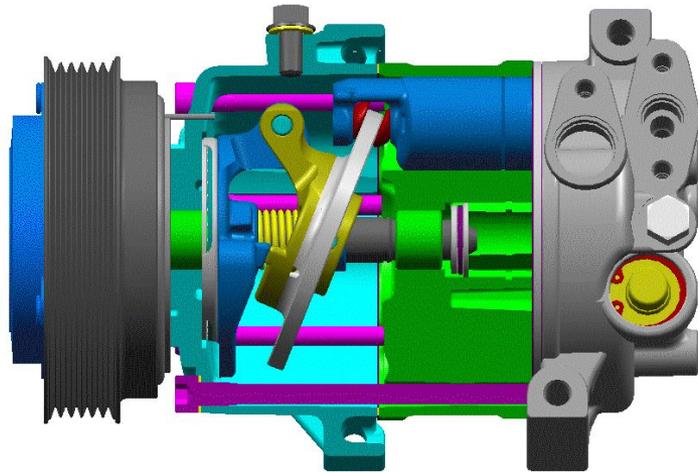


Клапан управления открыт

Diaphragm (Ps)

- Inlet pressure is lower than standard value (2.0kgf/cm^2).
- Diaphragm shrinking → (клапан управления открыт)
- Outlet gas enter to Control chamber (Control chamber pressure is increased.)
- Swash plate angle is decreased.

Operation

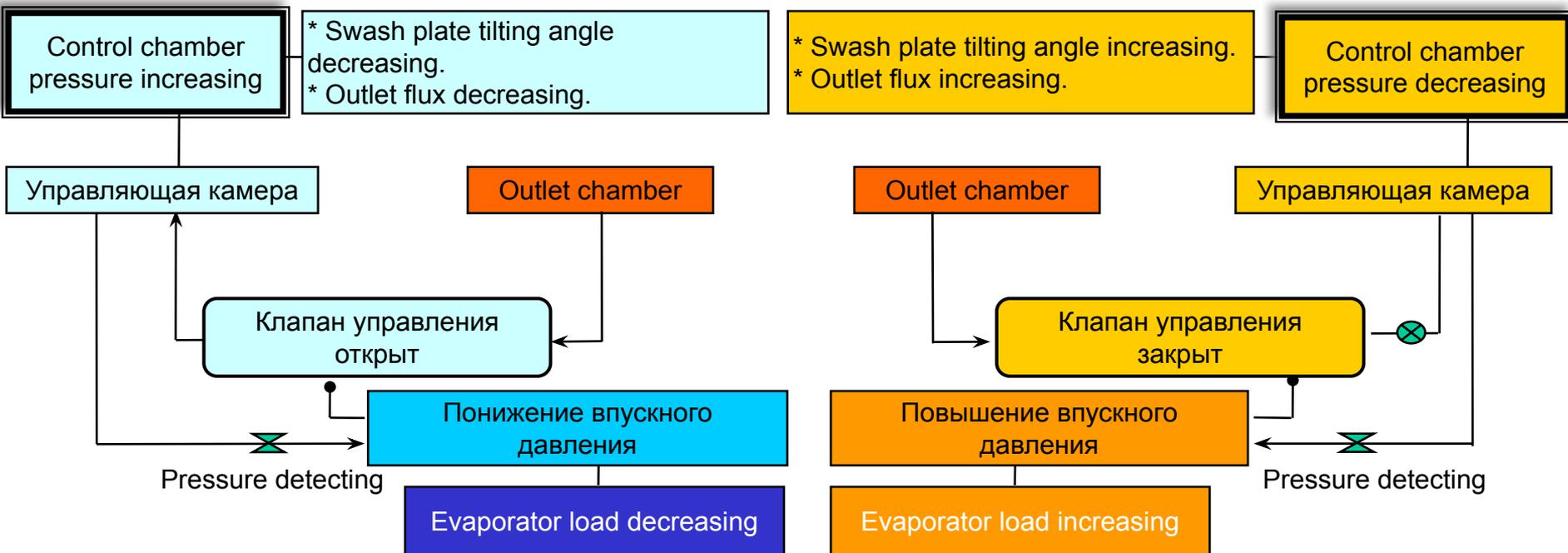


Клапан управления закрыт

- Inlet pressure is higher than standard value (2.0kgf/cm^2).
- Diaphragm expansion → (клапан управления закрыт)
- Outlet gas can not enter to Control chamber (Control chamber pressure is decreased.)
- Swash plate tilting angle is increased.

Диаграмма работы

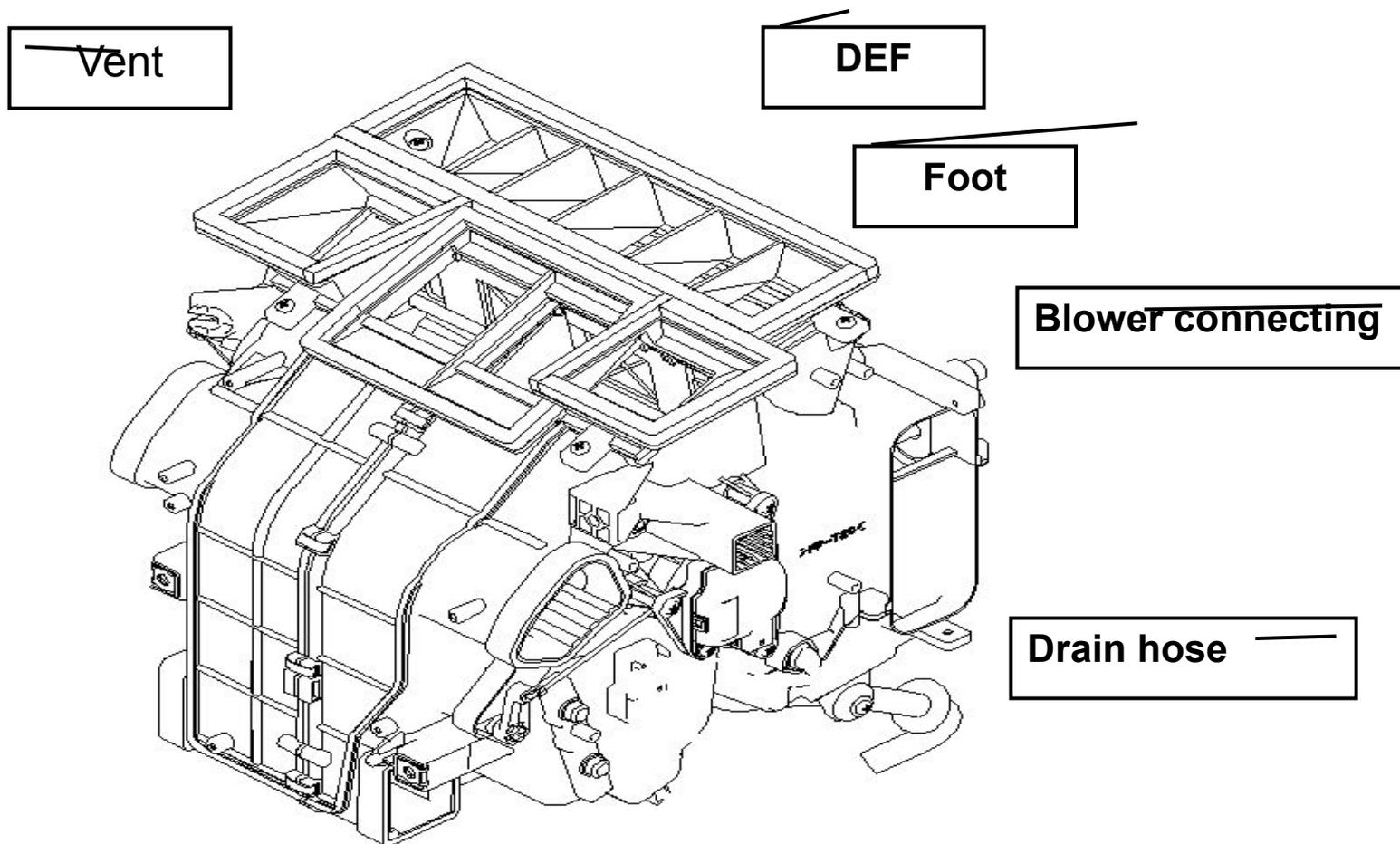
- Standardize the inlet pressure
- Standardize the Venting temperature
- Clutch Cycling Prevention
- Improvement in Fuel Consumption
- Engine Surge Prevention

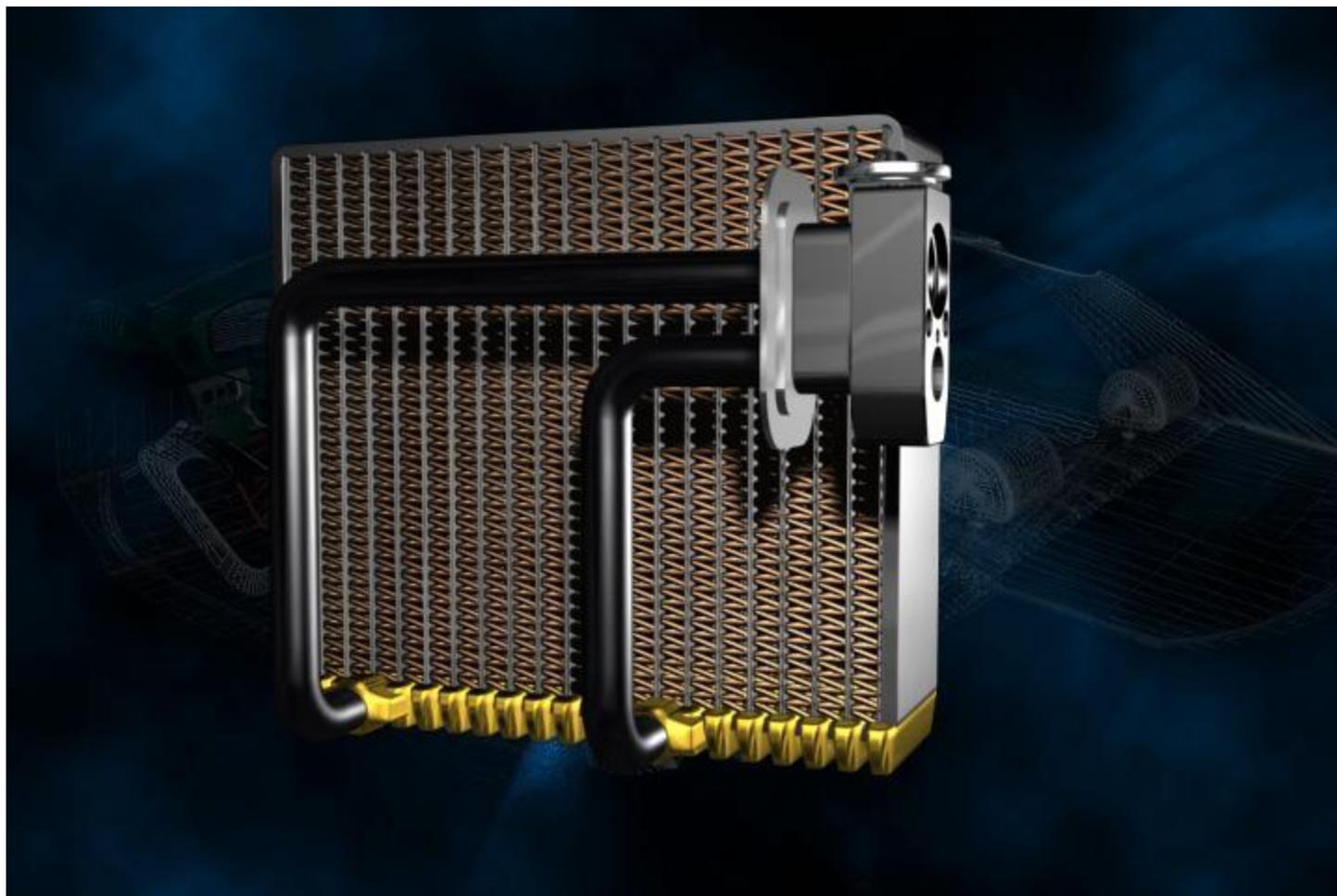


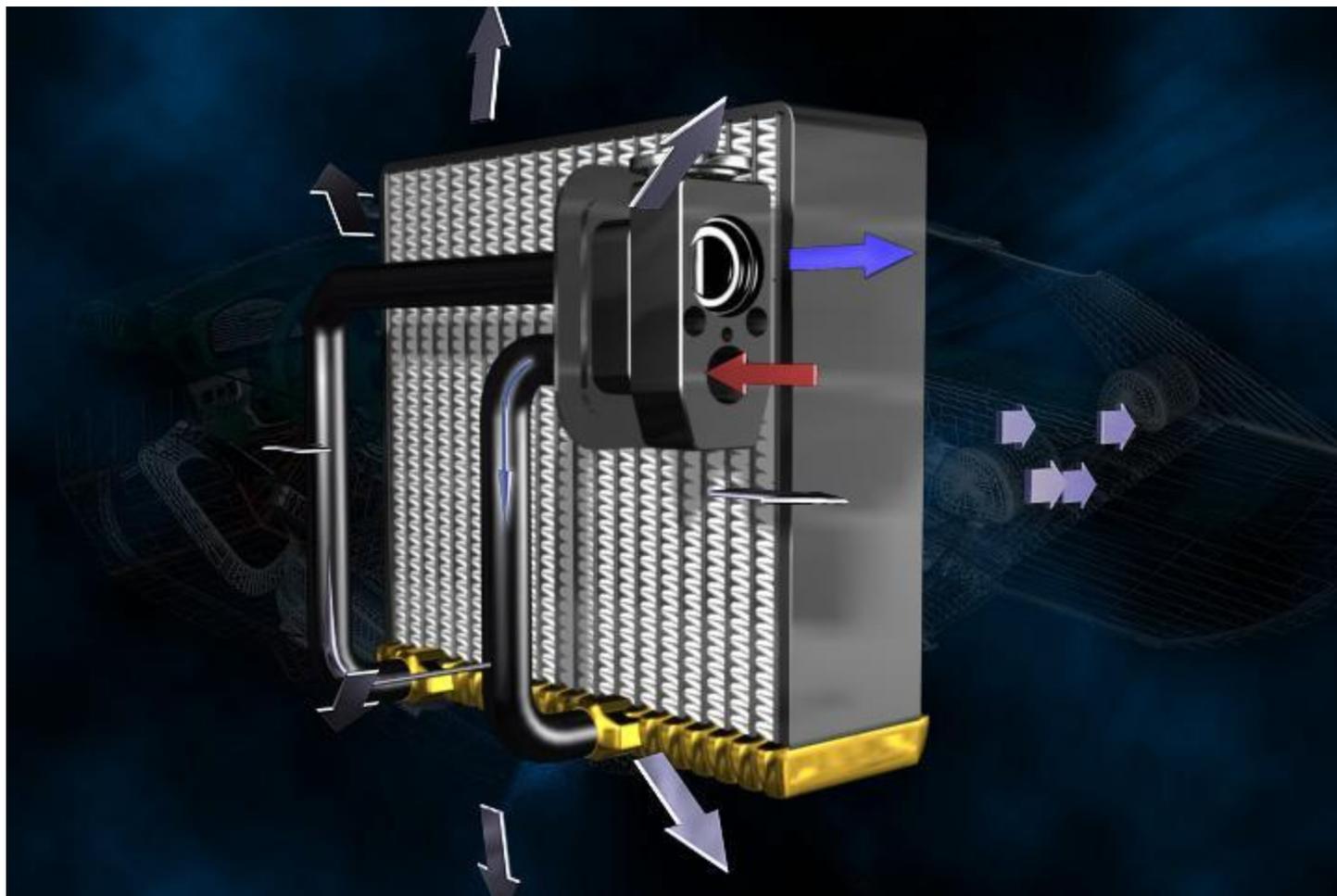
Inlet pressure < Control valve standard value

Inlet pressure > Control valve standard value

HEATER & EVAPORATOR UNIT







1. DESCRIPTION

Employing combination filter, dust and odor in the air is effectively removed.

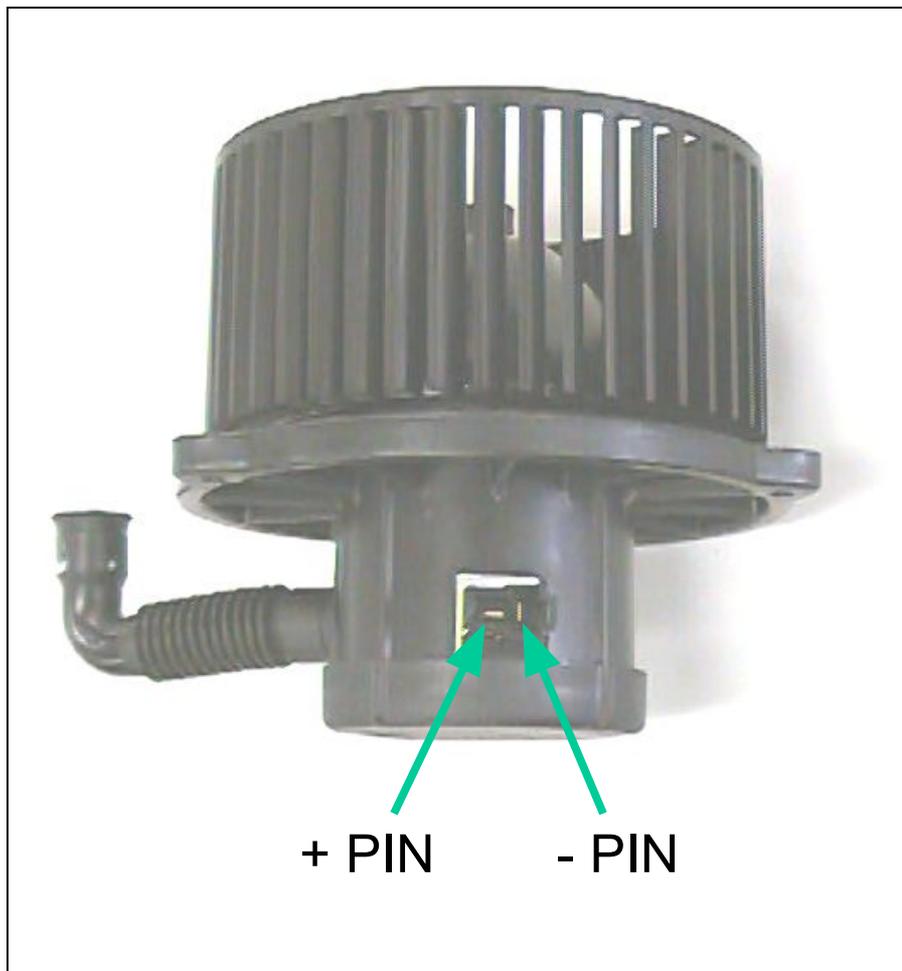
2. LIFE TIME

Filter replacement period is 5,000~12,000km. But this can be shorten if the road condition is bad causing more dust and black smoke in the air.

3. HOW TO REPLACE

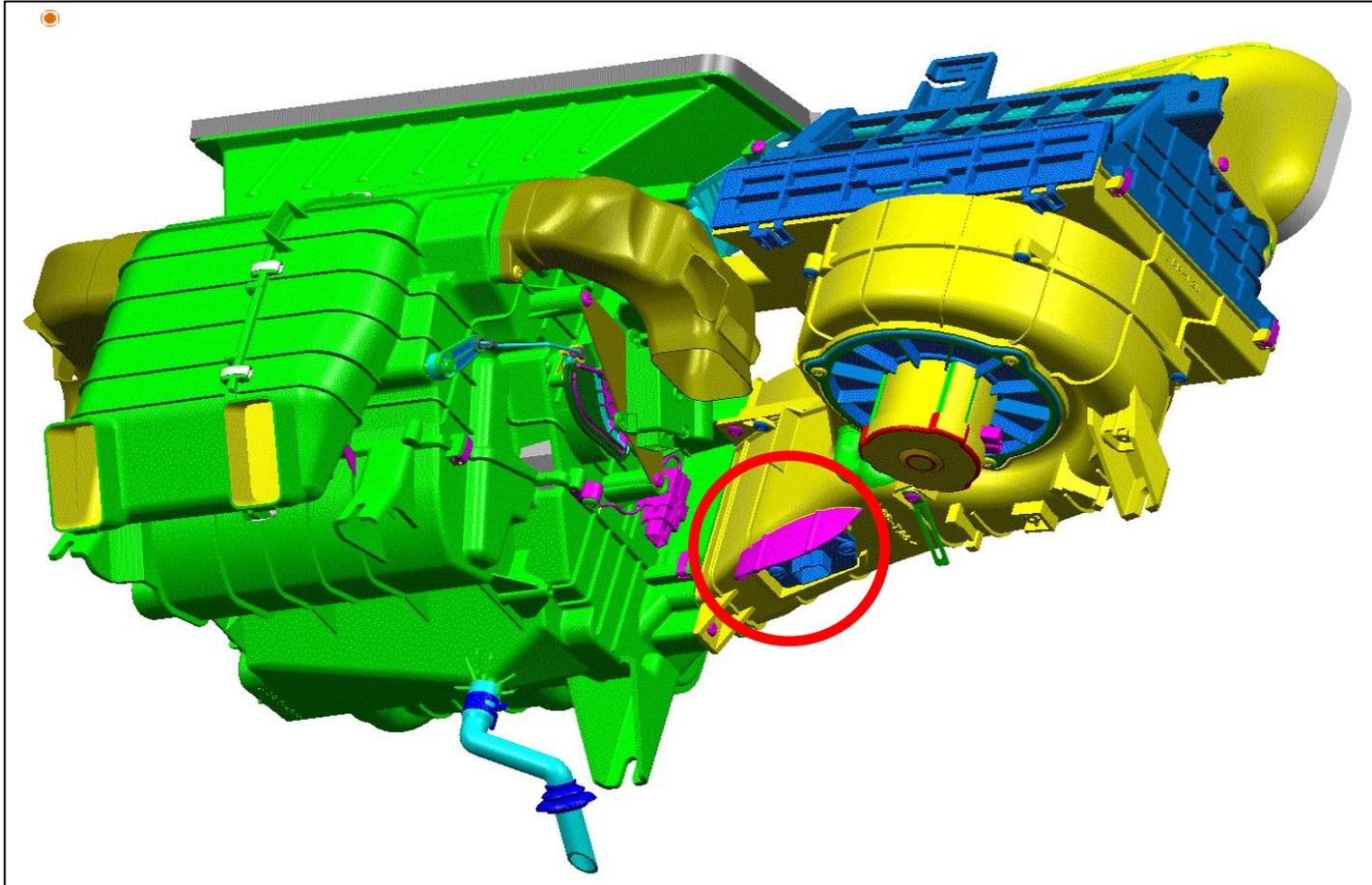
- ① Remove the glove box.
- ② Pull the locking part of the air filter cover



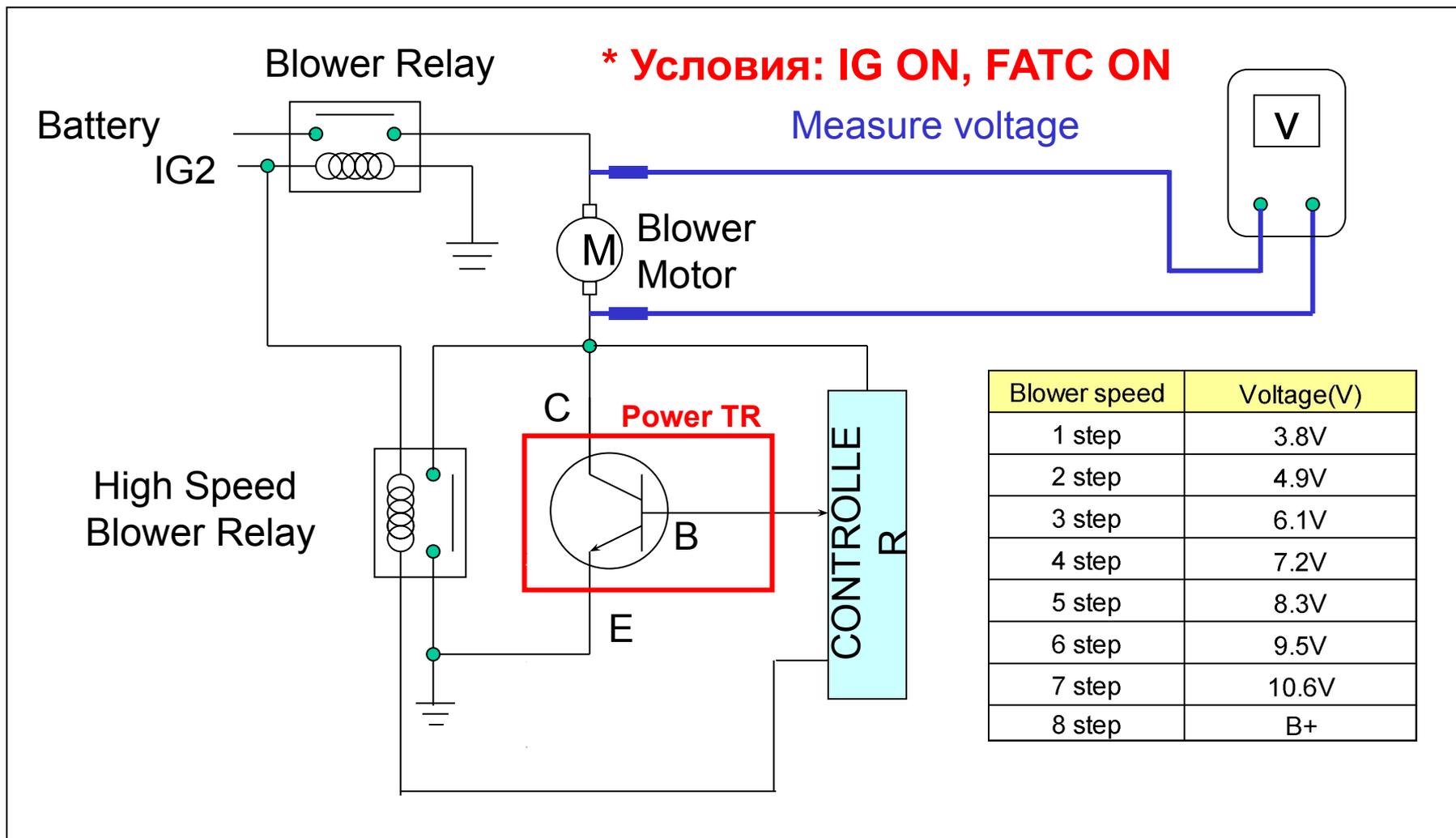


- ① Напряжение питания : 12V
- ② Без нагрузки
 - скорость : 3,300 rpm (min)
 - ток: 3.0A (max)
- ③ Температурный режим : -30°C ~ 80 °C

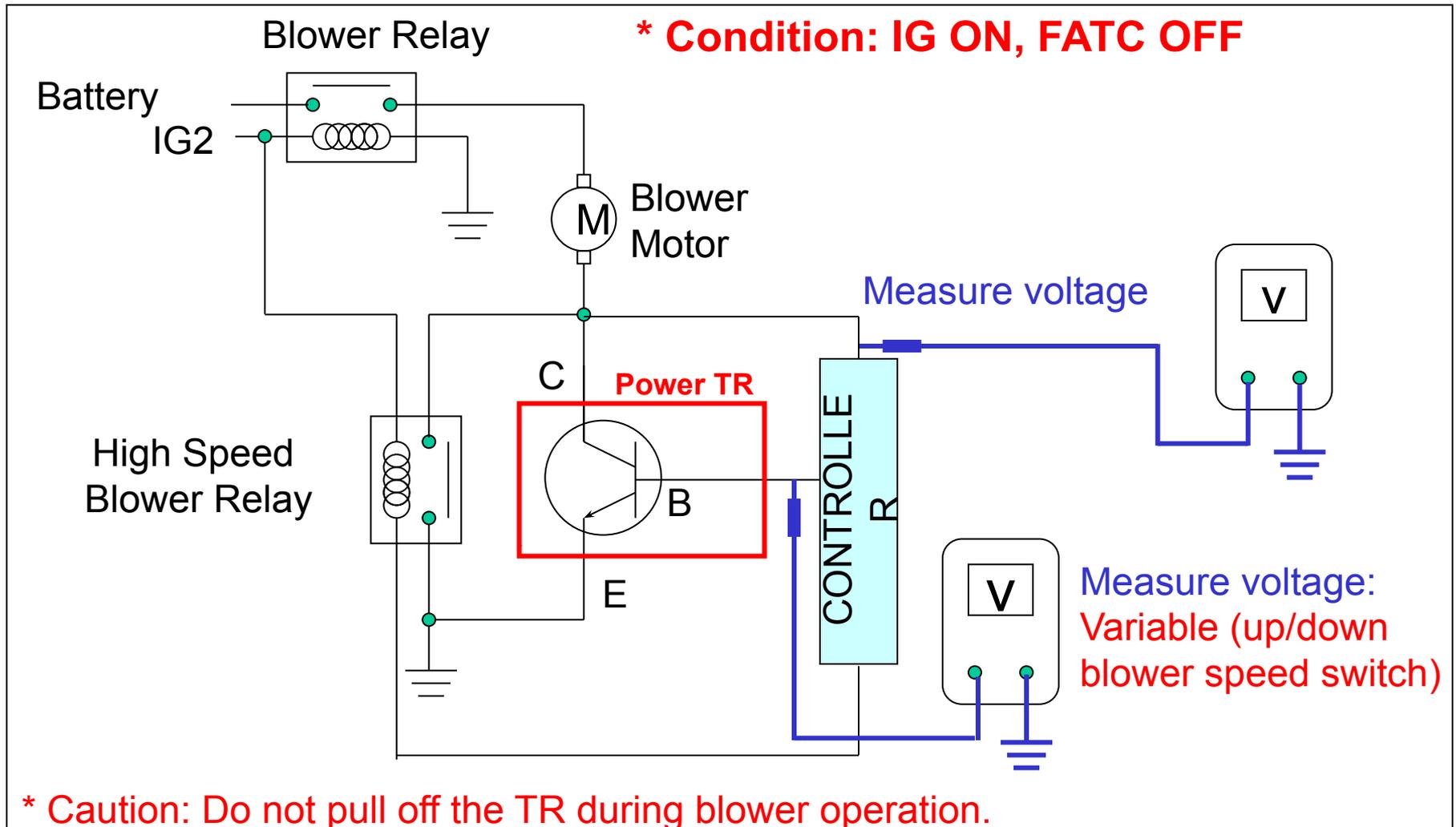
1. POWER TRANSISTOR



③ МЕТОД ПРОВЕРКИ ЭНЕРГОТРАНЗИСТОРА



④ POWER TRANSISTOR INSPECTION METHOD 2



ACTUATORS

OUTPUT ACTUATOR OPERATION & INSPECTION

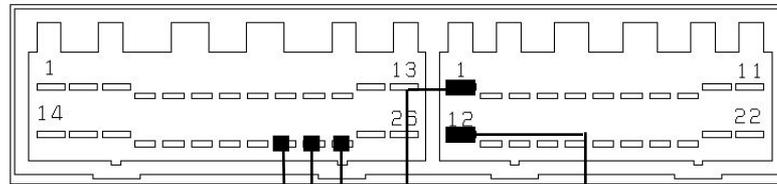
Intake Actuator Location





A

B



Terminal	Function
B-1	Sensor source (5V)
B-12	Sensor ground
A-24	Sensor feedback signal
A-23	Intake actuator(REC)
A-22	Intake actuator(FRE)

Intake actuator

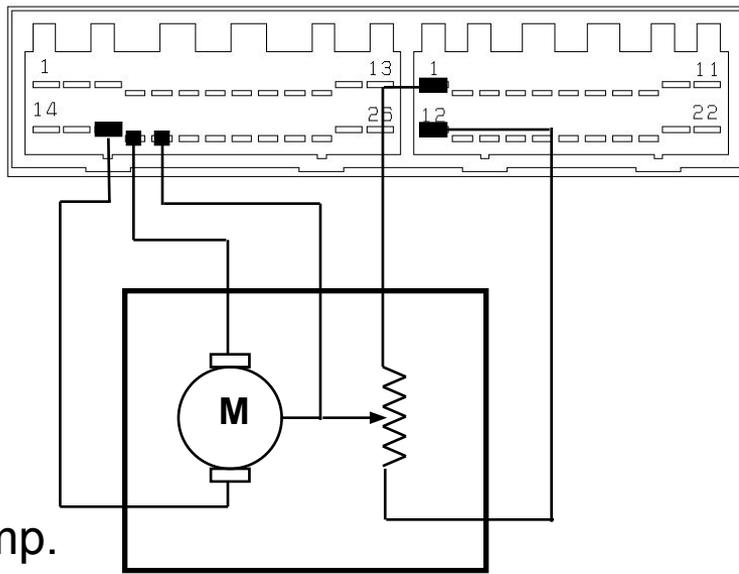
Temperature Control Door Actuator Location



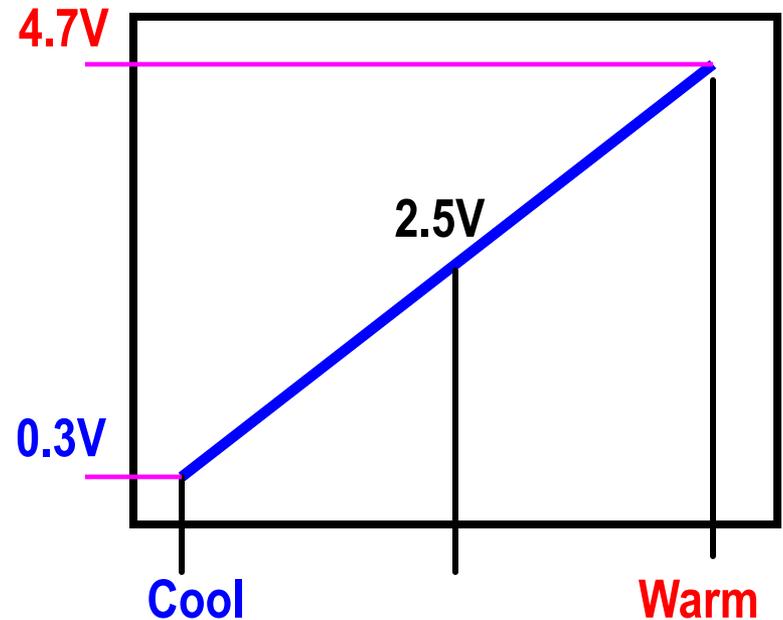


A

B



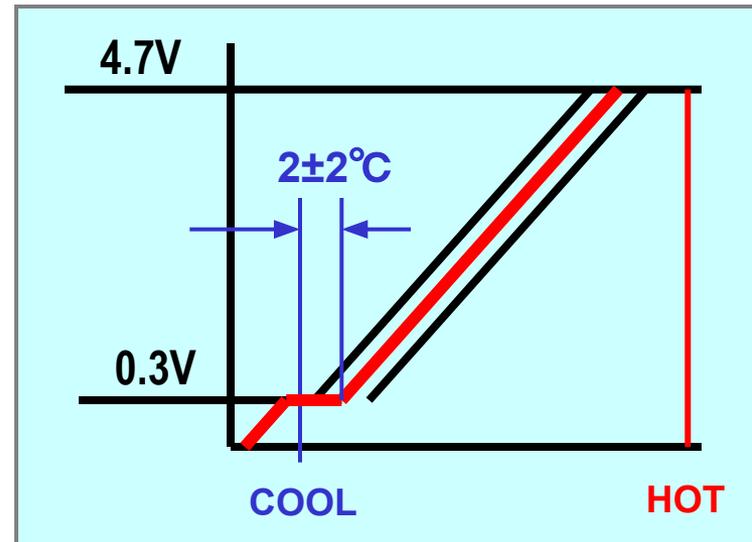
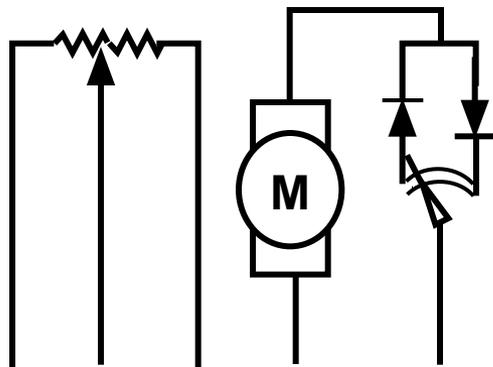
Temp.
actuator



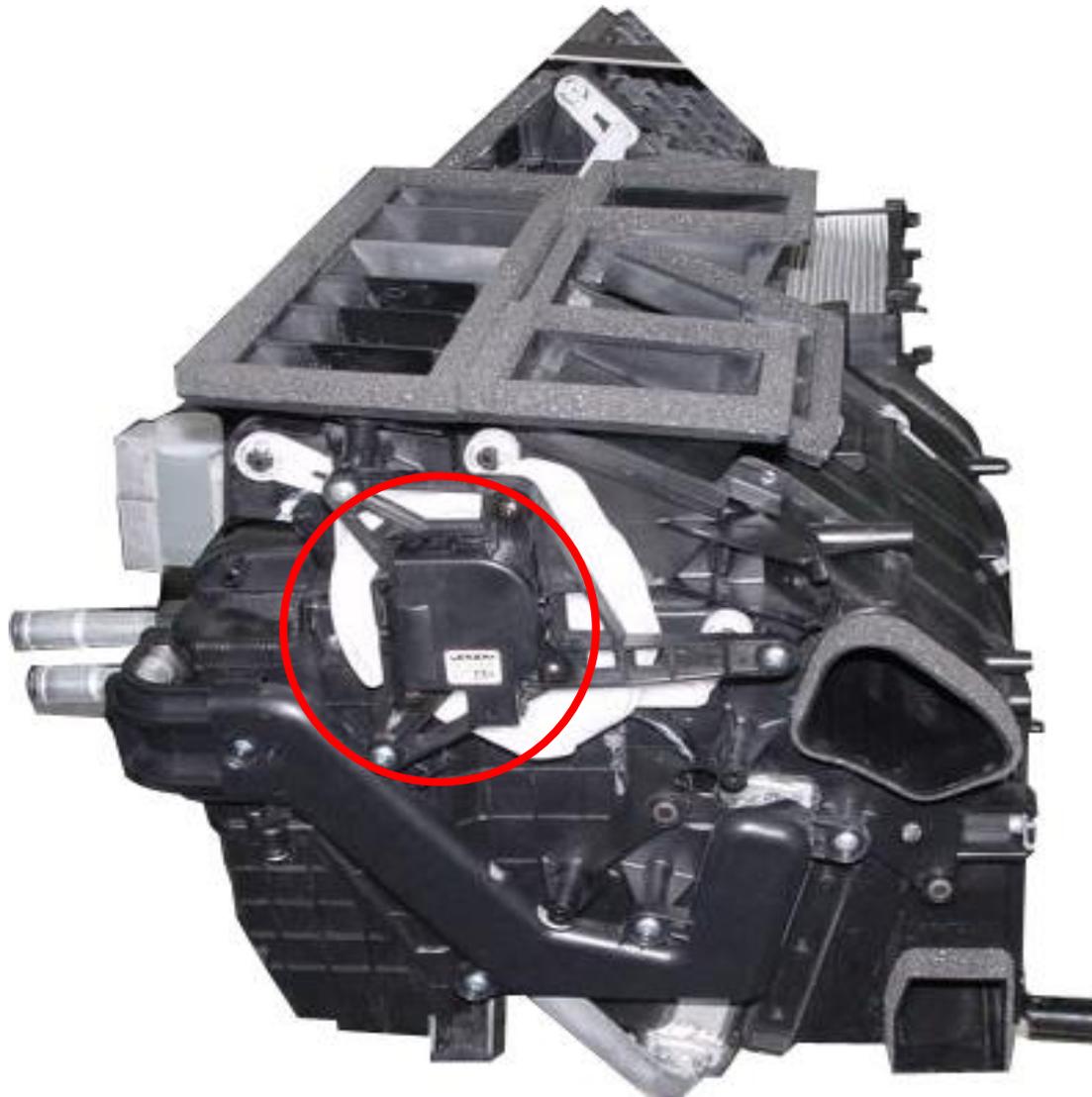
* Feedback line open or short: 17~24.5°C : MAX Cool

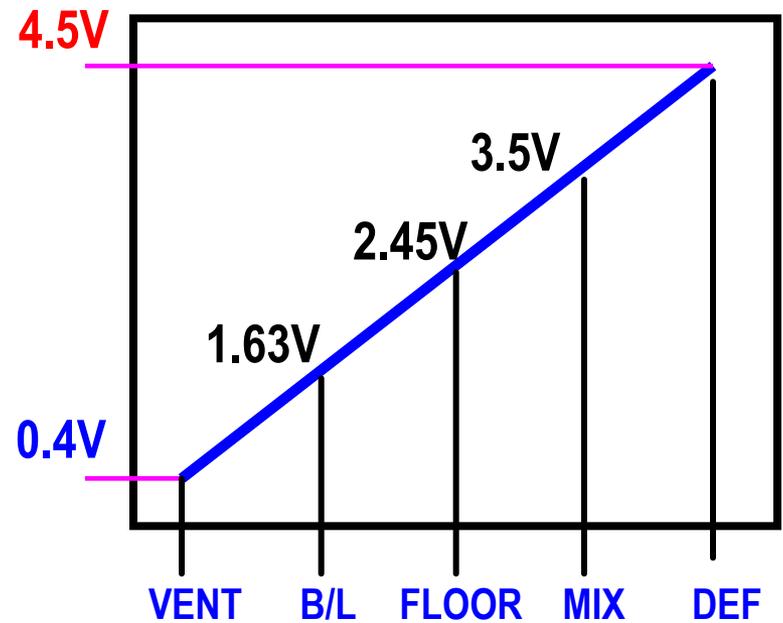
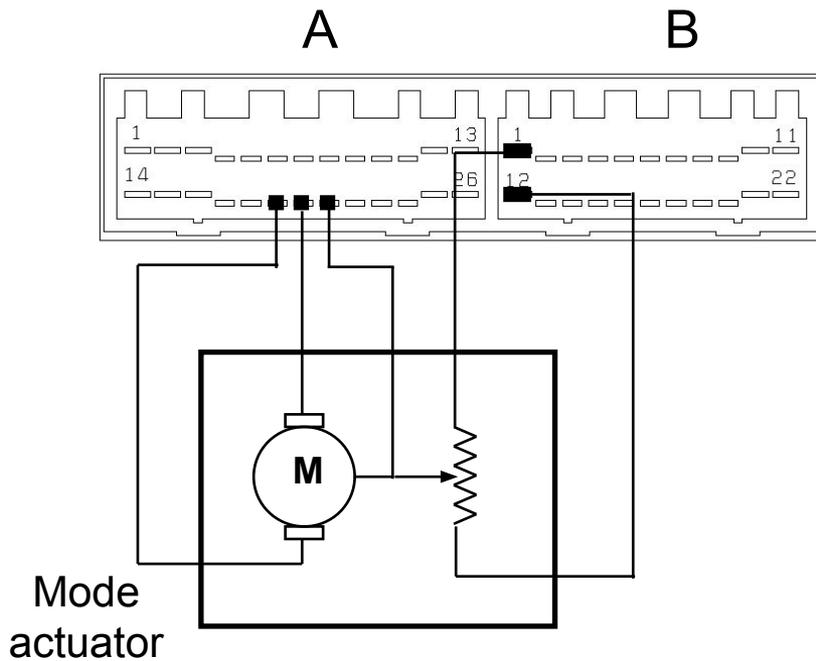
25~32°C : MAX Warm

TEMP DOOR ACTUATOR controls the position of the temperature blend door based on the voltage signal from the FATC module. Potentiometer inside actuator sends a feedback signal to the controller and controller cuts off the the voltage signal coming from the controller when the required door position is achieved.



[POTENTIOMETER CHARACTERISTICS]



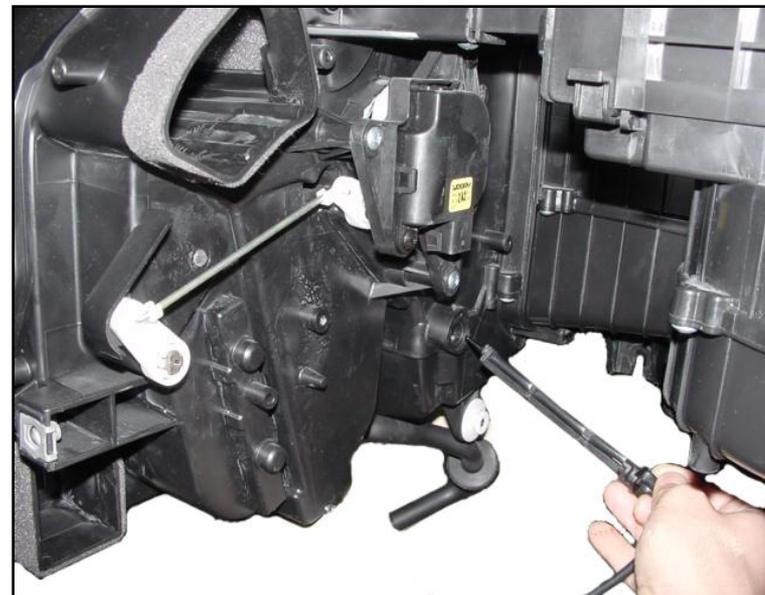


ДАТЧИКИ

Описание и расположение

Датчик установлен рядом с испарителем и определяет температуру на его поверхности. Он предотвращает обледенение испарителя.

Температура (°C)	Сопротивление (kΩ)
-30	176.34
-20	97.75
-10	55.85
0	32.91
20	12.51
40	5.31
60	2.48
80	1.25

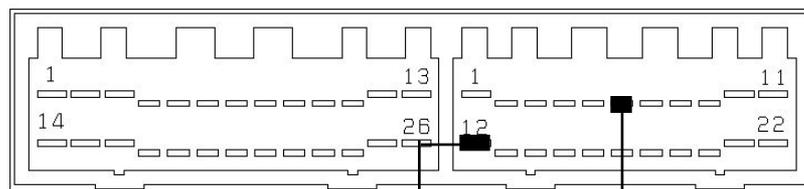


Температура включения/выключения: 2.1 ON, 0.6°C OFF

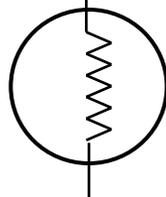


A

B

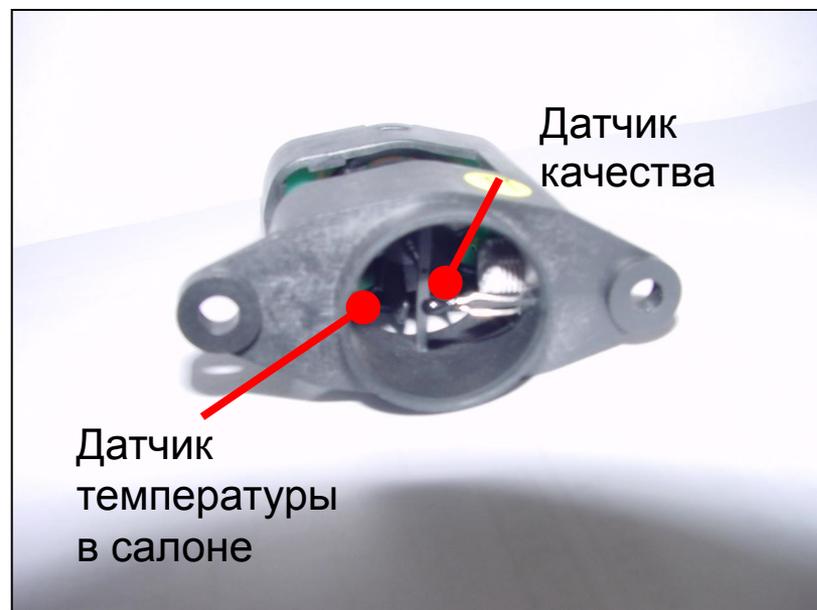


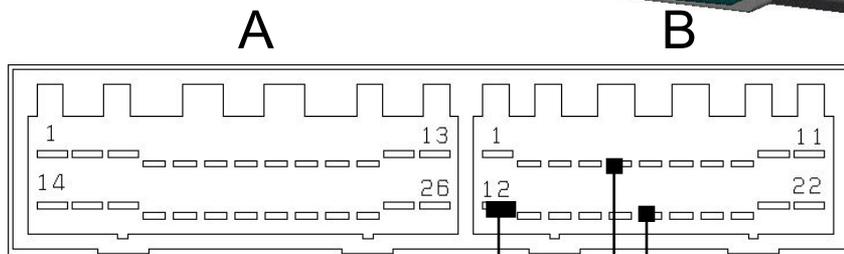
Термодатчик



Terminal	Function
B-6	Sensor source (5V)
B-12	Sensor ground

Датчик температуры воздуха в салоне расположен в нижней части приборной панели. Сигнал от встроенного термистора (сопротивление которого зависит от температуры) передается в виде соответствующего напряжения в ECU FATC.





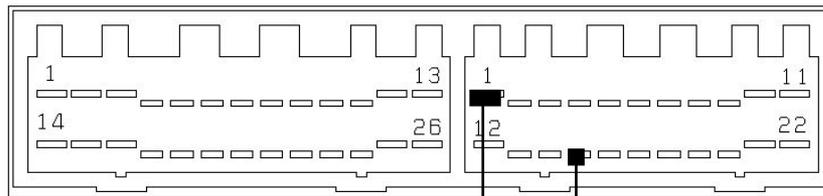
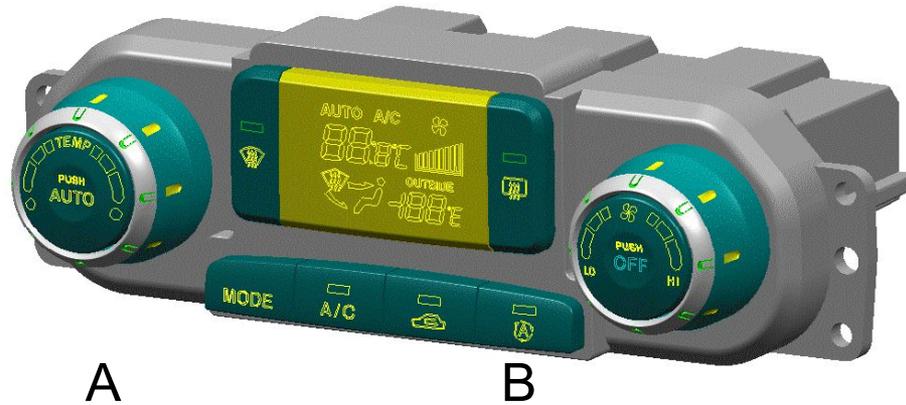
Terminal	Function
B-5	Sensor source (5V)
B-12	Sensor ground
B-17	Motor ground

Датчик в салоне

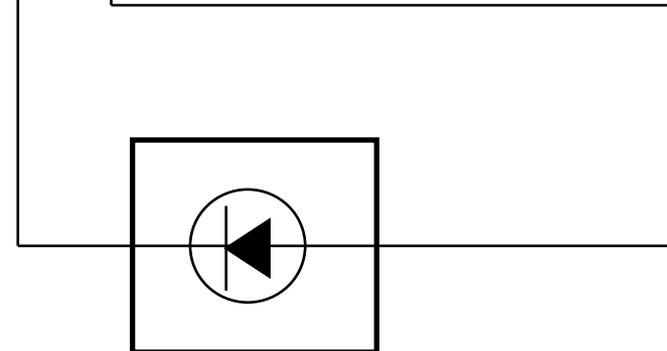
Датчик установлен в центре приборной панели.

Он содержит фотоэлектрический (чувствительный к солнечному излучению) диод.

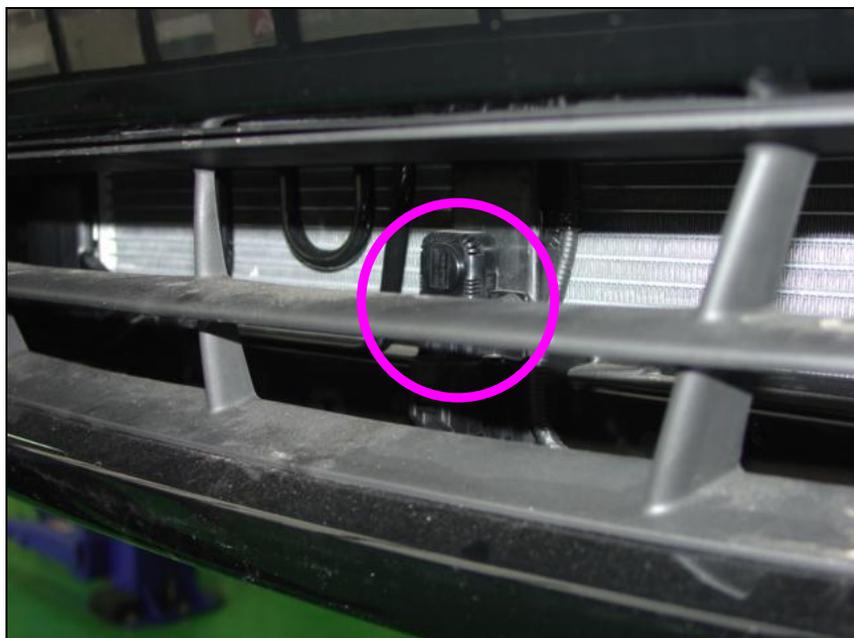




Terminal	Function
B-1	Sensor source (5V)
B-15	Sensor ground



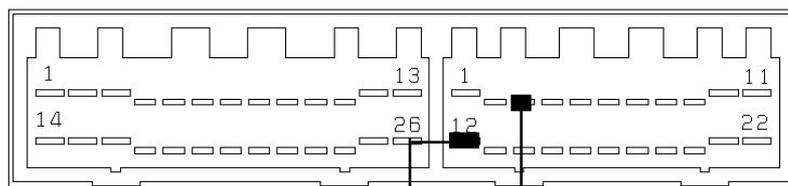
Датчик наружной температуры установлен перед конденсером, за фальшпанелью радиатора. Датчик определяет температуру наружного воздуха и посылает электрический сигнал в блок управления.



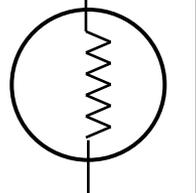


A

B

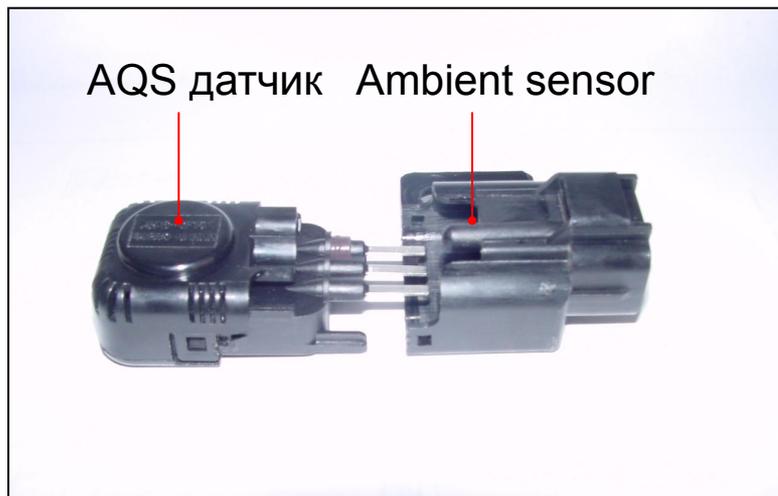


Датчик температуры



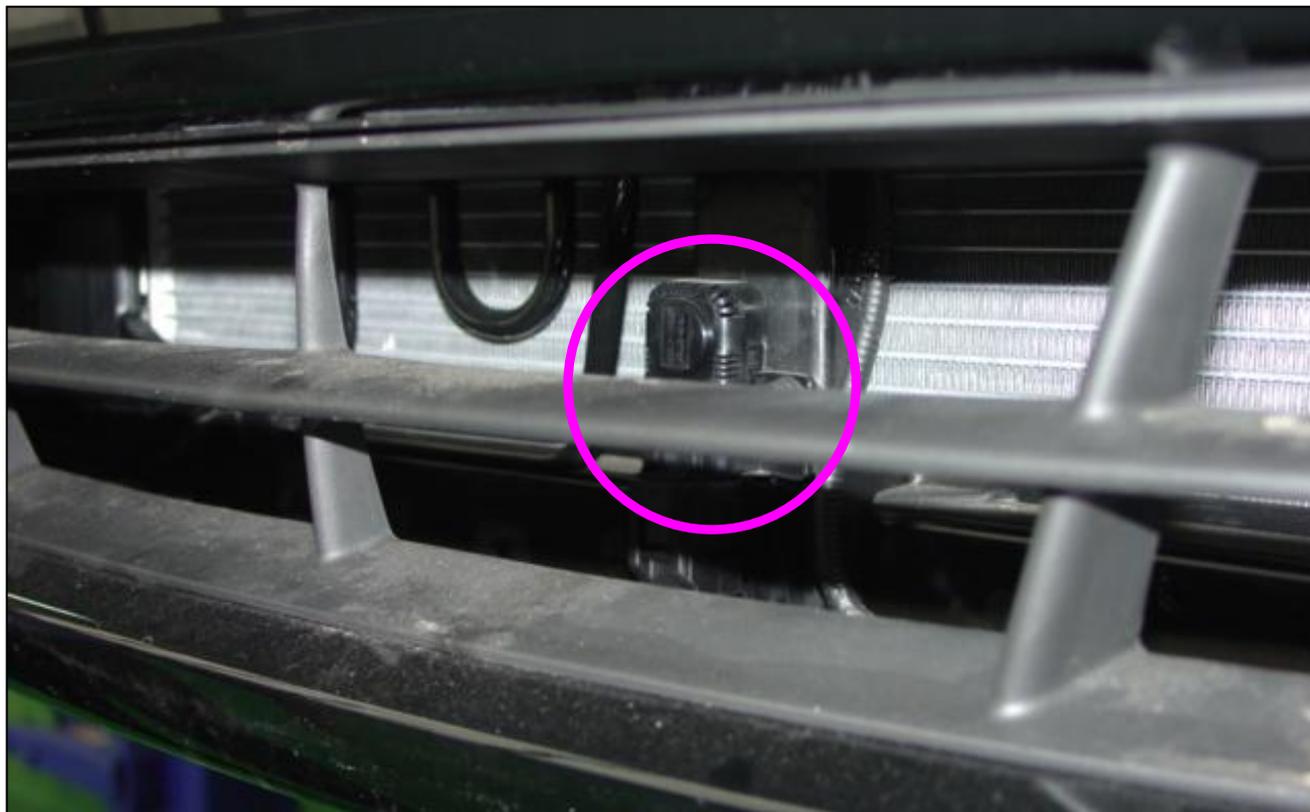
Характеристика датчика

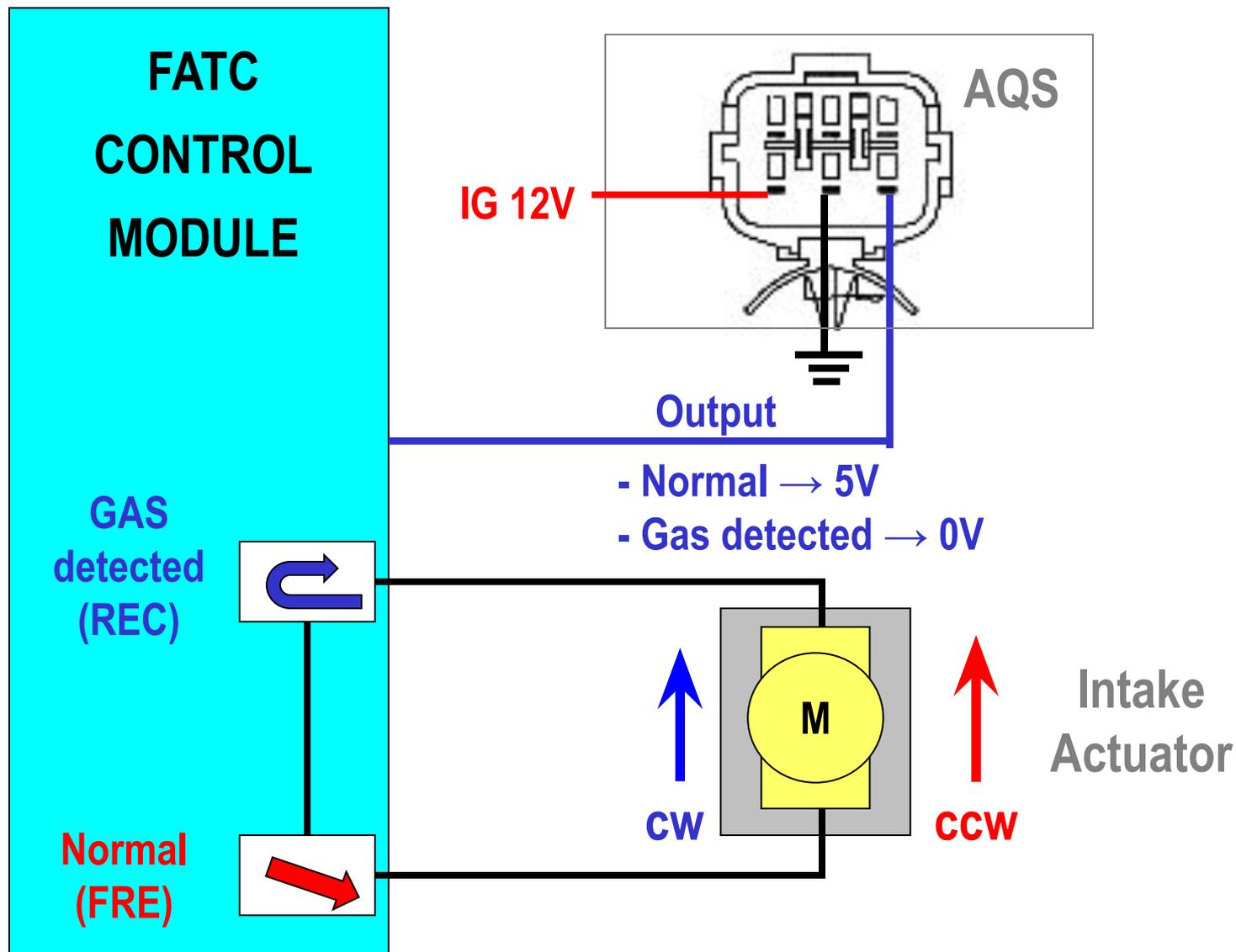
Temp(°C)	R min(KΩ)	R mid(KΩ)	R max(KΩ)
-20	280.25	290.17	300.39
0	95.52	97.83	100.18
25	29.64	30.00	30.36
50	10.58	10.82	11.06
80	3.66	3.78	3.91



Датчик качества воздуха определяет превышение содержания вредных веществ, присутствующих вокруг автомобиля, и подает сигнал на ECU для управления заслонкой рециркуляции воздуха. Заслонка рециркуляции может управляться автоматически (посредством информационного сигнала от AQS) или принудительно.

Характеристика датчика		
Рабочее напряжение	9 ~ 16V DC	
Номинальное напряжение	12V DC	
Рабочая температура	-30 ~ +105°C	
Определяемый газ	Бензин	CXHY, CO, C6H6...
	Дизель	NOX, SO2
Время реакции	Менее 1 секунды	



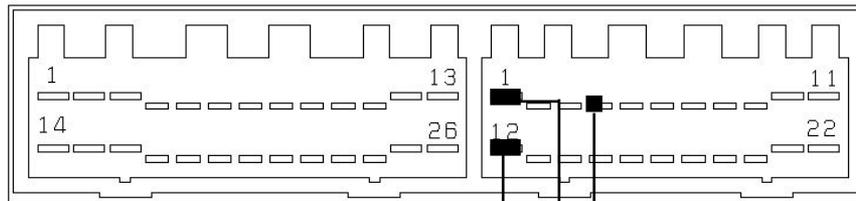
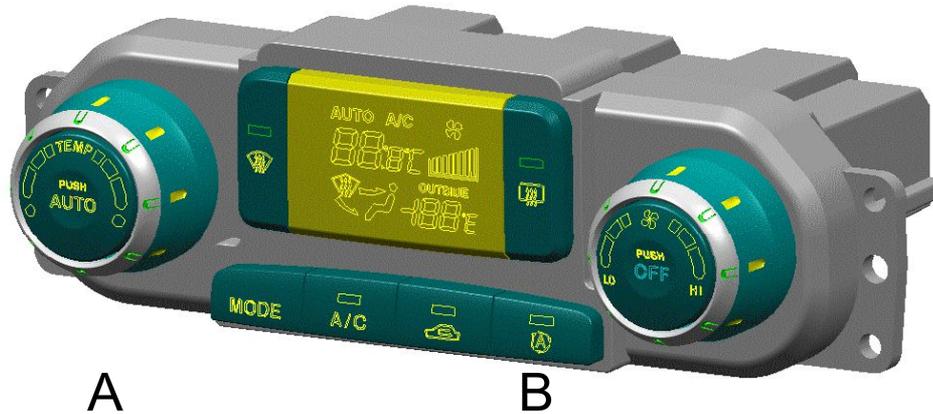




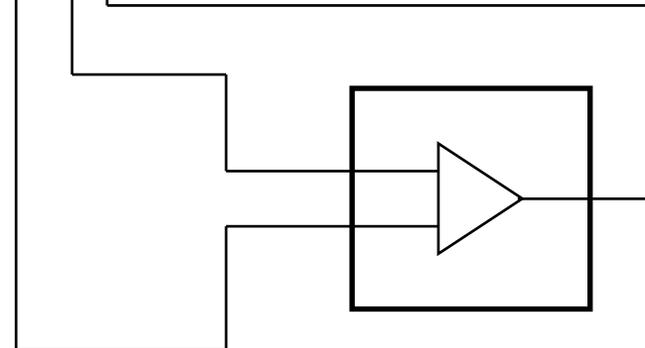
Humidity sensor detects the relative humidity of the car's cabin. This sensor converts it into the voltage signal and sends the signal to the FATC controller.

1. SENSOR CHARACTERISTICS

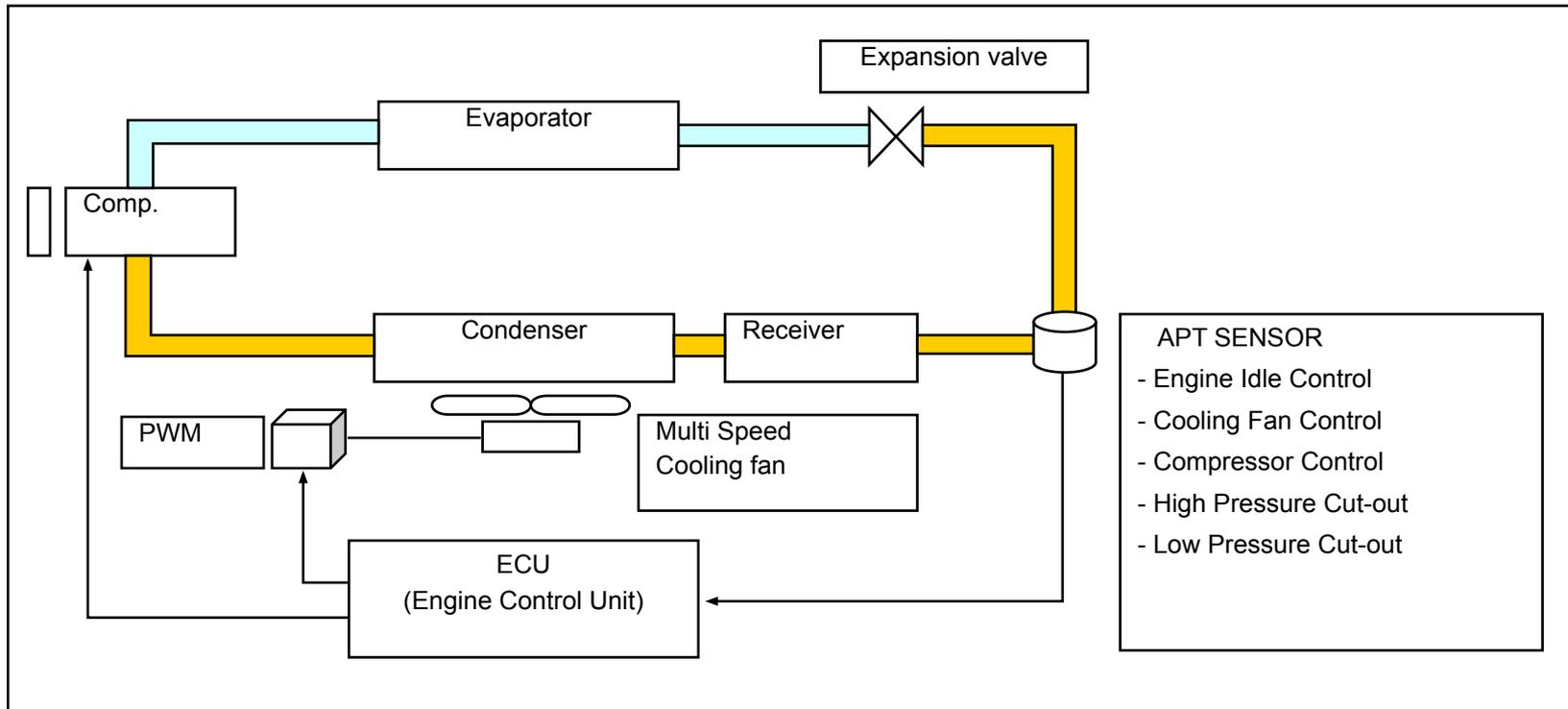
%RH ref	SPECIFICATION(Hz)
10	7060
20	6950
30	6855
40	6750
50	6645
60	6540
70	6410
80	6275
90	6100



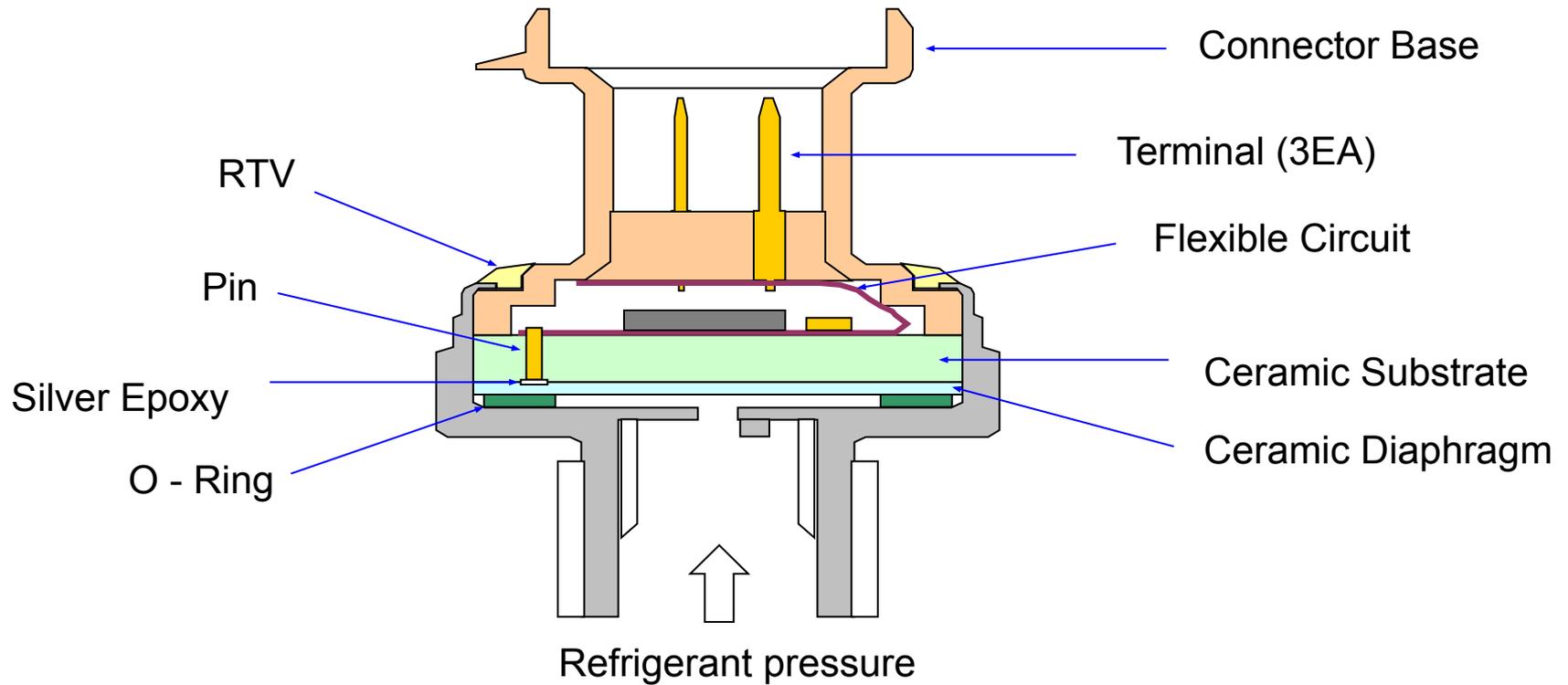
Terminal	Function
B-1	Sensor source (5V)
B-4	Sensor input(5~10hz)
B-12	Sensor ground



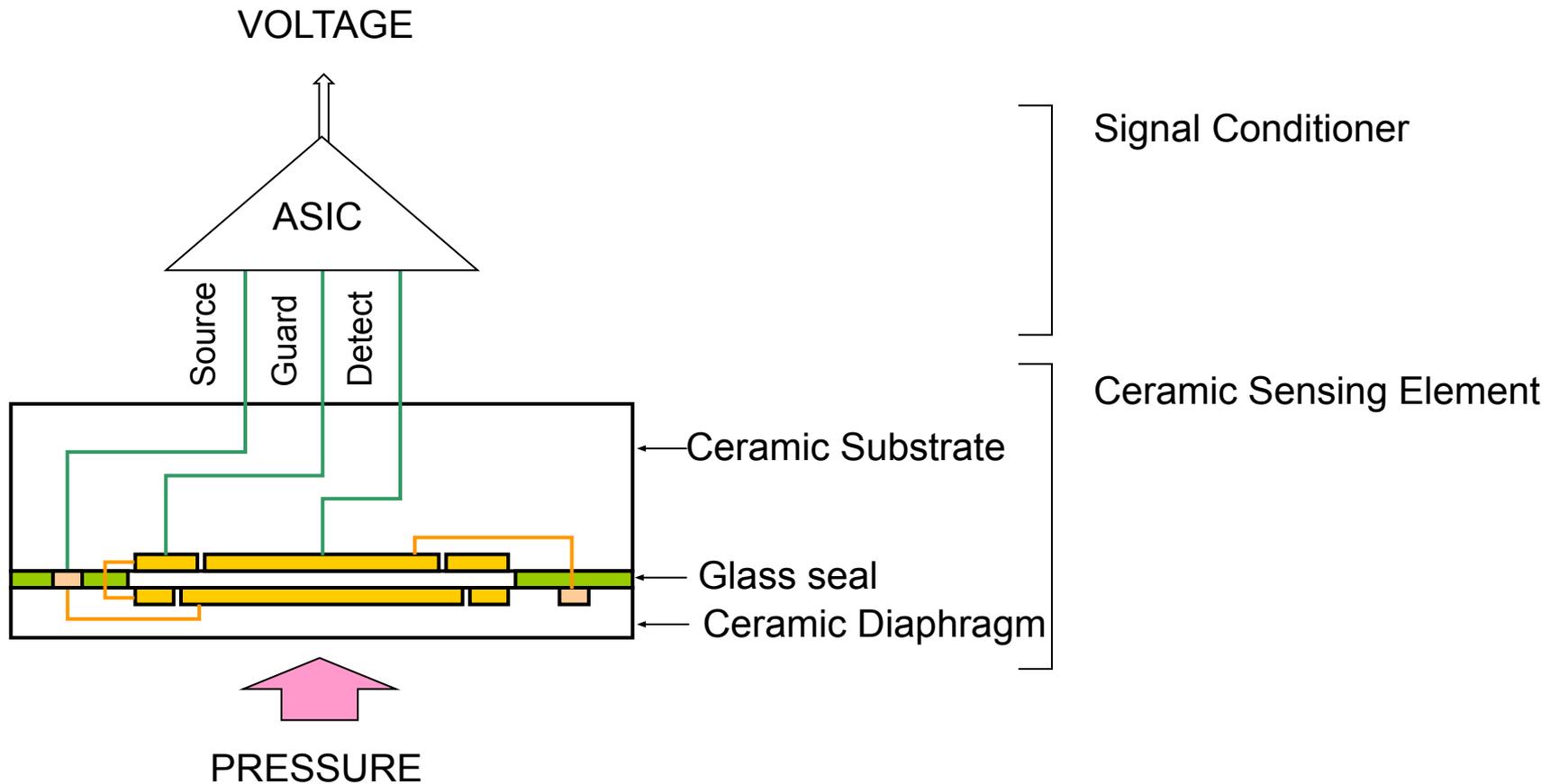
The APT (Automotive Pressure Transducer) is a capacitive-based sensor, it senses the pressure of the refrigerant that provides a linear voltage output directly proportional to applied pressure.

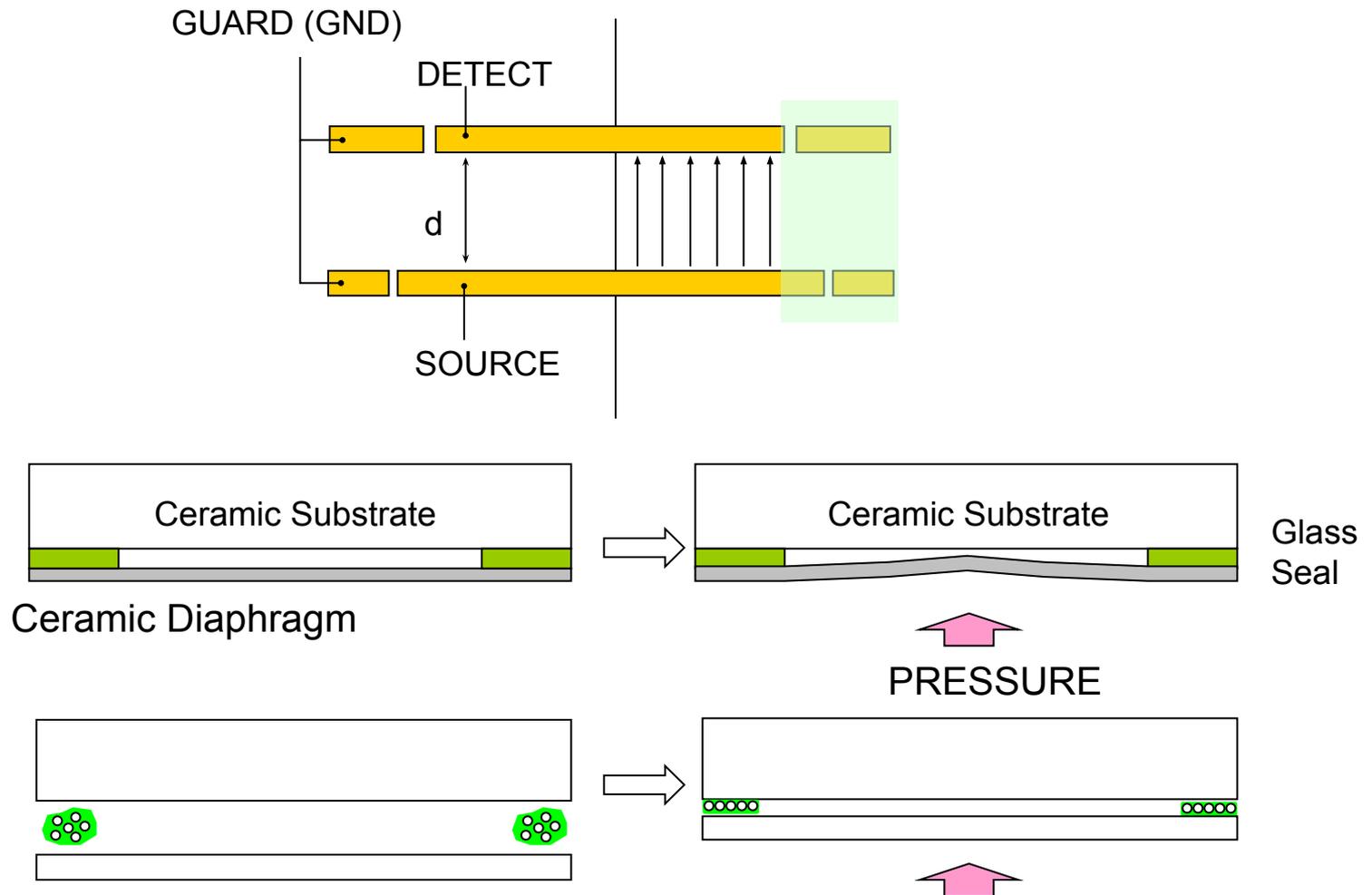




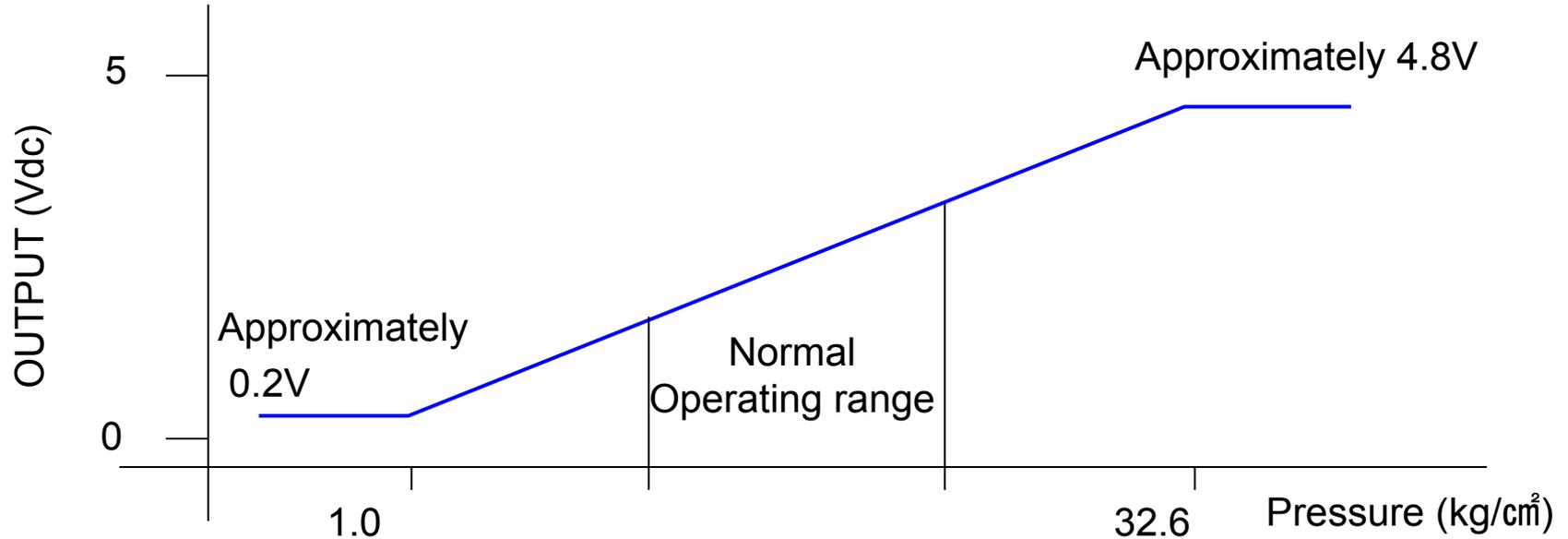


- * Flexible circuit changes the pressure to voltage.
- * Ceramic diaphragm detects the refrigerant pressure.





* The main function of APT sensor is detecting the refrigerant pressure (distance d).

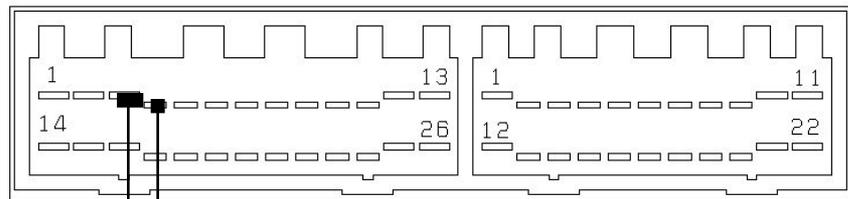


- A. There is 0.2V(not 0V), if the refrigerant line pressure has gone to 0, for communication to engine ECM. (0V means poor contact or open circuit)
- B. There is 4.8V, even if the line pressure is over the standard value (high pressure). (5V means short circuit)

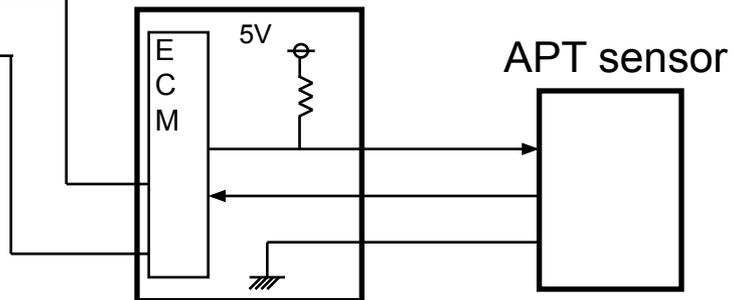


A

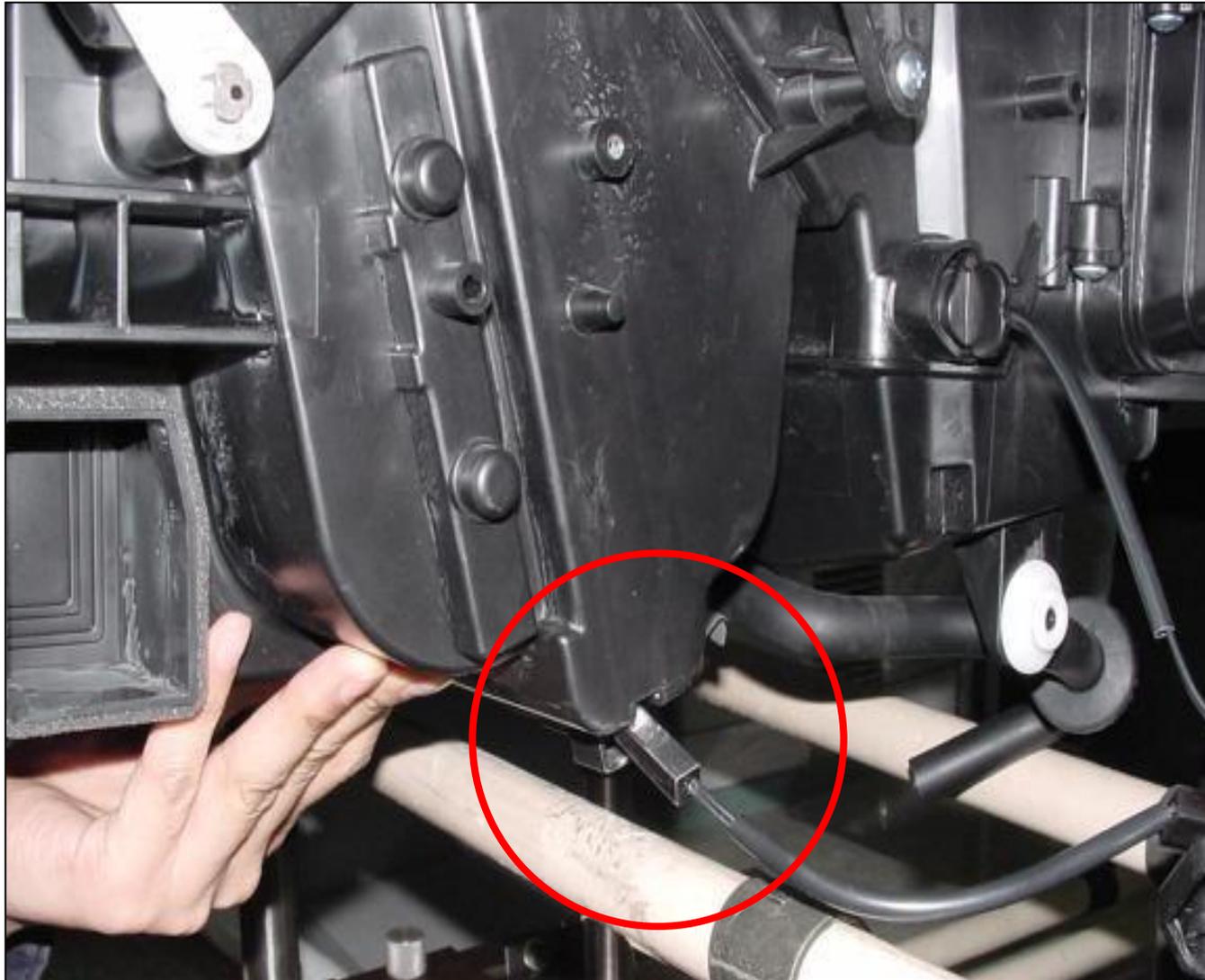
B



Terminal	Function
A-3	A/C operating signal(12V)
A-4	A/C switch signal(12V)



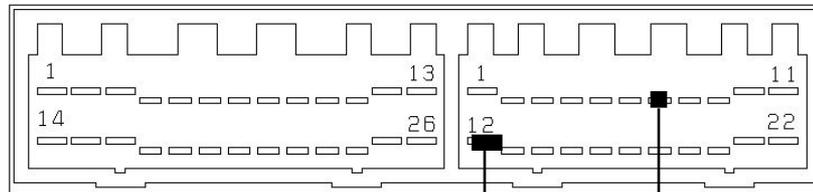
WATER TEMPERATURE SENSOR



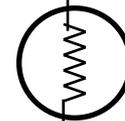


A

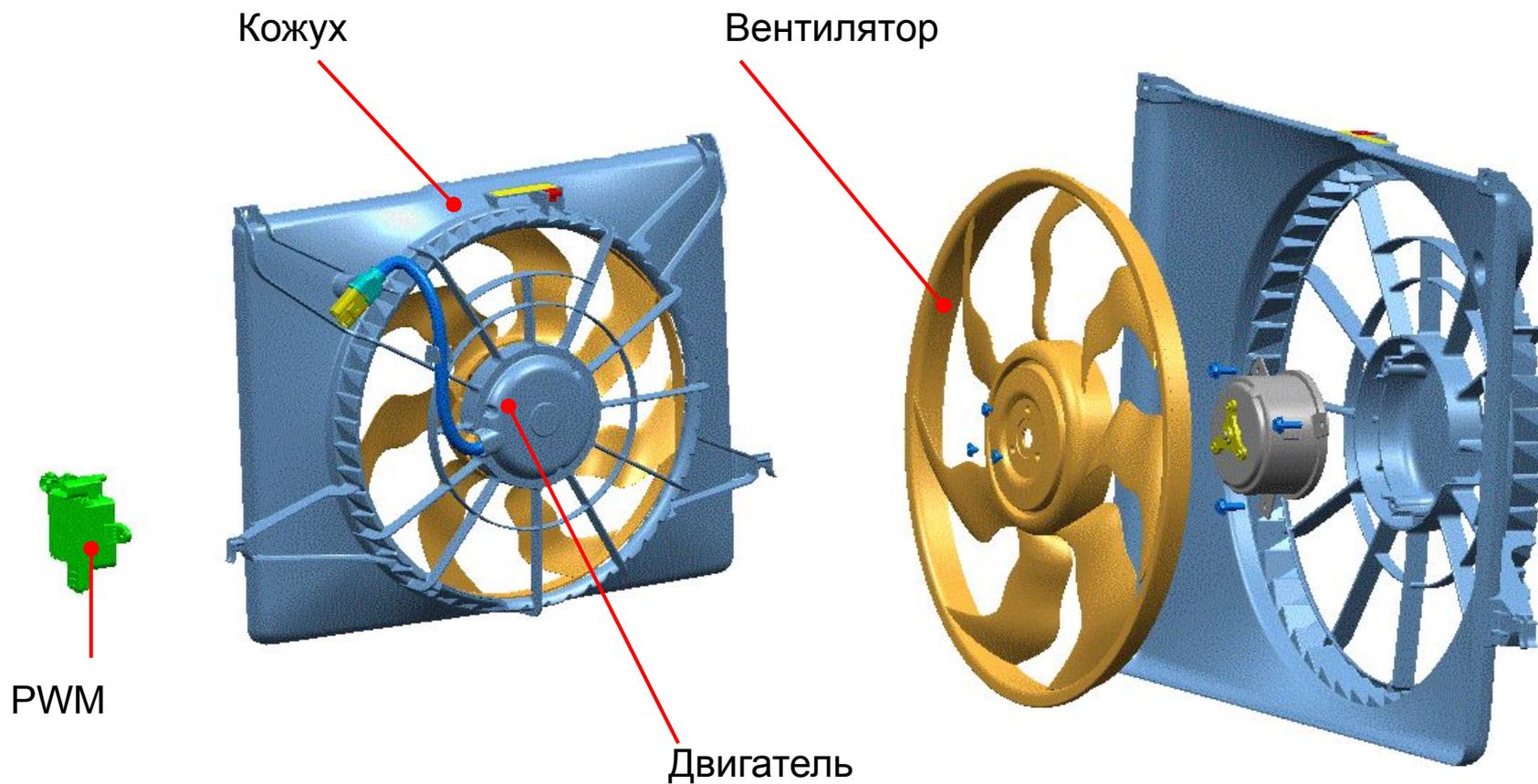
B



Terminal	Function
B-7	Sensor source(5V)
B-12	Sensor ground



Датчик температуры охлаждающей жидкости



A/Con switch	Pressure switch	Vehicle speed(KPH)	Engine coolant temperature(°C)									
			-30	82	94	96	98	101	103	105	109	115
OFF	-	V < 45	10		35		40	50	60	70	80	90
		45 ≤ V < 80	10			40	50					
		80 < V	10									
ON	Pressure < Middle 1	V < 45	10	30	35	40	50	60	80	90		
		45 ≤ V < 80	10			40	50					
		80 < V	10									
	Middle 1 ≤ Pressure < Middle 2	V < 45	70							80	90	
		45 ≤ V < 80	10	40			50	60				
		80 < V	10									
Middle 2 ≤ Pressure	ALL	90										

Air conditioner pressure	ON
Middle 1	12.0kgf/cm2
Middle 2	15.5kgf/cm3

* 1.0kgf/cm2 = 14.22 psi

Изменение настройки: °C  °F



1. In-car temperature correction

When the in-car sensor detects a sudden steep temperature change, controller corrects the temperature differences slowly.

- 1°C up / 4sec delay
- 1°C down / 4sec delay

2. Ambient temperature correction

When the ambient sensor detects a sudden steep temperature change, controller corrects the temperature differences slowly.

- 1°C up / 3 min delay (ex. Underground, tunnel)
- 1°C down / 4sec delay

3. Heat radiation correction

When the photo sensor detects a sudden steep solar radiation change, controller compensates it slowly.

- 350 → 1000 (W/m²) / 1 min delay
- 350 ← 1000 (W/m²) / 5 min delay

4. Temp. door control

Temp. door angle (0% ~ 100%) is automatically controlled according to the selected temperature and other sensor signals.

: Available selected temperature range

- MAX COOL: 17°C
- MAX HOT: 32°C
- 17°C ↔ 32°C, 0.5°C step (62°F ↔ 90°F, 1°F step)

5. Blower speed control

- AUTO mode: linear control
- MANUAL mode: 7 step control

6. Mode control

- AUTO: Mode changes automatically according to the selected temperature and other sensor signals.
- Manual: Mode changes when the mode switch is selected.

VENT → B/L → FLOOR → MIX → VENT

7. Intake door mode

- The Fresh/ Recirculation door state can be changed at AUTO mode according to the input data combination.

8. Compressor ON/OFF control (AUTO mode)

- Fin sensor: lower 0.5°C ▶ Compressor OFF
over 3°C ▶ Compressor ON

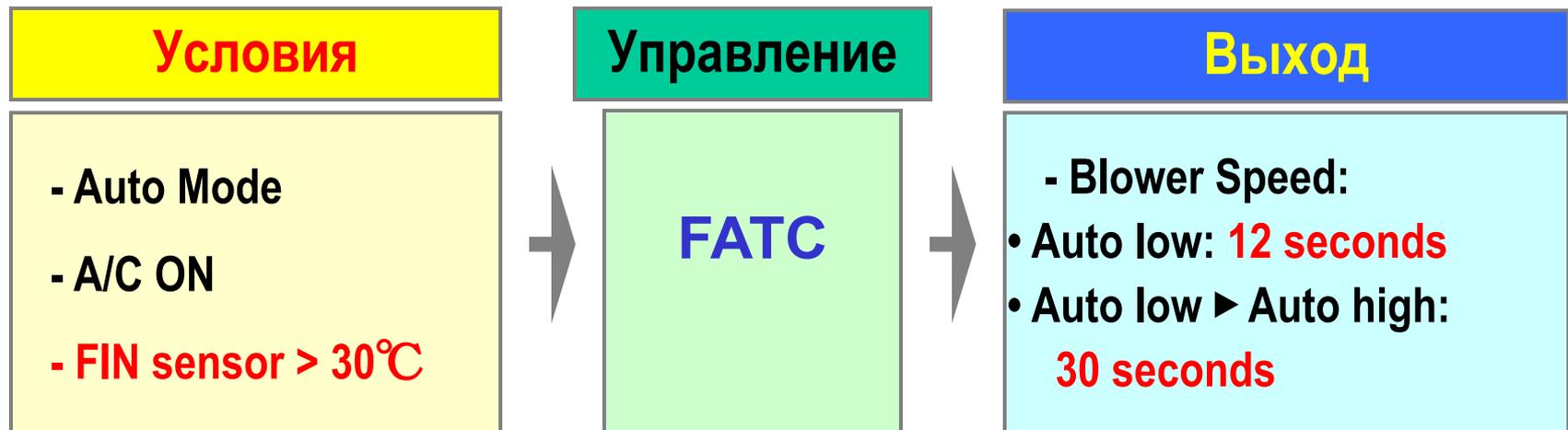
9. Max. Warm function (When 32°C is selected at AUTO mode)

- ▶ Temp door: Max. Warm side
- ▶ Mode door: Floor mode
- ▶ Intake door: Fresh mod
- ▶ Compressor: Off
- ▶ Blower speed: Auto high

10. Max. Cool function (When 17°C is selected at Auto mode)

- ▶ Temp door: Max. Cool side
- ▶ Mode door: VENT mode
- ▶ Intake door: REC mode
- ▶ Compressor: ON
- ▶ Blower speed: Max. High

11. Warm Air Prevention Function (Initial A/C operation)



12. Функция CELO (COLD ENGINE LOCK OUT)

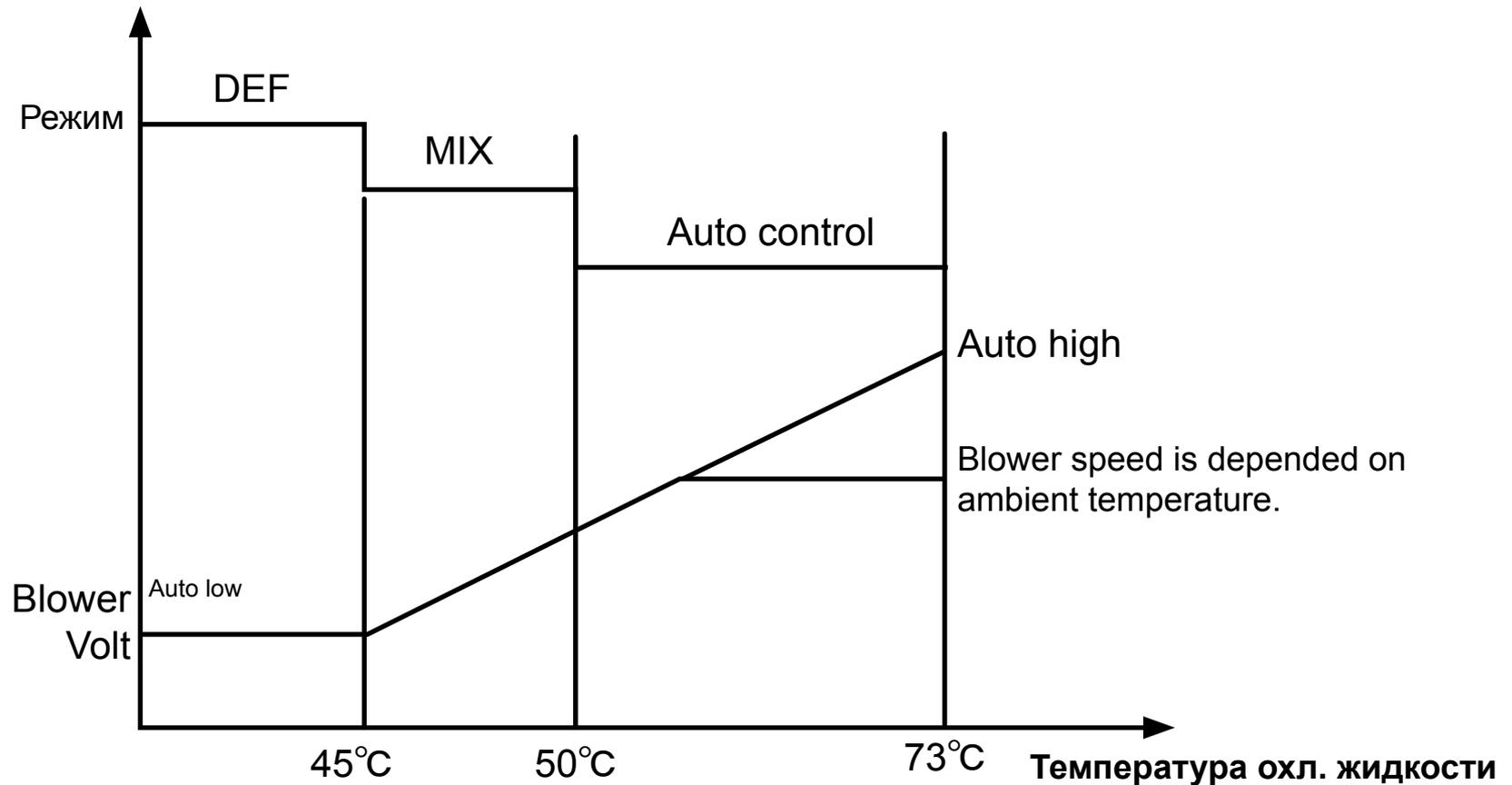
Условия функционирования

1. Температура наружного воздуха $< 10\text{ }^{\circ}\text{C}$
2. Температура охлаждающей жидкости: ниже $73\text{ }^{\circ}\text{C}$
3. Режим: Auto or Floor
4. Вентилятор: Auto

Условия выключения функции

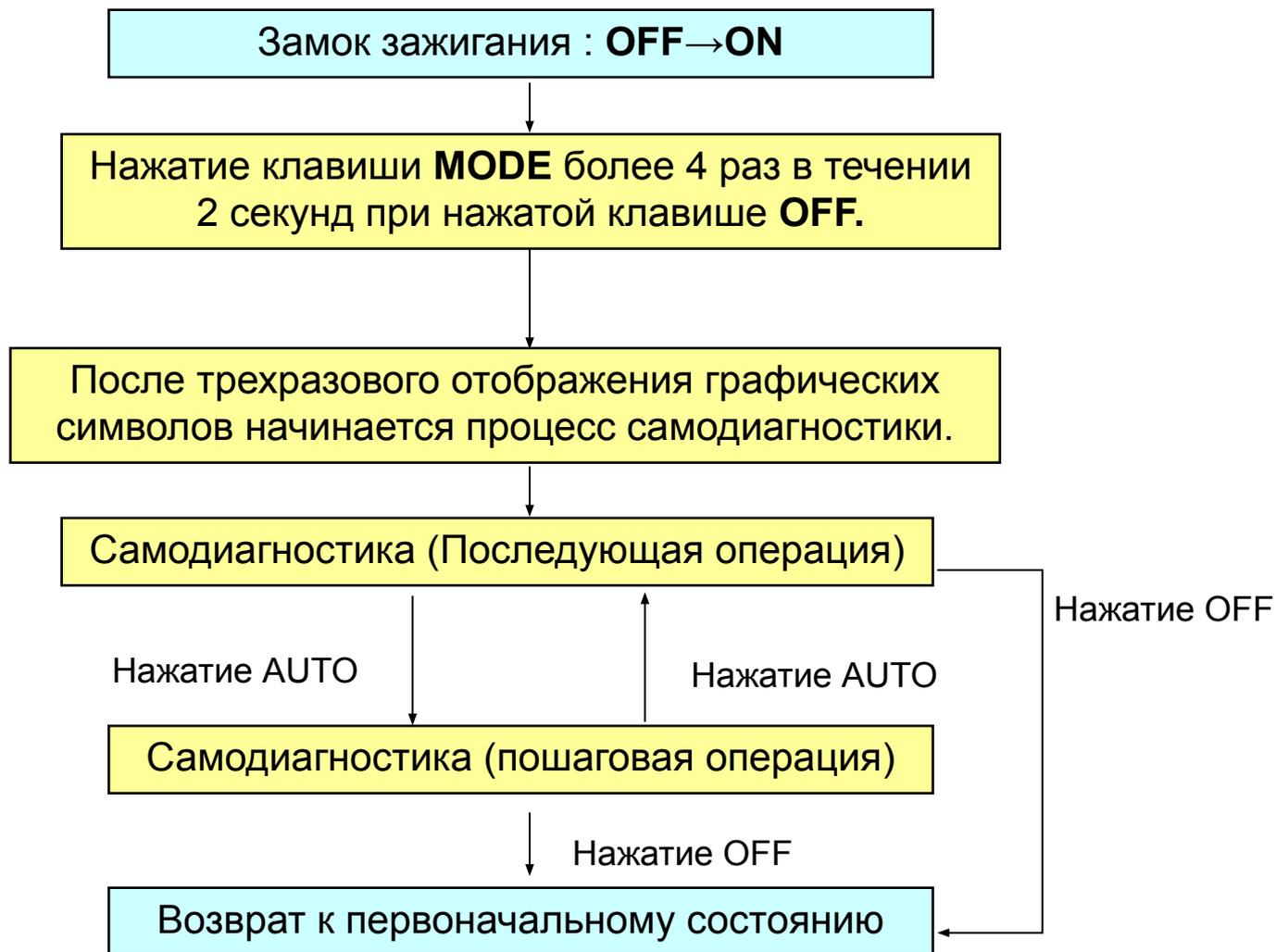
- Когда пользователь нажимает клавишу DEF.
- Когда пользователь выбирает максимальное охлаждение салона ($17\text{ }^{\circ}\text{C}$).
- Когда температура охлаждающей жидкости становится выше $73\text{ }^{\circ}\text{C}$

12. Функция CELO (COLD ENGINE LOCK OUT)



13. MIX / Defrost control

1. Mode door: Mix or Def
2. Intake door: Fresh mode (REC mode can be selected.)
3. Compressor: - It depends on the evaporator temperature.
 - If ambient temperature is below 3.5 °C, A/C OFF.
(General market)
 - * On (North America market only)
4. Def function has higher Priority than Max. Hot/Cool function.
5. Def function has higher Priority than Mix Mode.



DTC LIST & FAILSAFE

DTC Code	Description	Failsafe
00	Normal	-
11	Open In-car sensor circuit	25 °C Fixed
12	Short In-car sensor circuit	
13	Open Ambient sensor circuit	20 °C Fixed
14	Short Ambient sensor circuit	
15	Open Water temp. sensor circuit	- 2 °C Fixed
16	Short Water temp. sensor circuit	
17	Open Fin sensor circuit	- 2 °C Fixed
18	Short Fin sensor circuit	
19	Open or shorted Temp. door potentiometer	Setting temp. 17~24.5 °C : MAX Cool Setting temp. 25~32 °C : MAX Hot
20	Defective Temp. door potentiometer	
21	Open or shorted Mode door potentiometer	Vent mode : Vent mode Fixed Other mode : Def mode Fixed
22	Defective Mode door potentiometer	
23	Open Humidity sensor circuit	Humidity 10% Fixed
24	Short Humidity sensor circuit	
25	Open or shorted Intake door potentiometer	FRE mode: FRE mode Fixed REC mode: REC mode Fixed
26	Defective Intake door potentiometer	
27	Open AQS sensor circuit	AQS OFF Intake door: Maintain intake door condition just before select AQS switch
28	Short AQS sensor circuit	
31	Defective AQS sensor	

Использование Hi-scan pro



NO	DTC	DTC ITEM	NO	DTC	DTC ITEM
1	B1200	HUMIDITY SENSOR-OPEN	12	B1246	TEMP. DOOR FEEDBACK- SHORT
2	B1201	HUMIDITY SENSOR-SHORT	13	B1249	MODE DOOR FEEDBACK-OPEN
3	B1202	WATER TEMP. SENSOR-OPEN	14	B1250	MODE DOOR FEEDBACK-SHORT
4	B1203	WATER TEMP. SENSOR-SHORT	15	B2406	DEFECTIVE TEMP DOOR MOTOR
5	B1233	INCAR TEMPERATURE SENSOR-SHORT	16	B2409	DEFECTIVE MODE DOOR MOTOR
6	B1234	INCAR TEMPERATURE SENSOR-OPEN	17	B1208	INTAKE DOOR FEEDBACK-OPEN
7	B1237	AMBIENT TEMPERATURE SENSOR-SHORT	18	B1209	INTAKE DOOR FEEDBACK-SHORT
8	B1238	AMBIENT TEMPERATURE SENSOR-OPEN	19	B2408	DEFECTIVE INTAKE DOOR MOTOR
9	B1241	FIN THERMO SENSOR-SHORT	20	B1257	AQS SENSOR -OPEN
10	B1242	FIN THERMO SENSOR-OPEN	21	B1258	AQS SENSOR - SHORT
11	B1245	TEMP. DOOR FEEDBACK-OPEN	22	B1259	DEFECTIVE AQS SENSOR