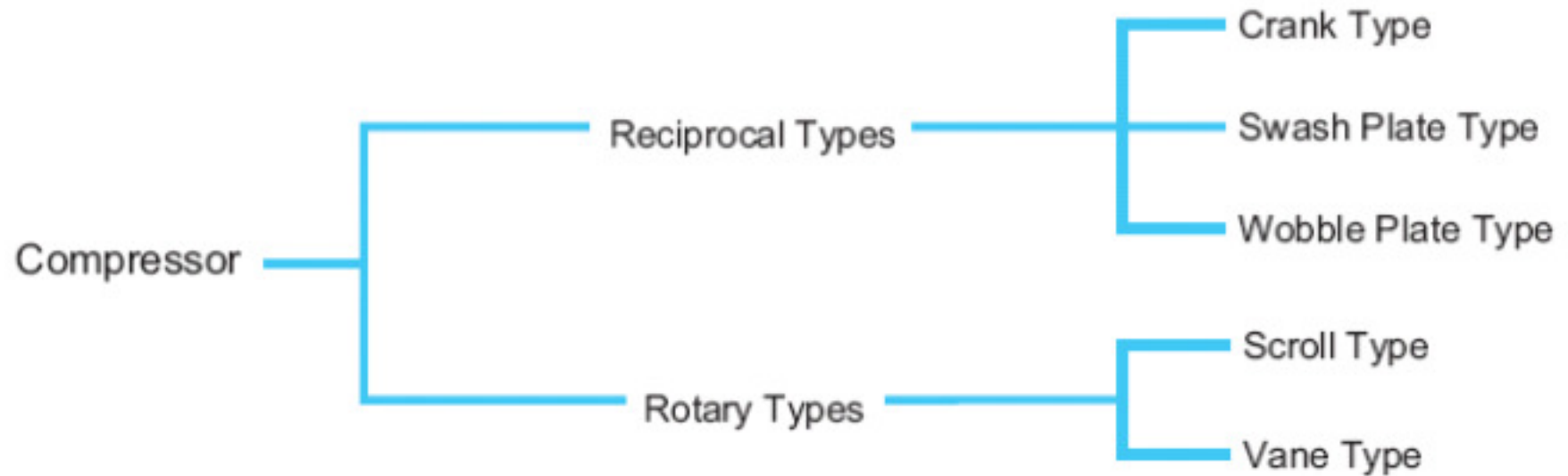


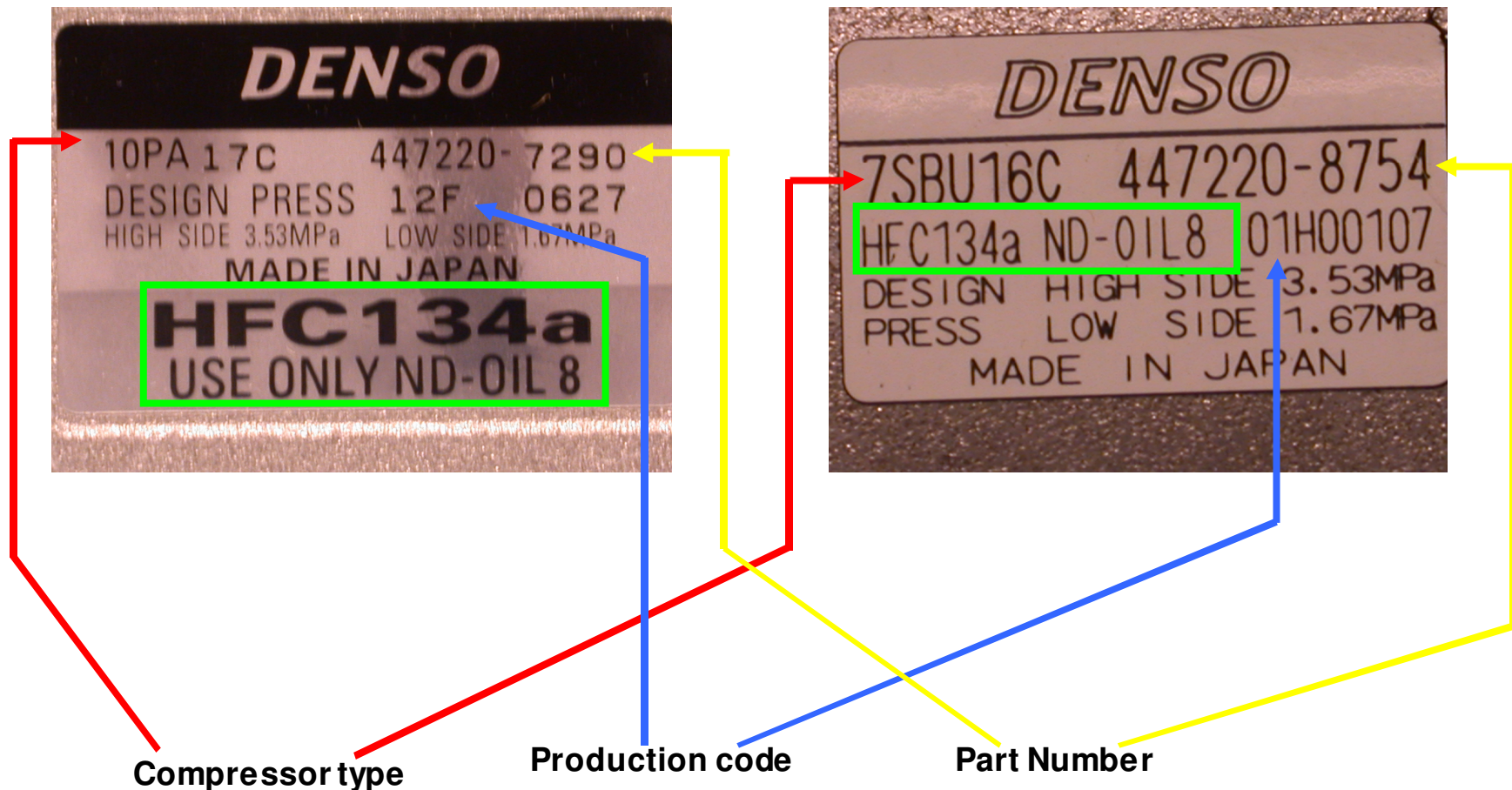


# **Basic Car Air Conditioning**

## Compressor



### Compressor Identification



### Compressor Part Number Explanation

	447100	-	1111	
<b>Compressor with Magnetic Clutch</b>				
447100				
447150				
447170				
447180				
447190				
<b>Compressor with out Magnetic Clutch (body)</b>				
447200				
447220				
447260				
<b>Compressor Clutch</b>				
447300				
248300				

<b>EXAMPLE :</b>								
	10	PA	17	V	C			
	↓	↓	↓	↓				
				Installation type				
				Control type				
			Displacement					
		Compressor type						
	Nr. Of cylinder							

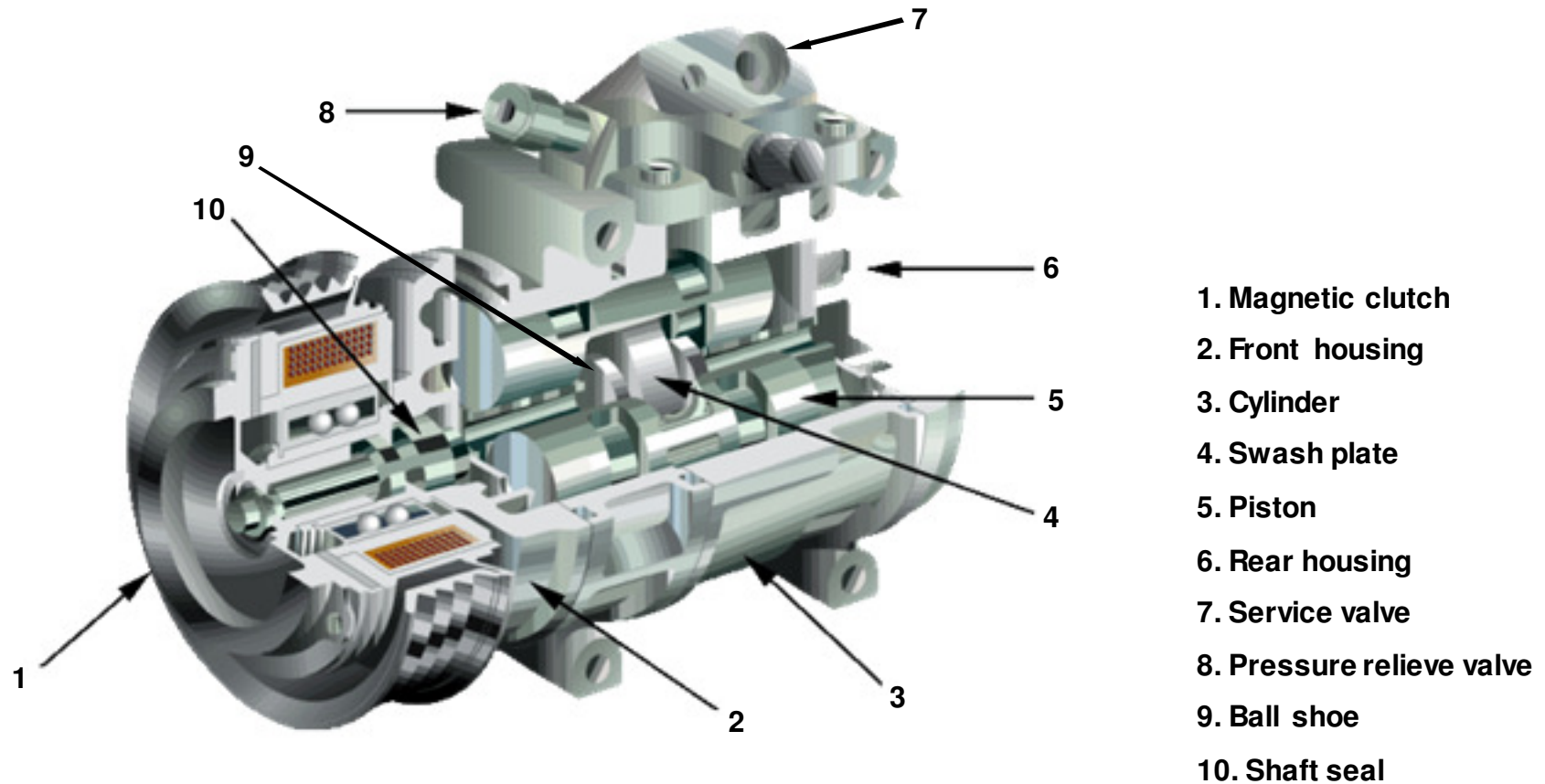
Letter	Year of Production	Letter	Year of Production
B	1982	B	2000
C	1983	C	2001
D	1984	D	2002
E	1985	E	2003
F	1986	F	2004
G	1987	G	2005
H	1988	H	2006
J	1989	J	2007
K	1990	K	2008
L	1991	L	2009
M	1992	M	2010
N	1993	N	2011
P	1994	P	2012
Q	1995	Q	2013
R	1996	R	2014
S	1997	S	2015
T	1998	T	2016
U	1999	U	2017

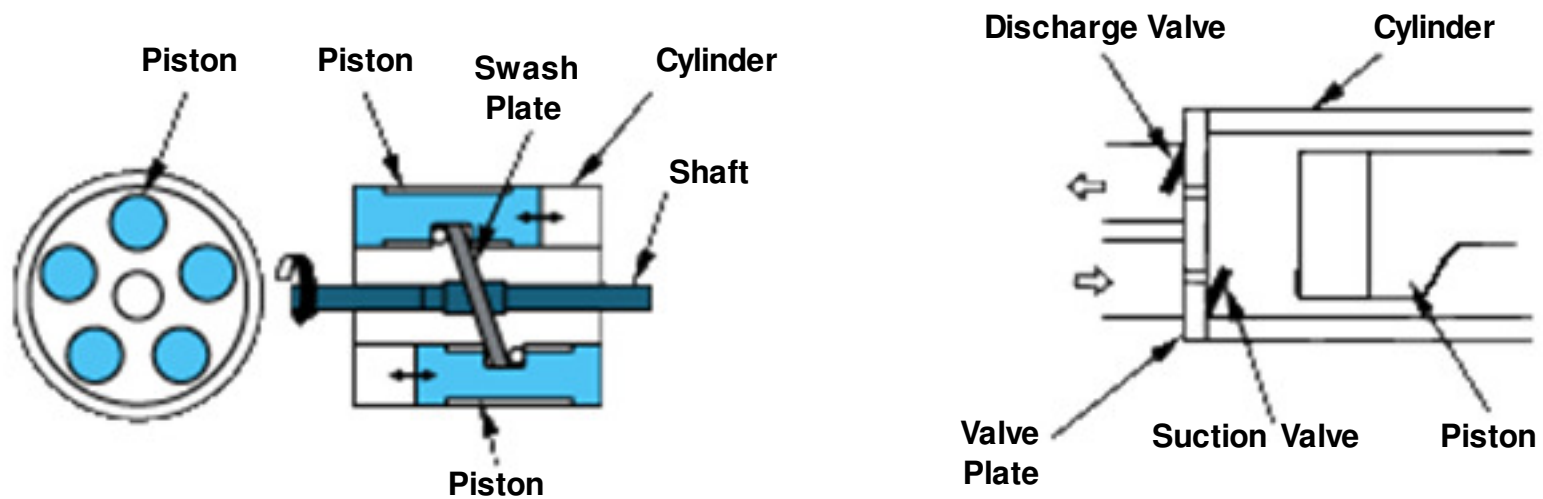
<u>2</u>	<u>R</u>	<u>0078</u>
↓	↓	↓
Month	Year	Lot / Serial number

### Compressor Classification

	Type		Type Number
Reciprocal Type	Crank Type (In-line)		3A188, 3A224, 6C300, 6C500, 2M110, 2M126
	Swash Plate Type	Dual Swash Plate Type	6E171, 6P127, 6P134, 6P148
			10P08, 10P13, 10P15, 10P17, 10P25, 10P30
			10PA15, 10PA17, 10PA20, 10PC20
			10S11, 10S13, 10S15, 10S17, 10S20
		Single Swash Plate Type	7SB16, 7SBU16
			5SE09, 6SE12, 6SEU12, 7SE 16
			5SA07E
Wobble Plate Type		6CA17	
Rotary Type	Vane Type	Sliding Vane Type	SV06, SV07
		Through-Vane Type	TV10, TV12, TV14
	Scroll Type		SC06, SC08, SCS06, SCS08, SCSA06

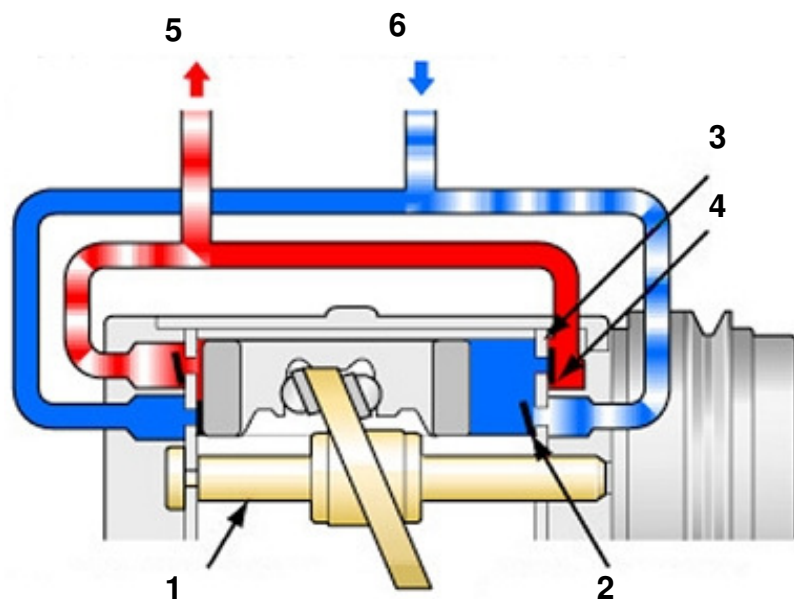
### COMPRESSOR : 10PA



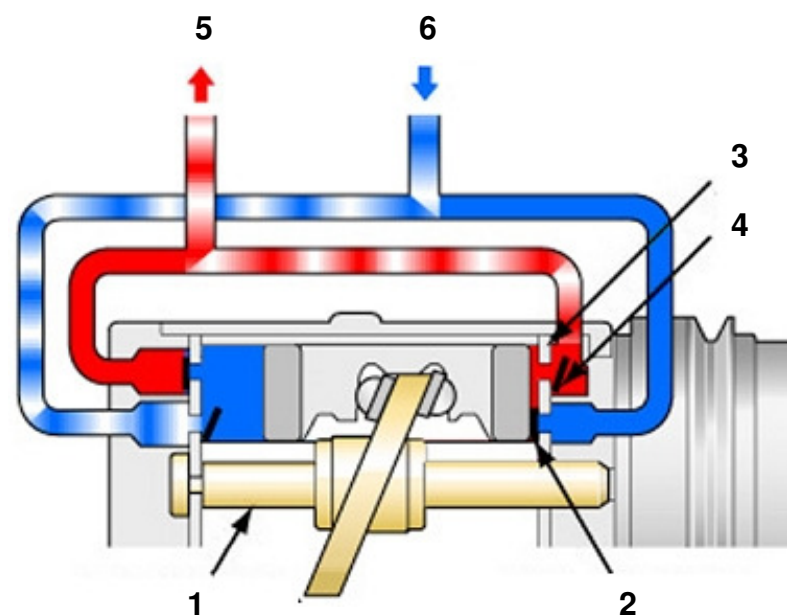
**COMPRESSOR : 10PA****Piston arrangement (10 cylinder)**



### COMPRESSOR : 10PA



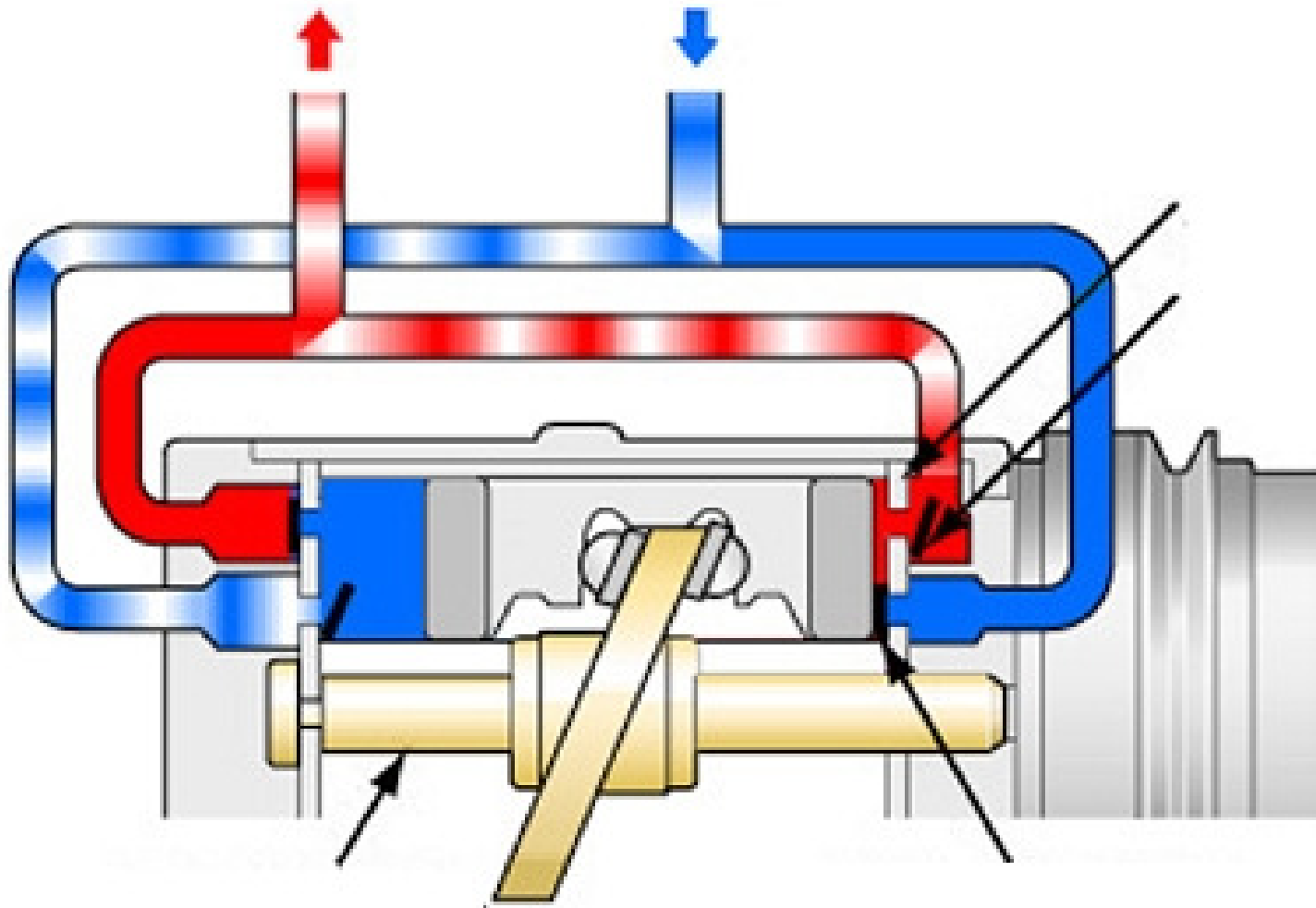
- 1. Shaft & Swash plate
- 2. Suction valve
- 3. Valve plate



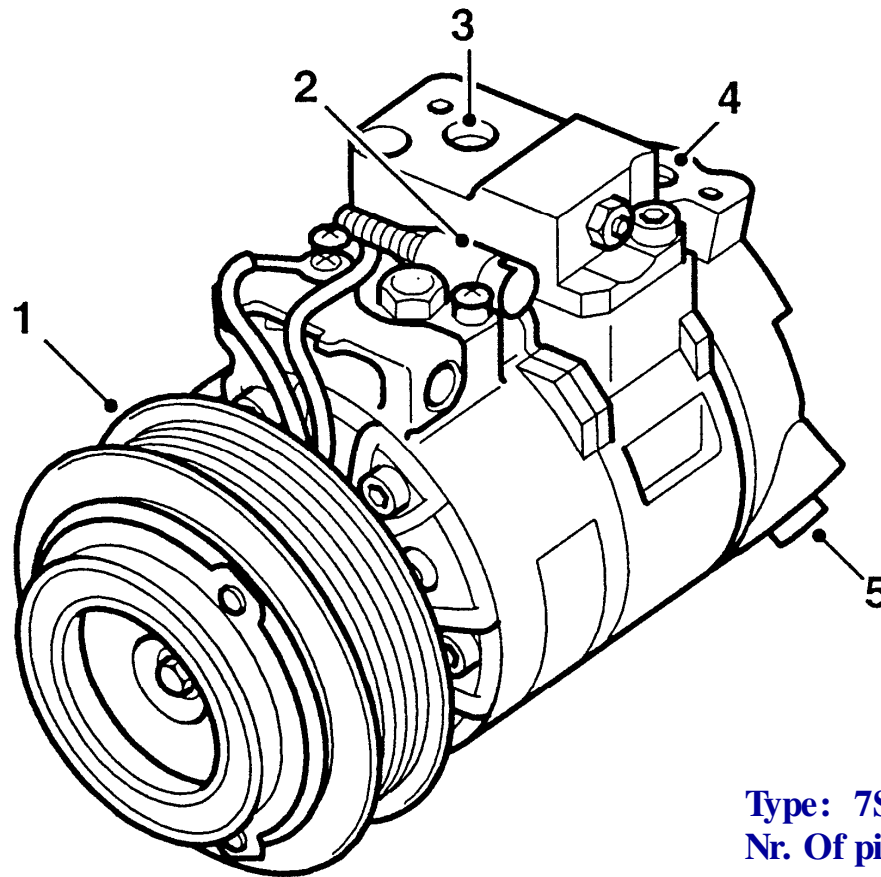
- 4. Discharge valve
- 5. High pressure side
- 6. Low pressure side



COMPRESSOR : 10PA

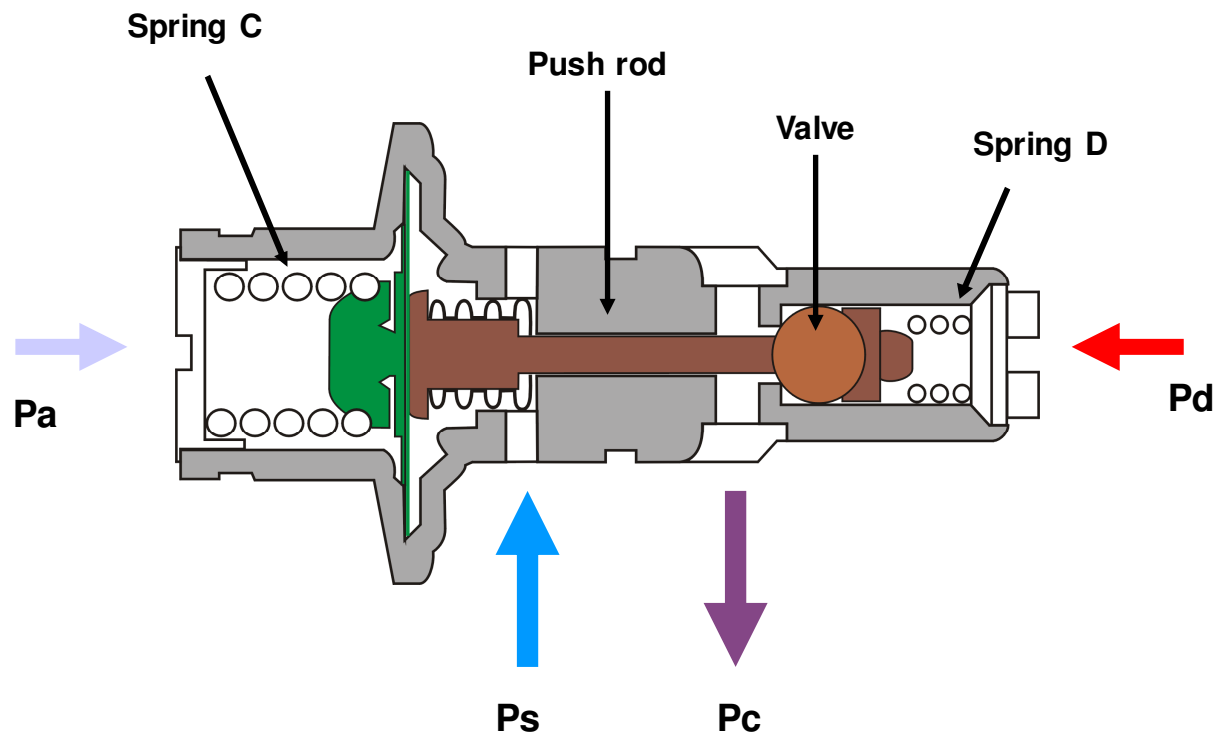


### COMPRESSOR : 7SB(U)



- 1. Magnetic clutch
- 2. Connector w/h
- 3. Connection suction hose
- 4. Connection discharge hose
- 5. Main control valve

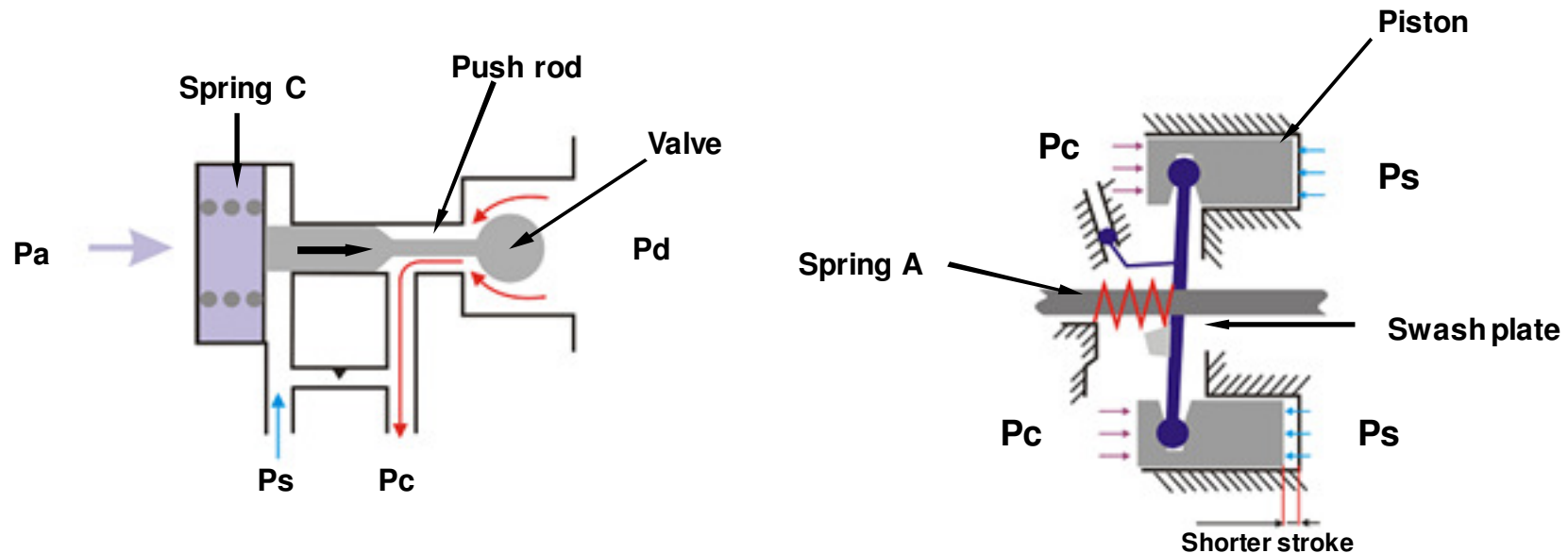
**Type: 7SB16**  
**Nr. Of pistons 7**  
**Variable displacement (7 ~ 100%)**  
**Displacement: 160cc**

**COMPRESSOR : SB type****Main Control Valve**

$P_a$  = Atmospheric pressure  
 $P_s$  = Suction pressure  
 $P_c$  = Crank chamber pressure  
 $P_d$  = Discharge pressure

### COMPRESSOR : SB type

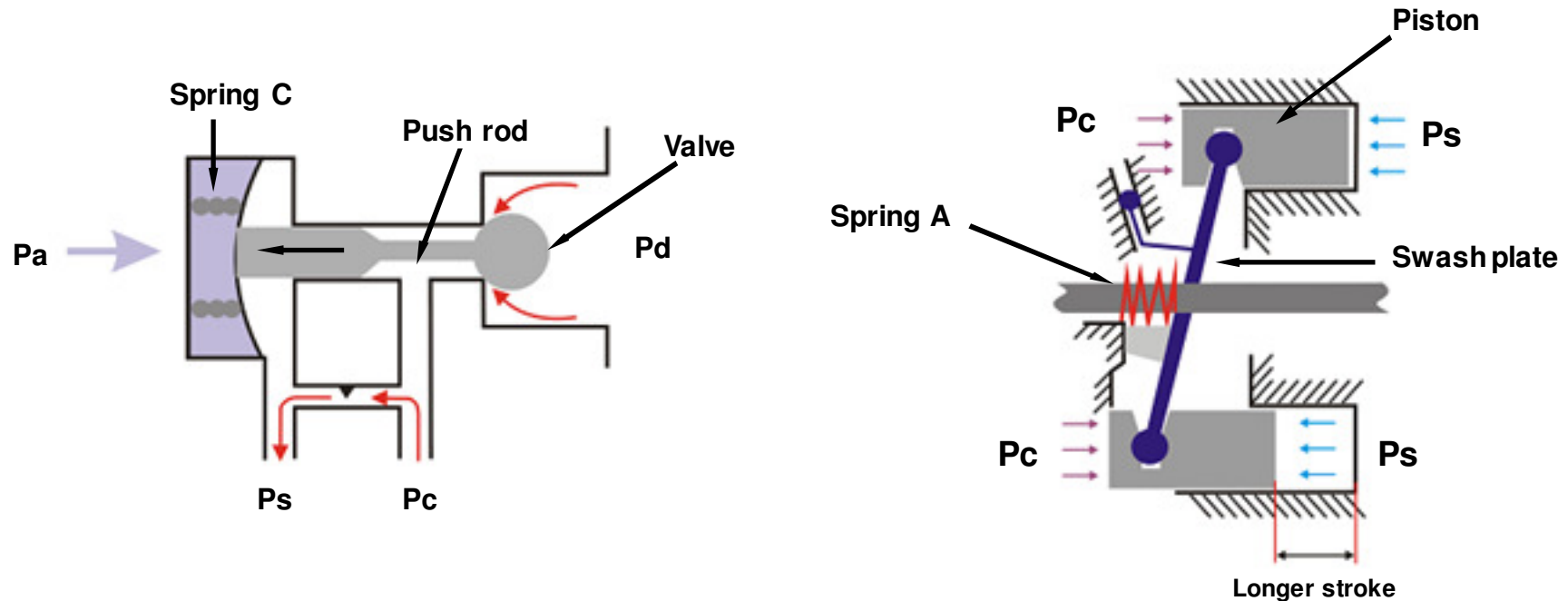
#### Variable Capacity Operation Low thermal load



$P_s < P_d + \text{Spring C} \rightarrow \text{Push Rod Opens} \rightarrow P_c = \text{High} \rightarrow \text{Small Displacement}$

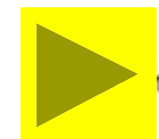
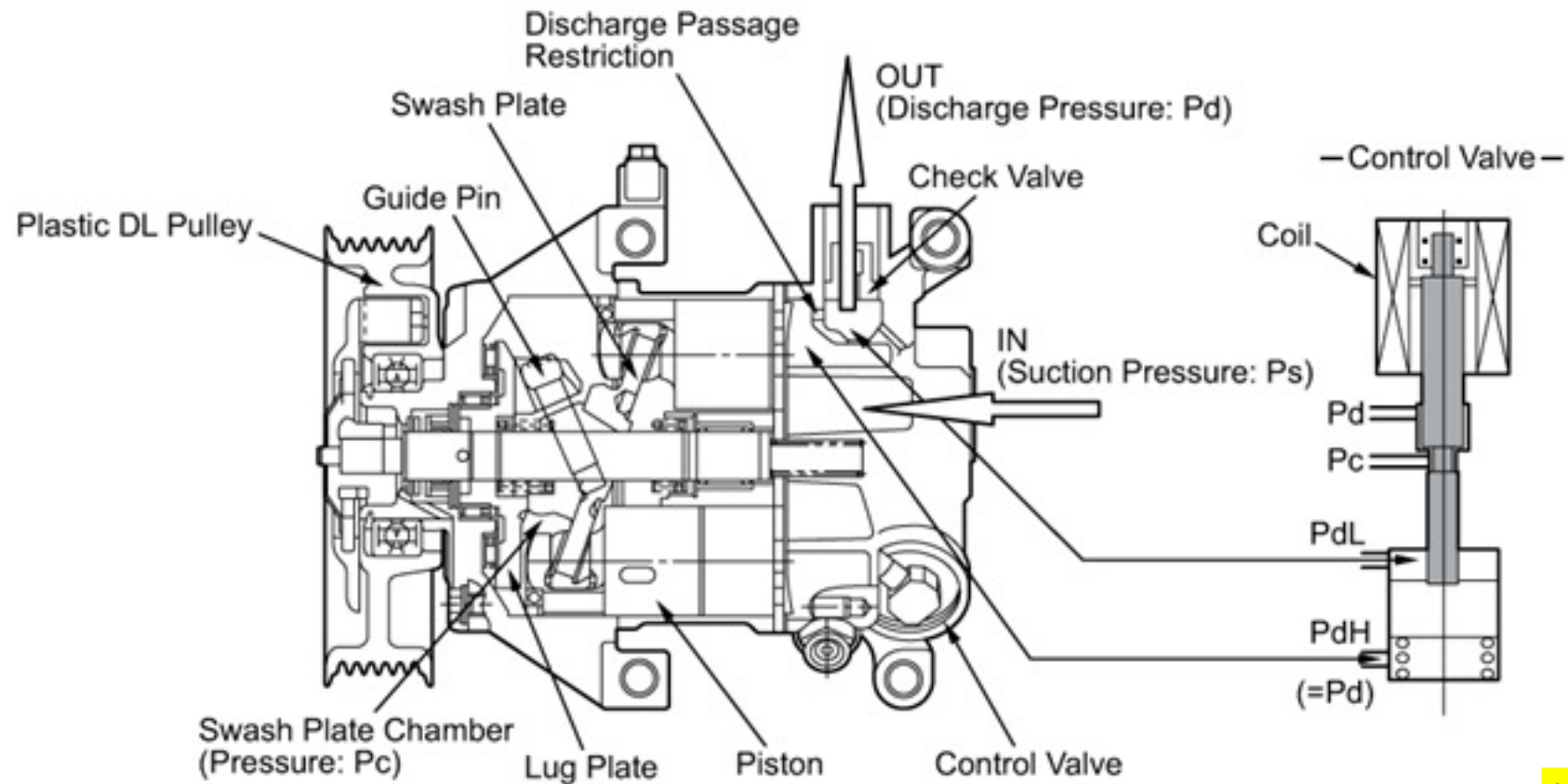
### COMPRESSOR : SB type

#### Variable Capacity Operation High thermal load



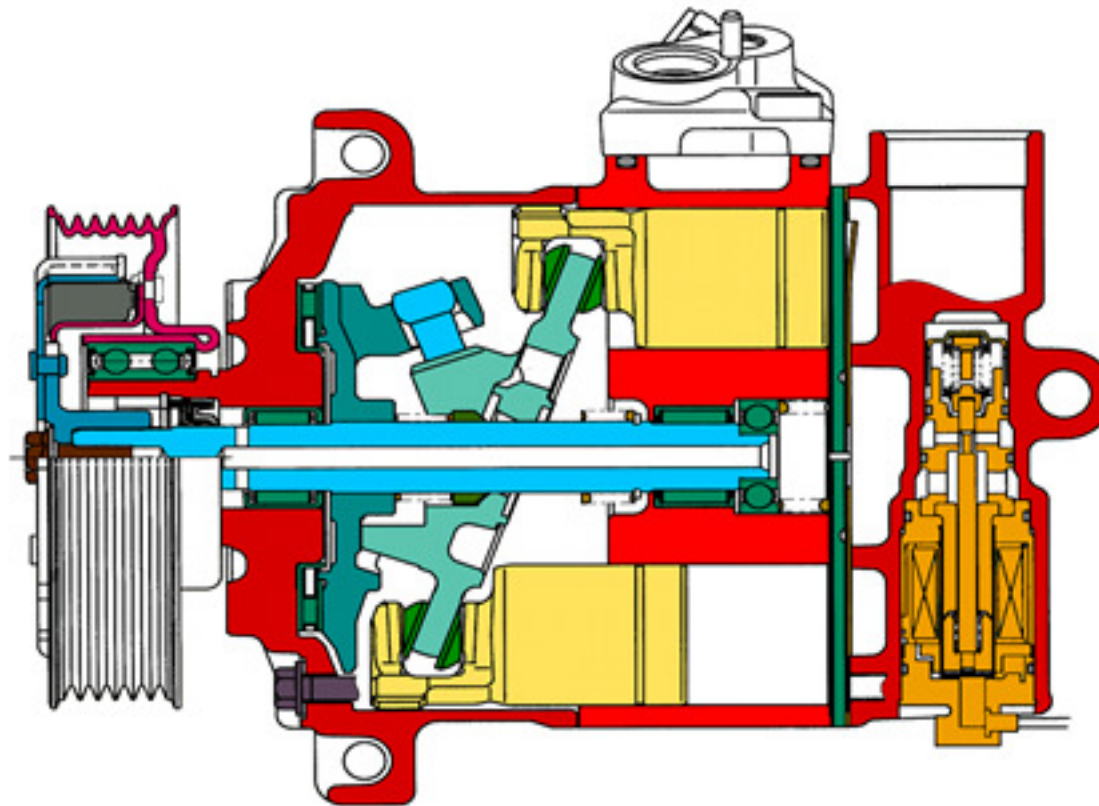
$P_s > P_a + \text{Spring C} \rightarrow \text{Push Rod Closes} \rightarrow P_c = \text{Low} \rightarrow \text{Big Displacement}$

### COMPRESSOR : SE type



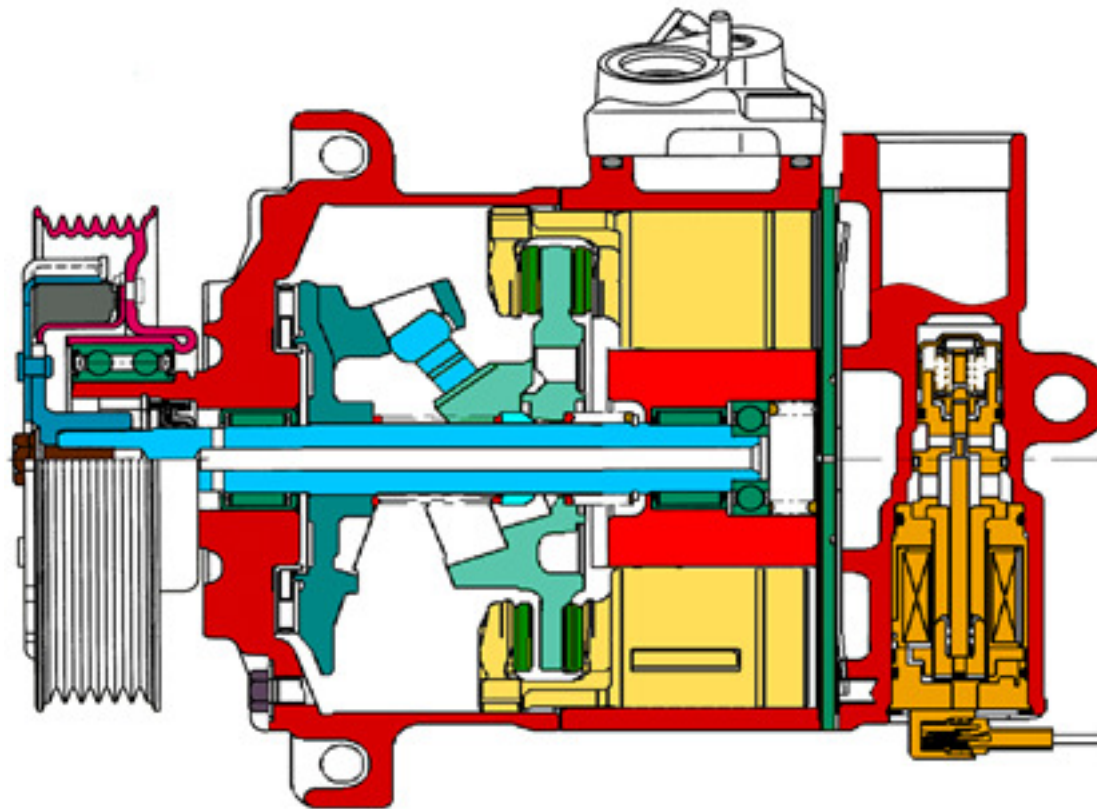
18

### COMPRESSOR : SE type



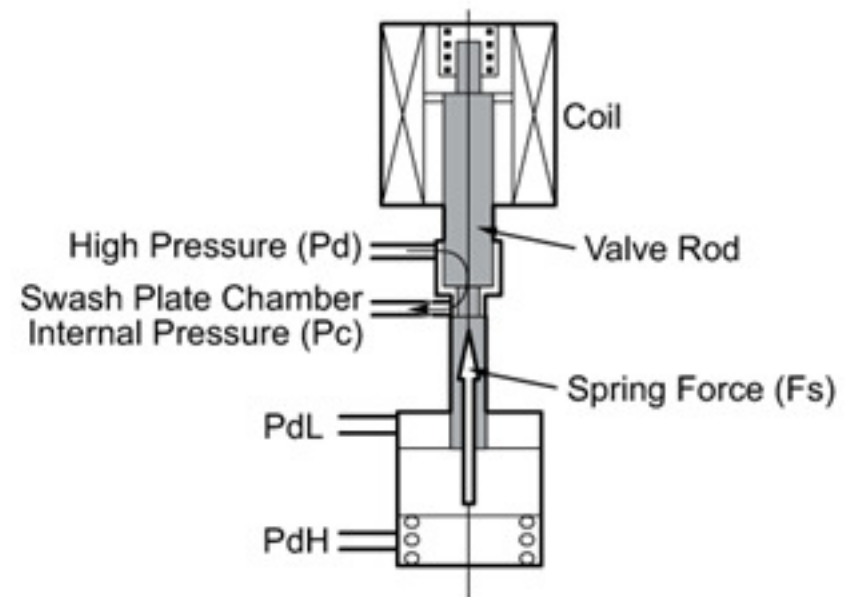
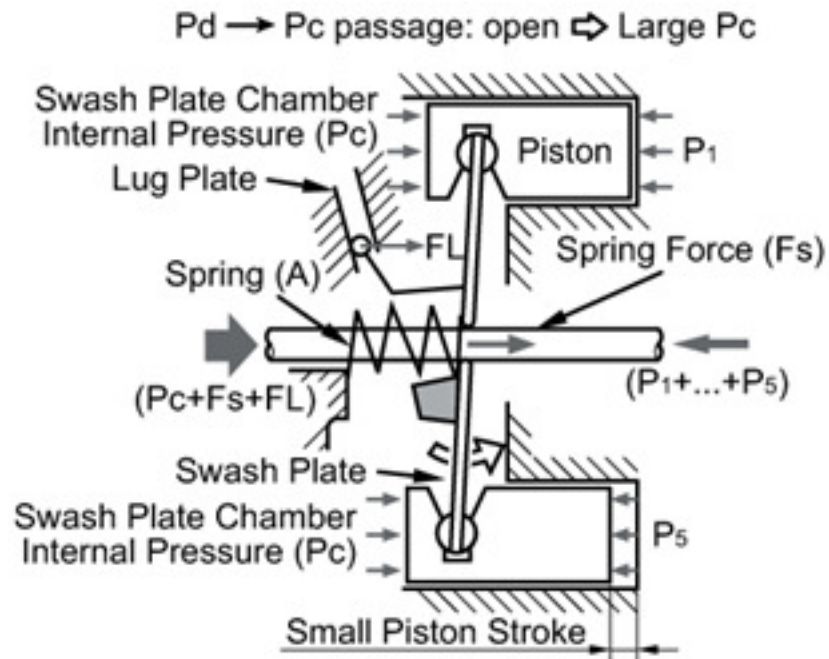


### COMPRESSOR : SE type



### COMPRESSOR : SE type

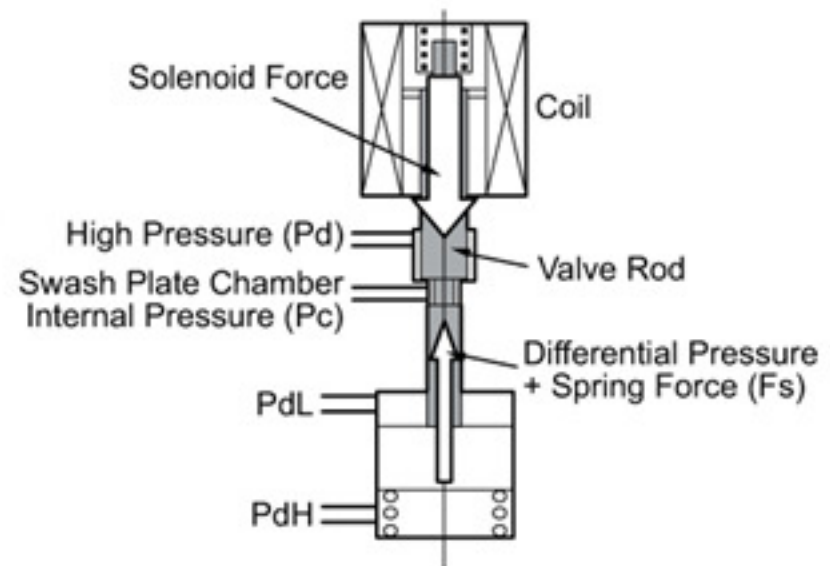
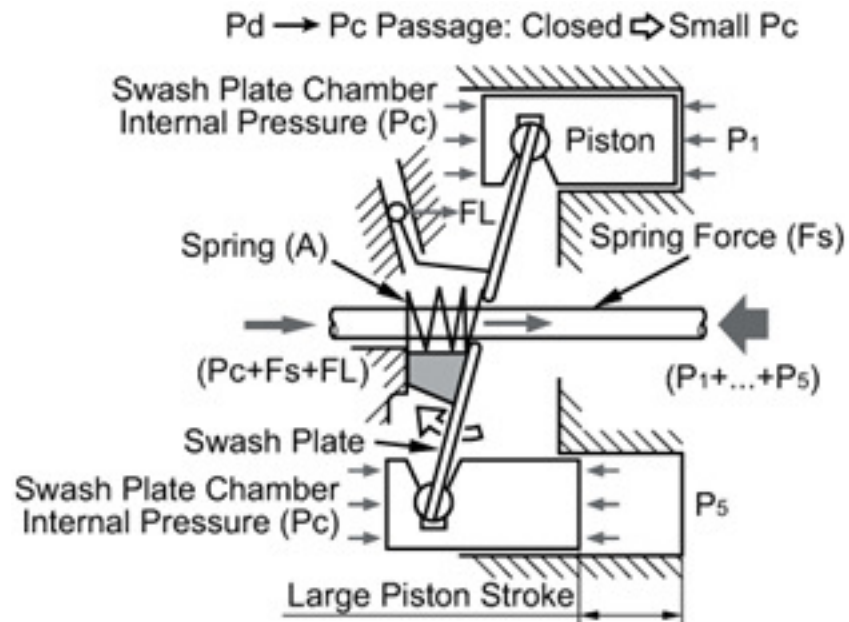
#### Variable Capacity Operation Low thermal load



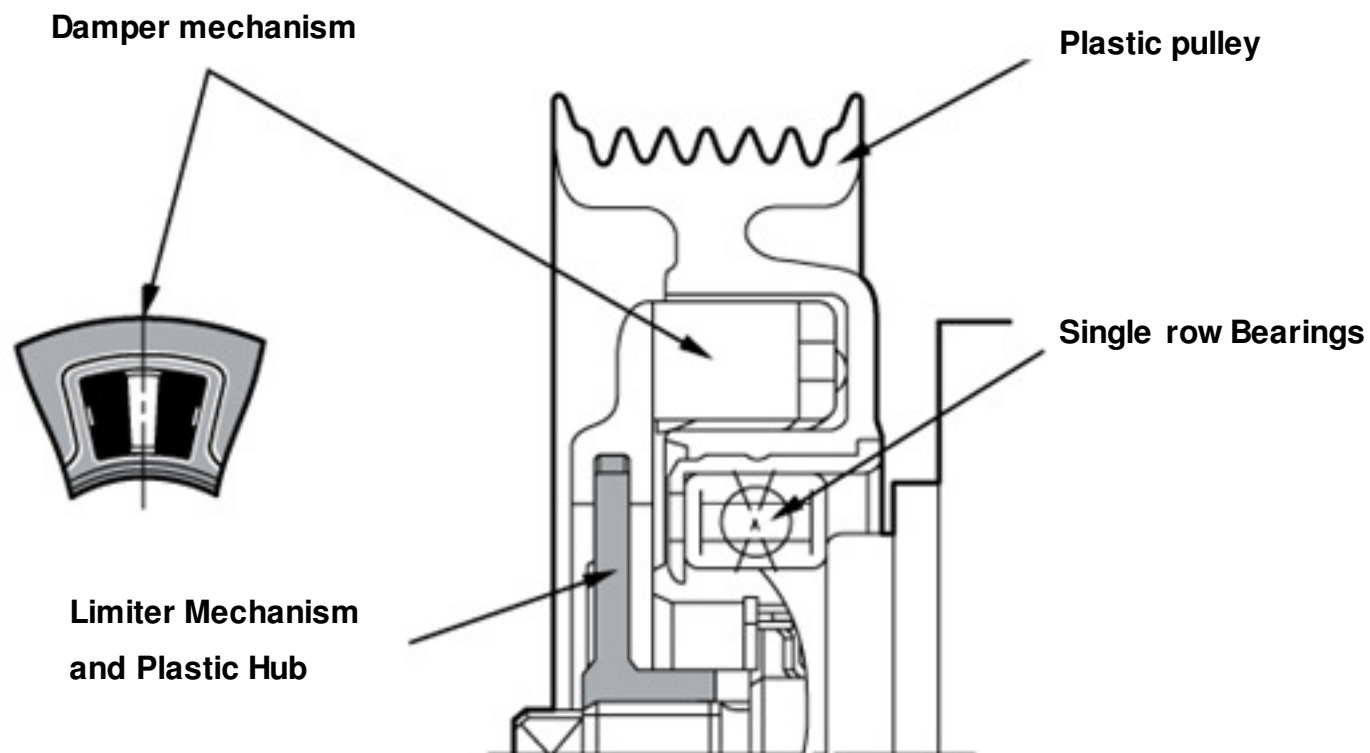
CD0019

### COMPRESSOR : SE type

#### Variable Capacity Operation High thermal load

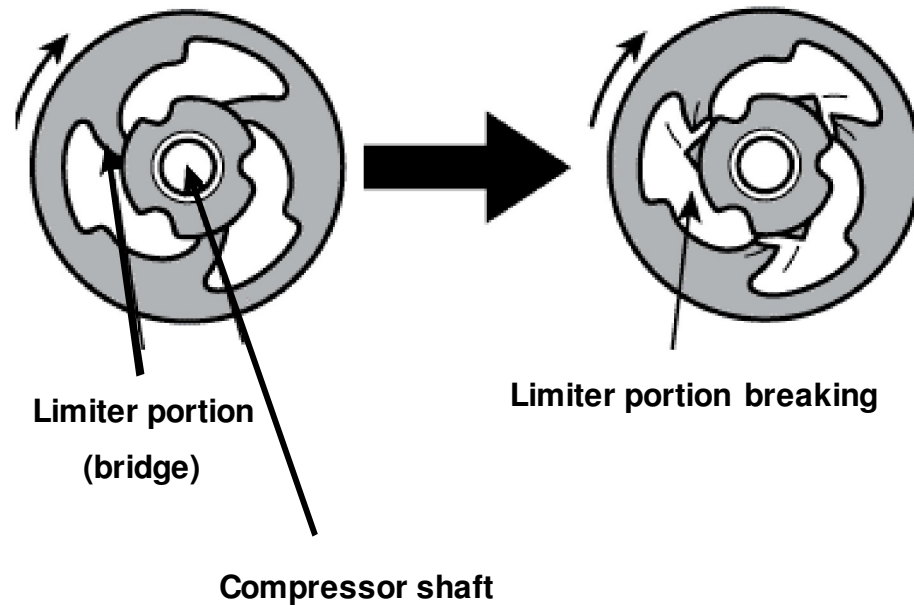


CD0020

**COMPRESSOR : SE type****Limiter Damper pulley**

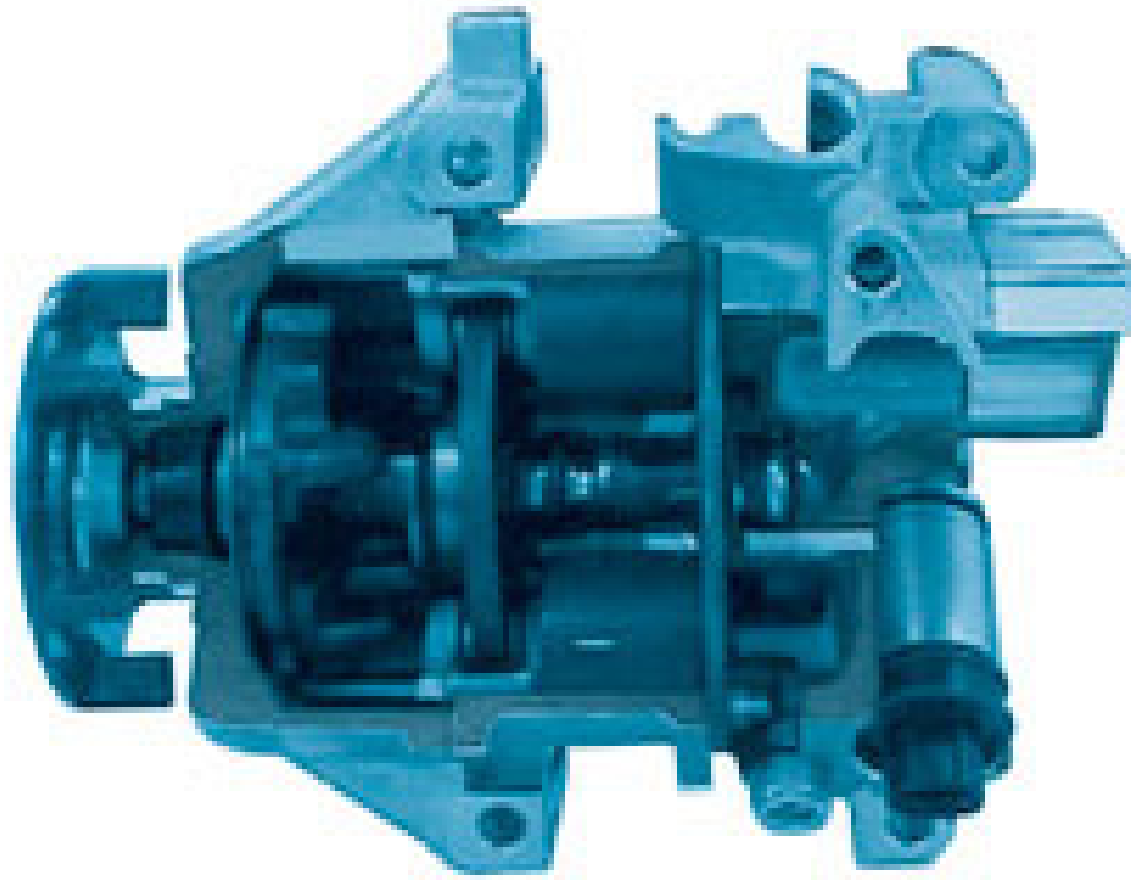
### COMPRESSOR : SE type

#### Belt protection





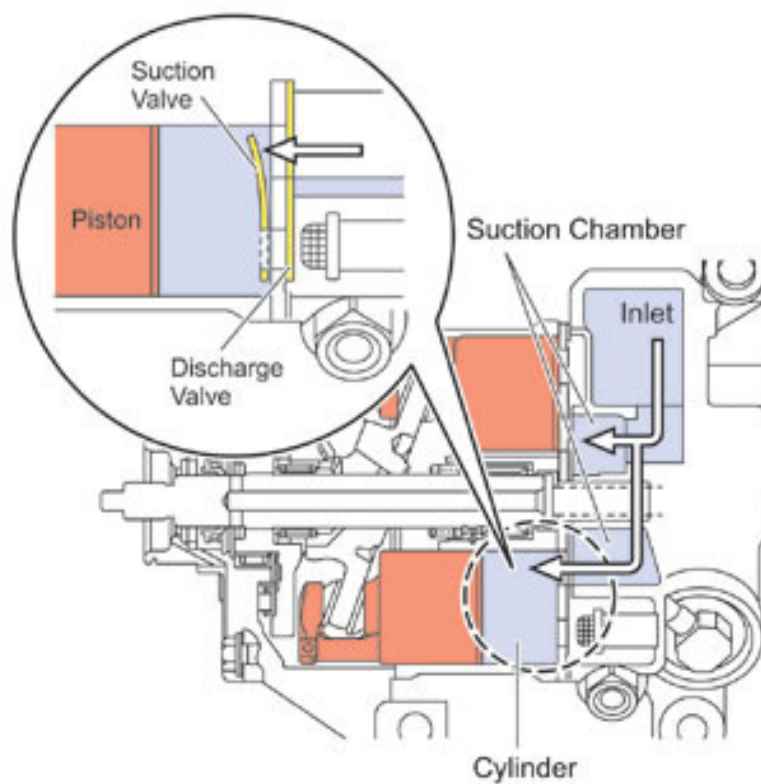
### New Feature: Compressor 5SER09



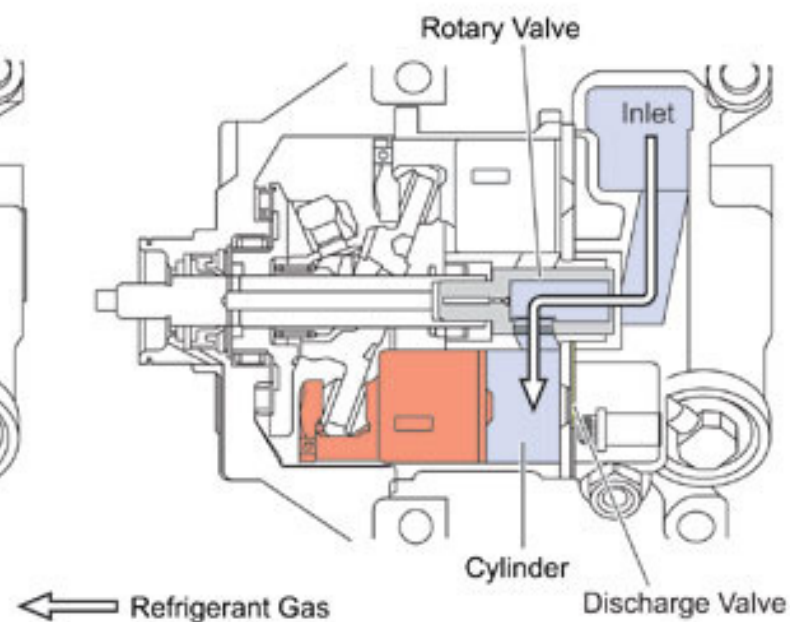


### New Feature: Compressor 5SER09

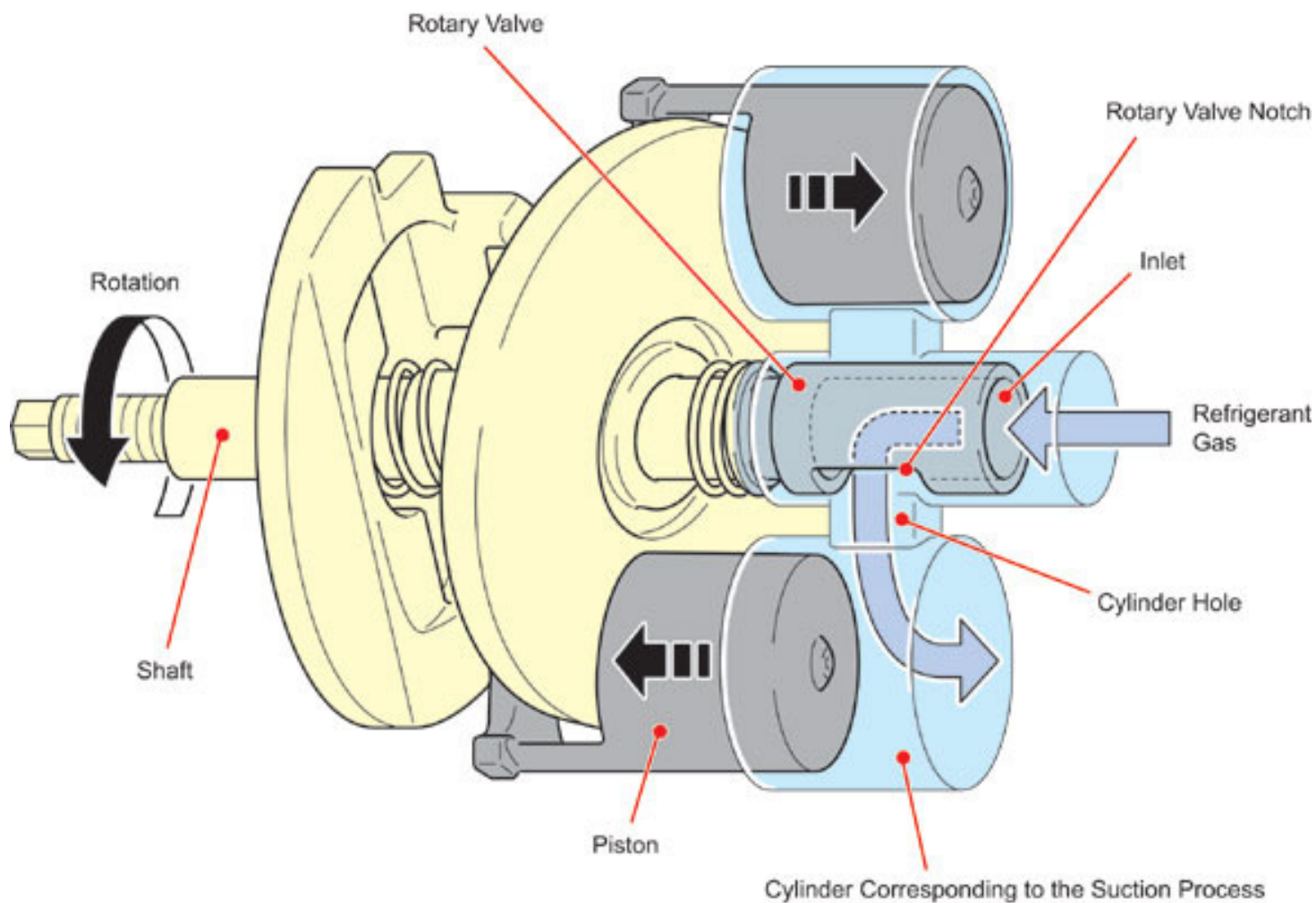
Reed Valve System  
(5SE09 Model Compressor)



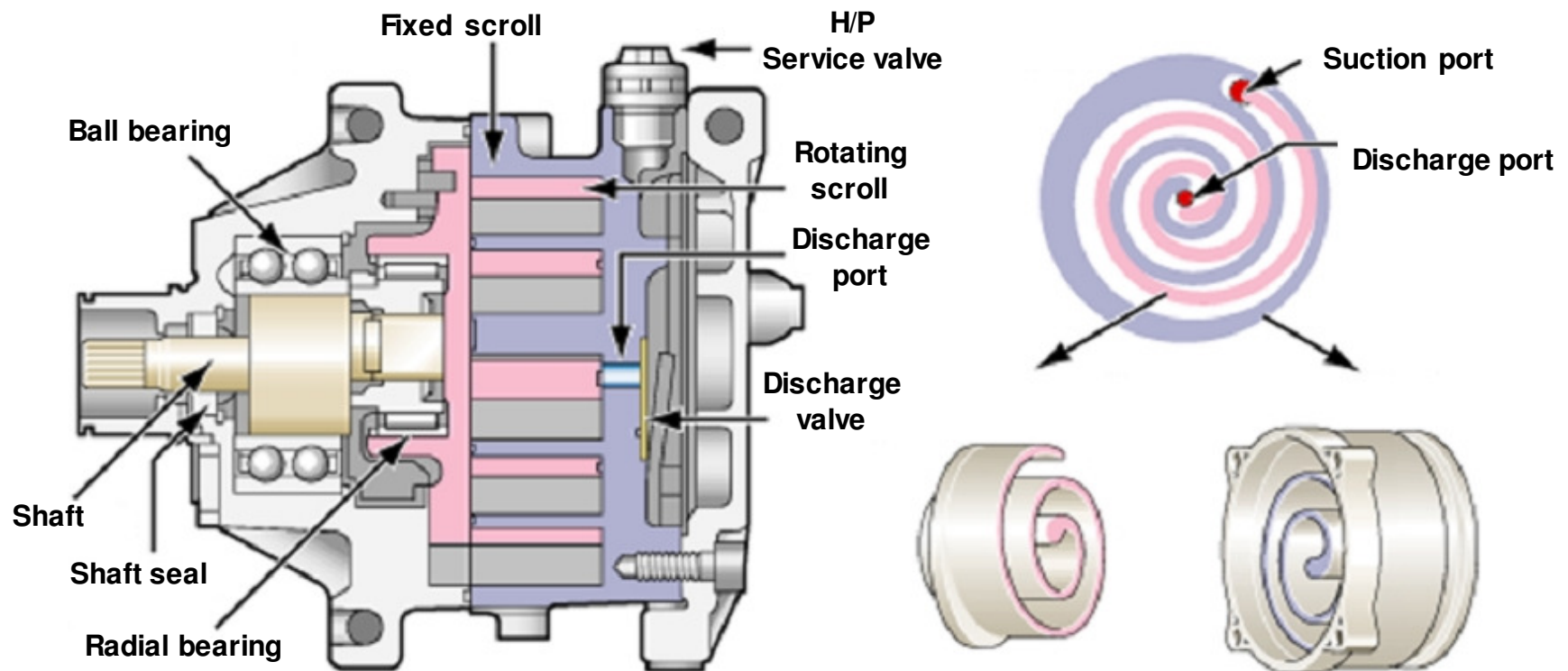
Rotary Valve System  
(5SER09 Model Compressor)

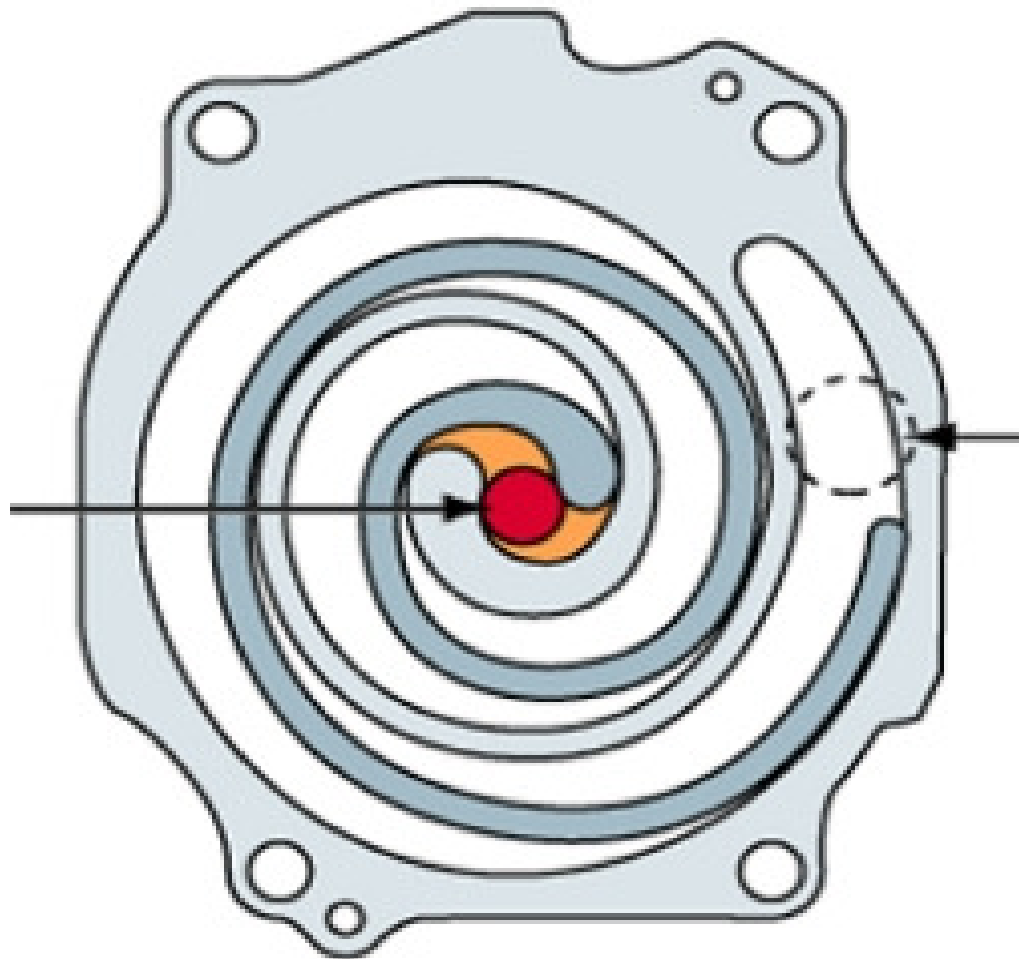


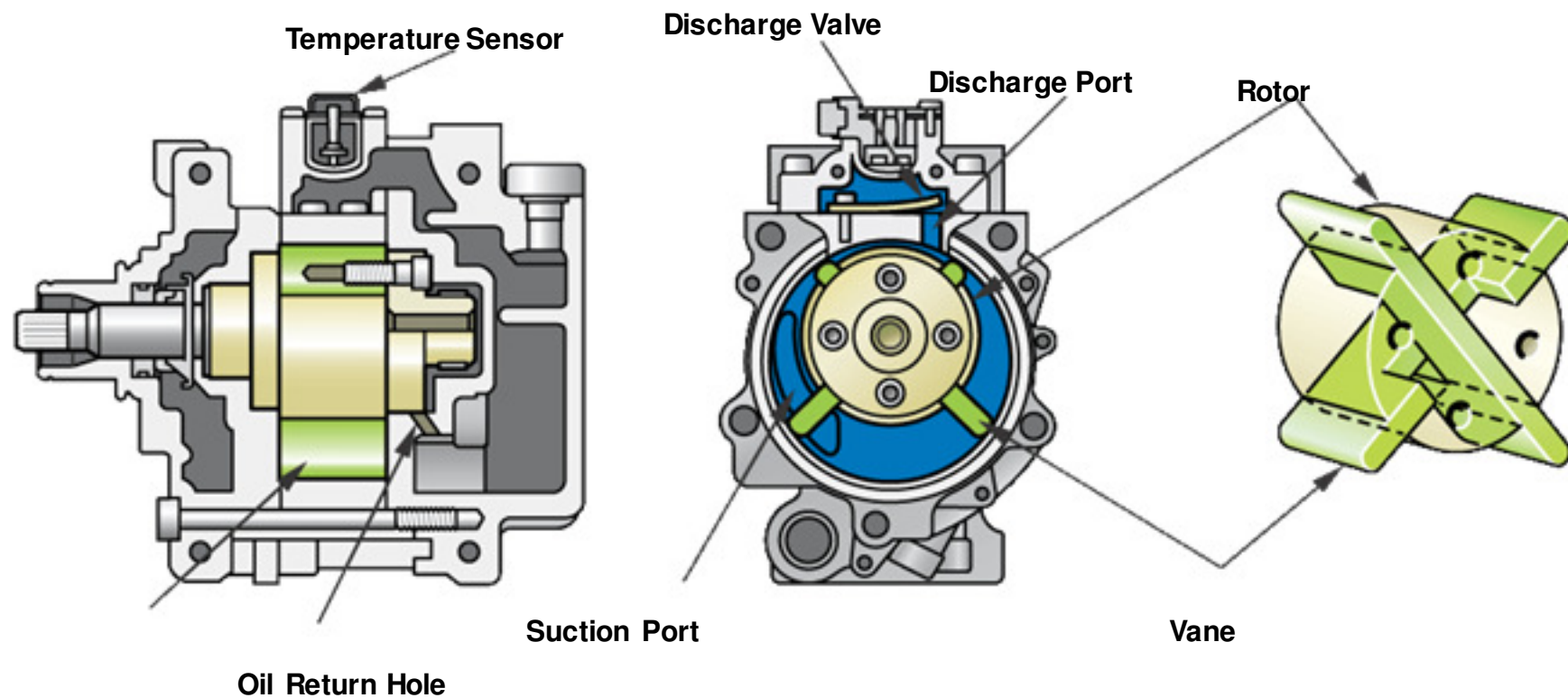
### New Feature: Compressor 5SER09

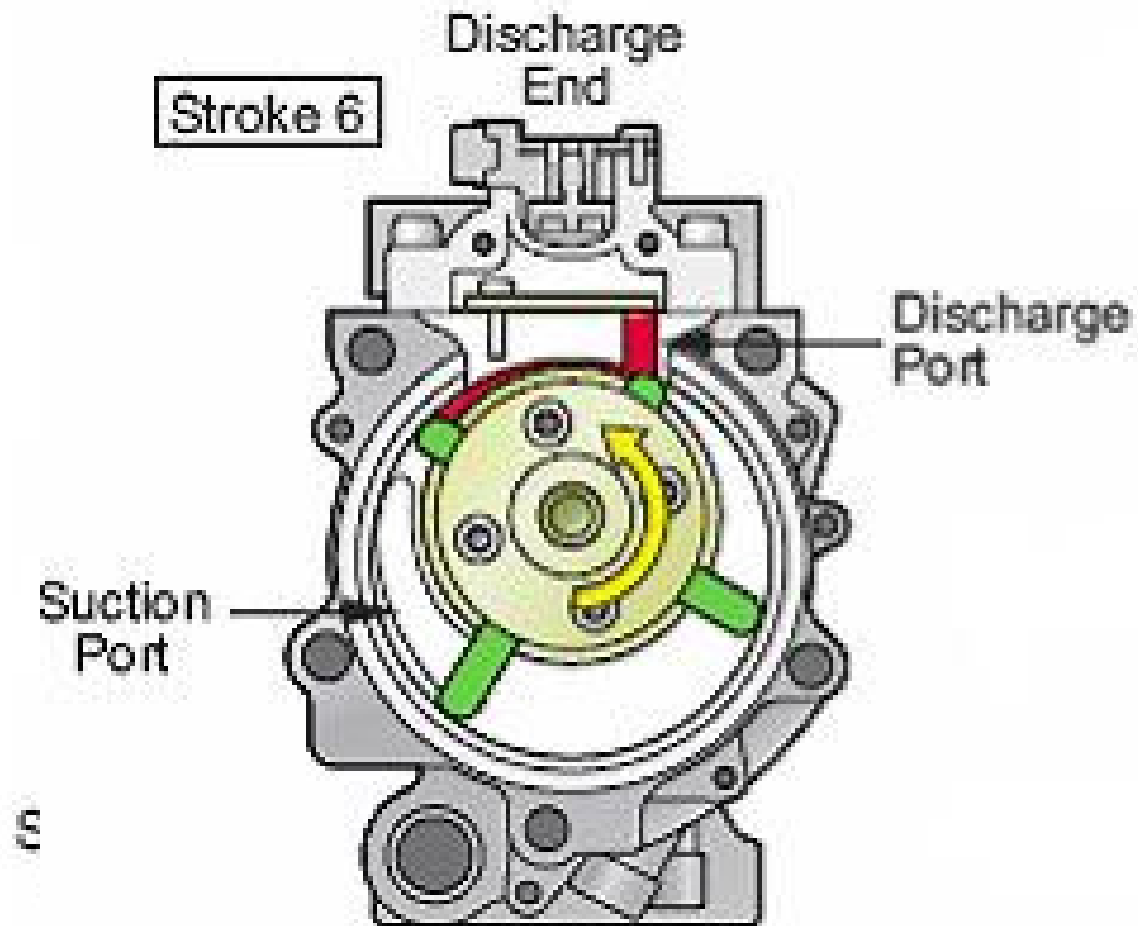


### COMPRESSOR : Scroll

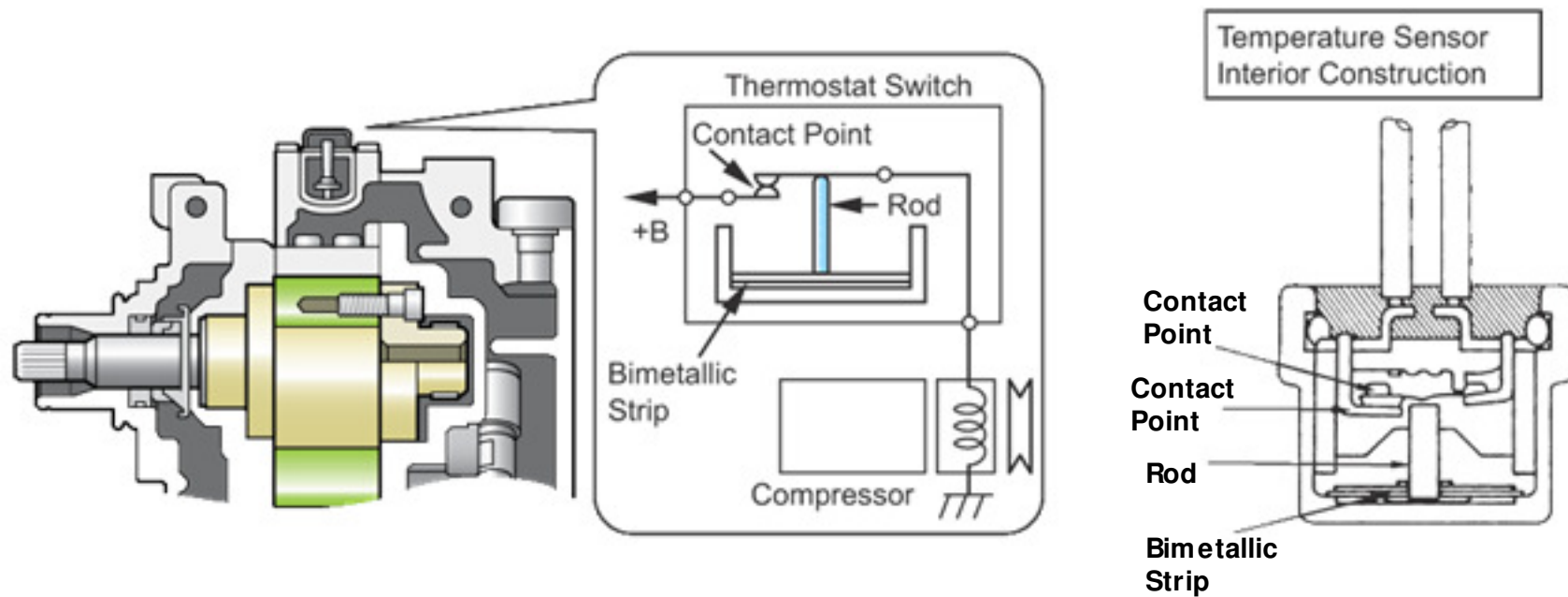




**COMPRESSOR : Through Vane**

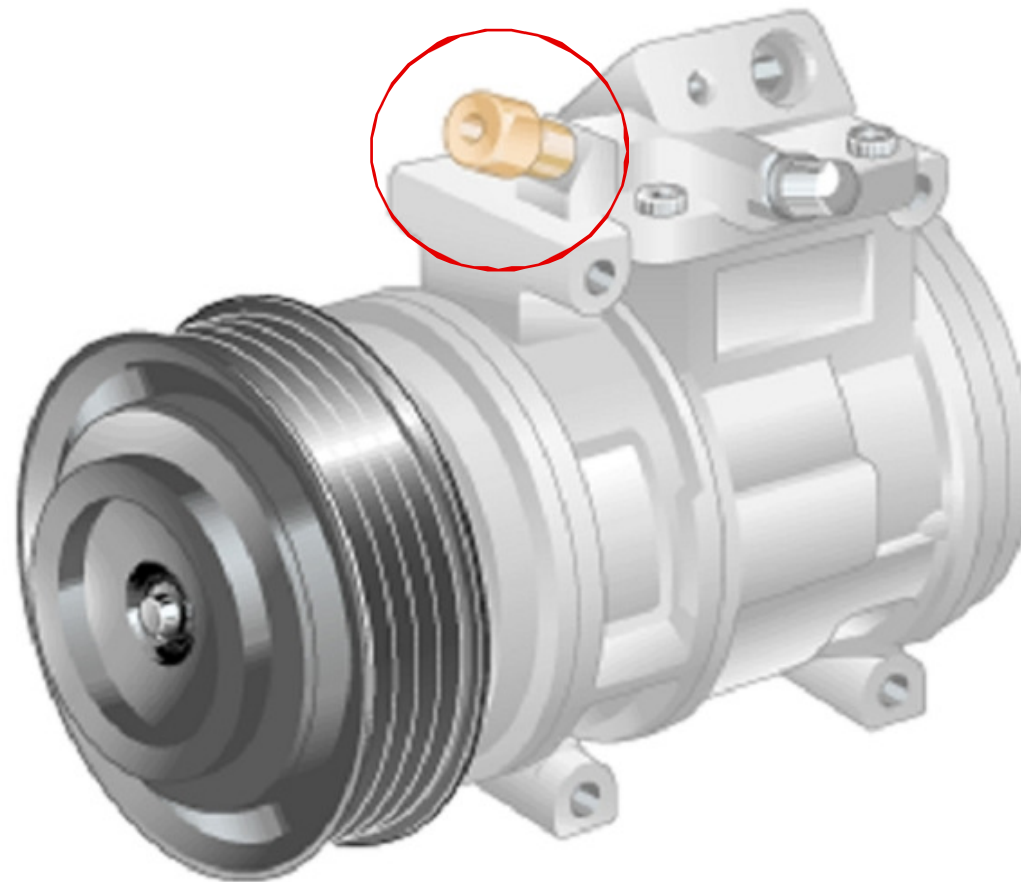


### COMPRESSOR : Through Vane

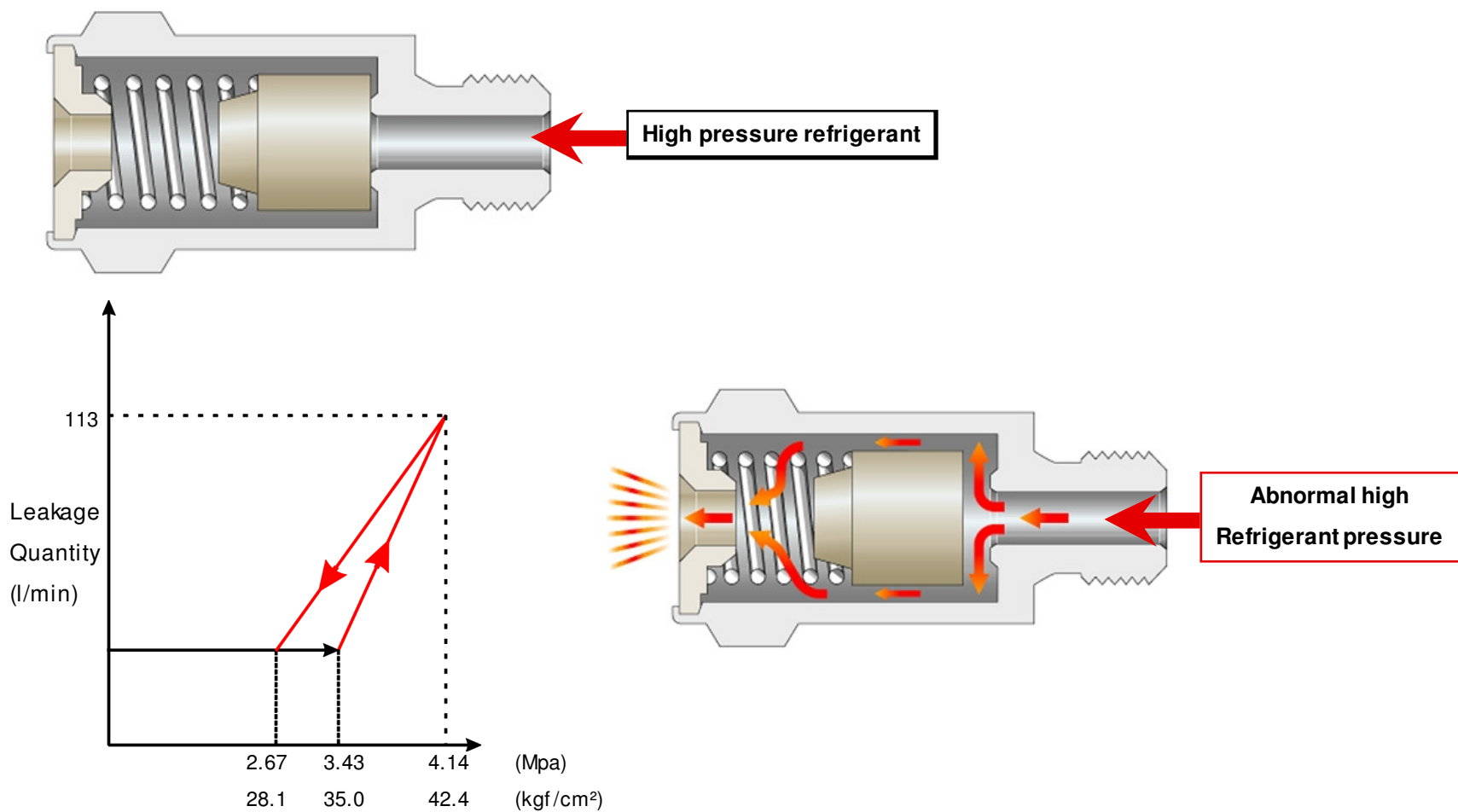




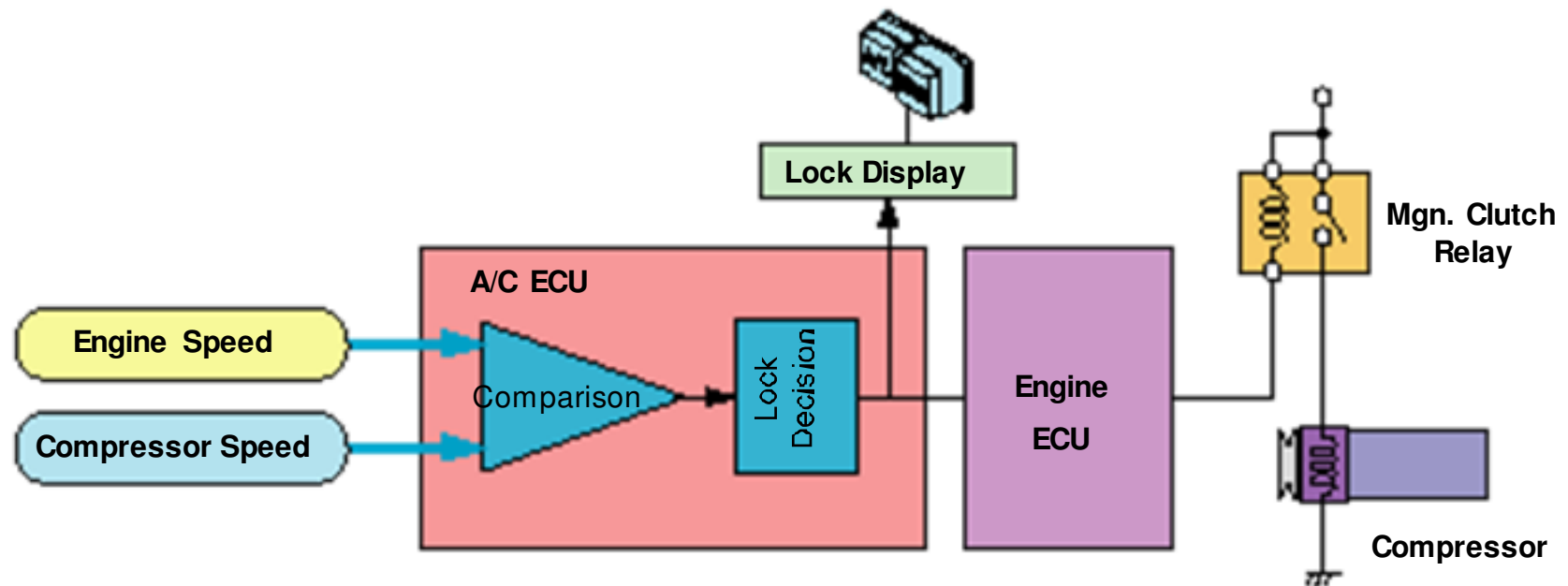
### Pressure relieve valve



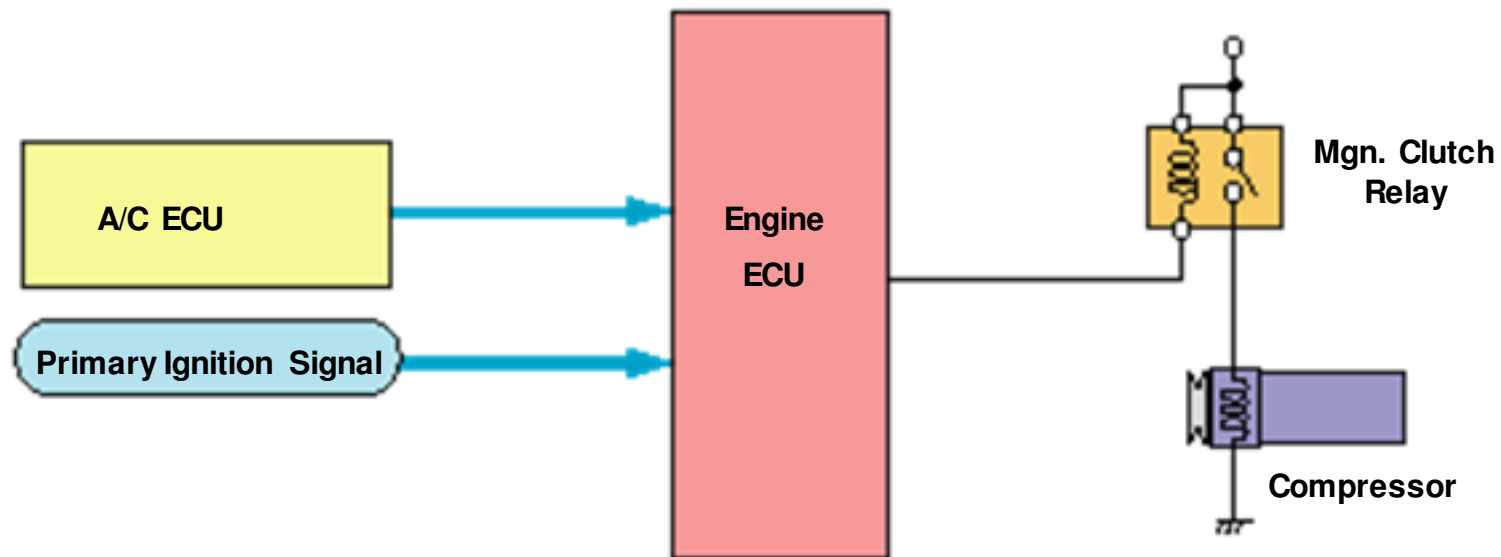
## Pressure relieve valve



## Compressor Lock

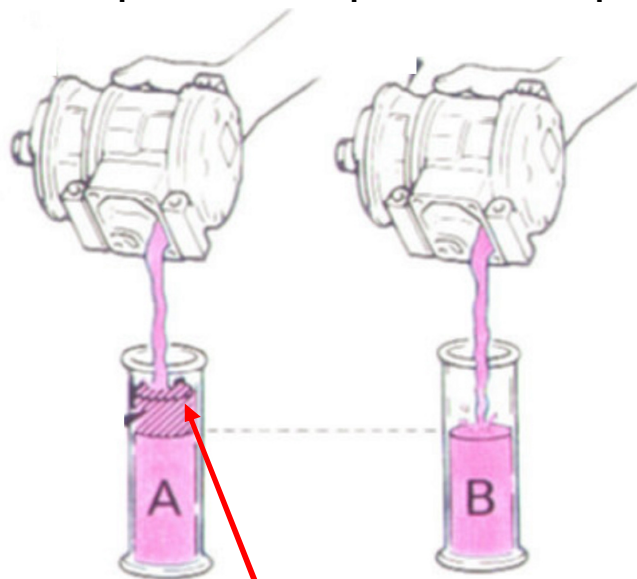


## Low Speed Cut Control



SC000000

New compressor      Compressor to be replaced



Remove excessive  
oil amount

### COMPRESSOR OIL FOR HFC134a

Compressor Oil → DENSO oil ND 8 & ND9  
DENSO oil 8 → PAG (Poly Alkaline Glycol)  
DENSO oil 9 → Synthetic oil

#### SV Compressors:

SV06 uses ND-oil 9

SV07 new uses MG20

SV07 repaired uses ND-oil 8

Compressor Type:	Oil Type	Viscosity
10PA	ND-8	46
7SB(U)	ND-8	46
SE(U)	ND-8	46
SCR	ND-8	46
TV	ND-9	100
SV	ND-8/9	46/100

### Oil Replacement Quantities

	Replacement parts				
	Compressor	Condenser	Evaporator	Receiver	Piping type
Quantity	Refer to 'compressor replacement'	40CC	40CC	10CC	10CC (per pipe)

### RUN IN PROCEDURE

Temperature → Max Cool  
Blower → Max  
Outlet → Face  
Engine RPM → Idle  
Duration → 3-5 Minutes

11/24

## Compressor oil

### Compressor oil & Run in procedure

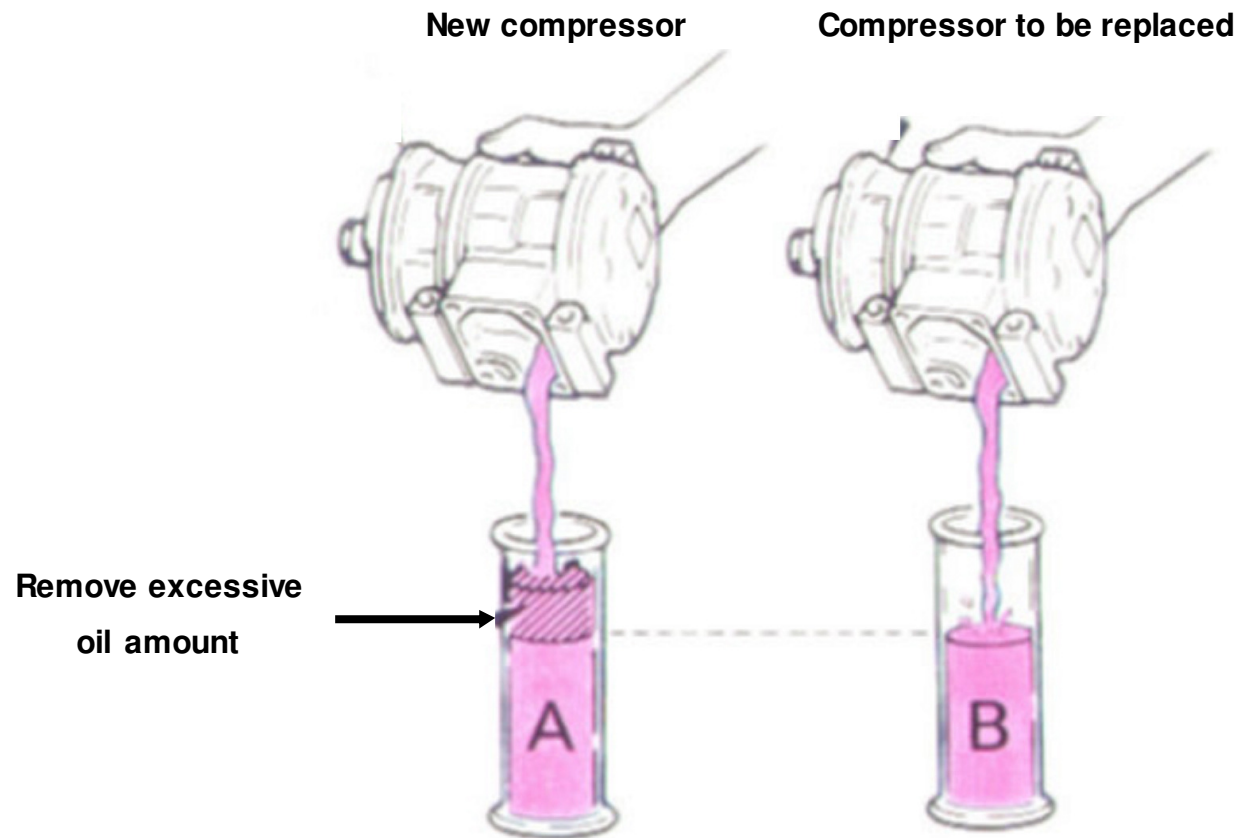
#### COMPRESSOR OIL

Compressor Oil	→	DENSO oil ND 8 & ND9
DENSO oil 8	→	PAG (Poly Alkaline Glycol)
DENSO oil 9	→	Synthetic oil

#### RUN IN PROCEDURE

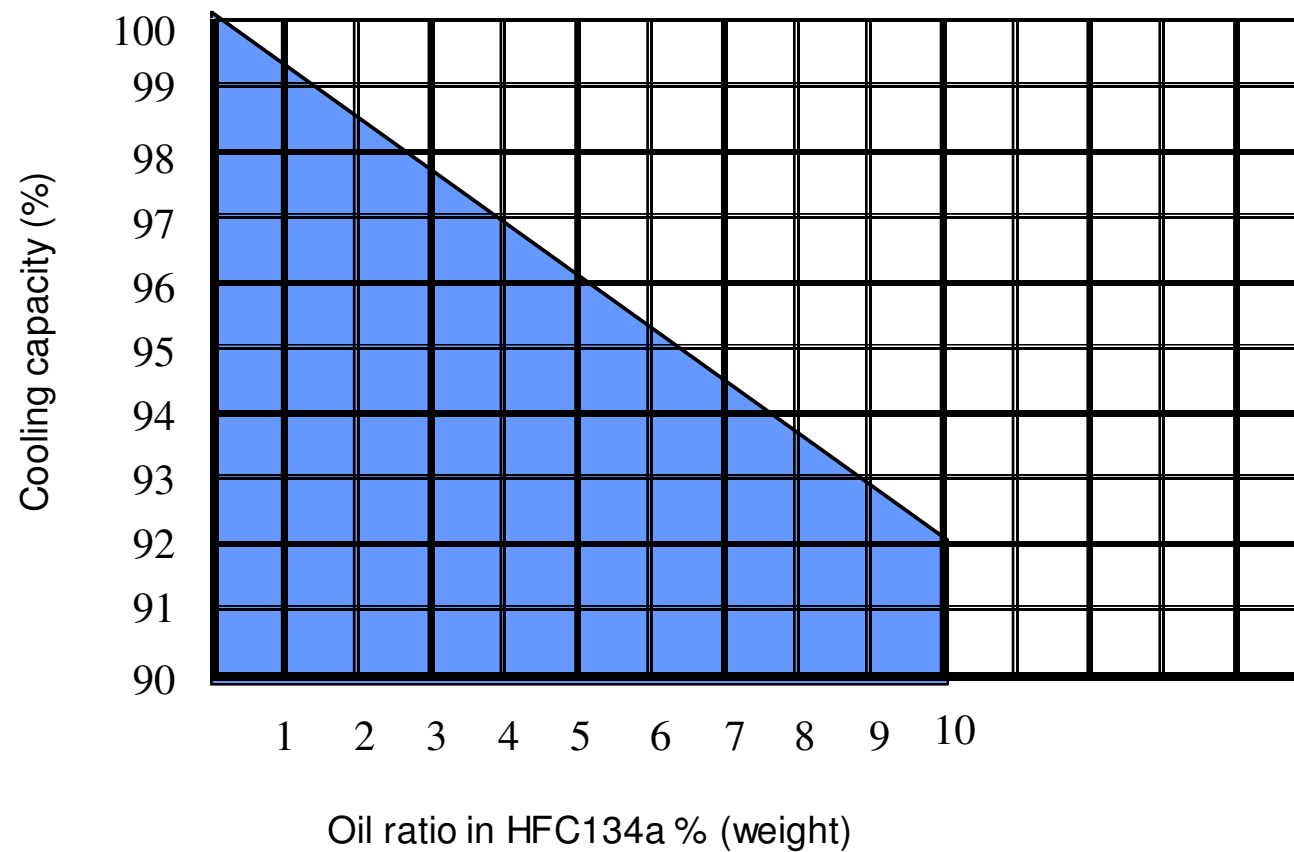
Time	→	2 ~ 4 minutes
Engine RPM	→	Idle

### Compressor oil replenishment

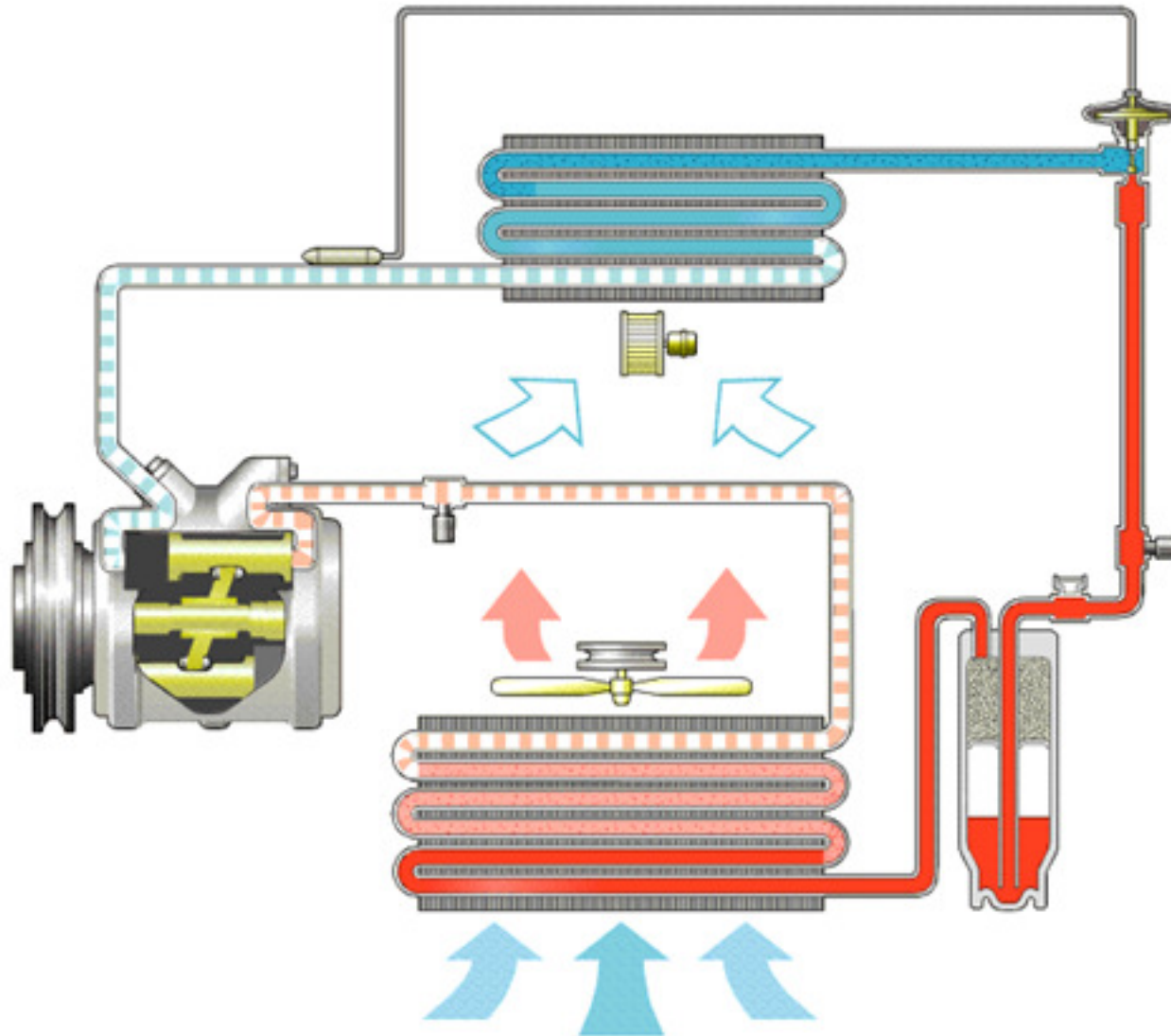


### COMPRESSOR OIL

#### Compressor oil quantity & Cooling capacity





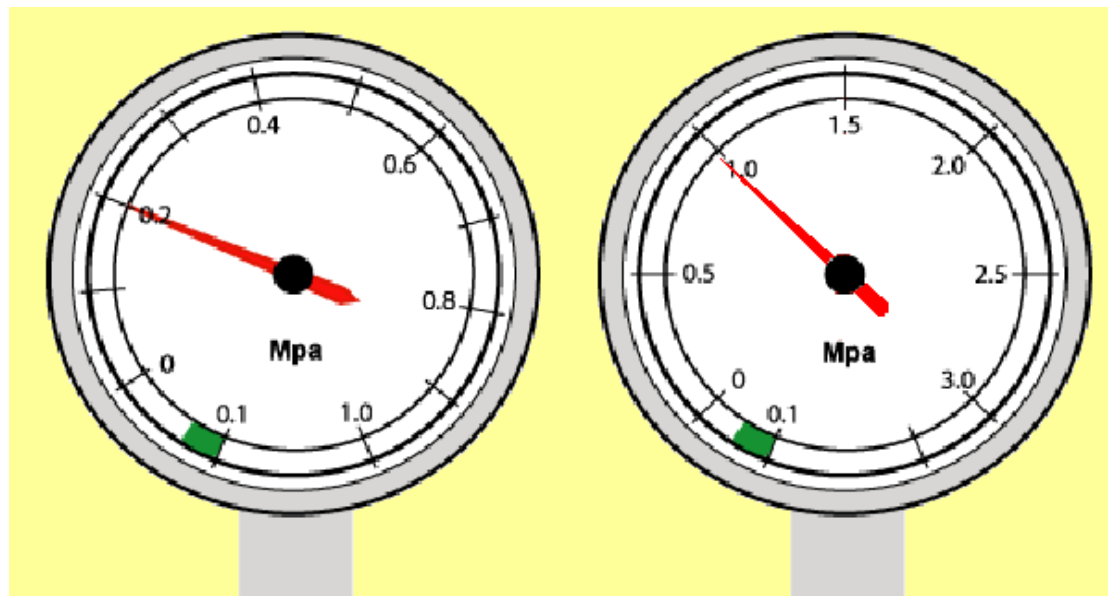


## Temperatuur/druk verhouding R134a

Temp (°C)	Druk (bar)	Druk (kPa)	Temp (°C)	Druk (bar)	Druk (kPa)	Temp (°C)	Druk (bar)	Druk (kPa)
-9	2,0	209				41	10,5	1044
-8	2,2	217				42	10,7	1072
-7		225	21	5,9		43	11,0	1101
		234	22	6,0		44	11,3	1130
0	2,9		23	6,3		45	11,6	1160
1	3,0		24	6,5		46	11,9	1190
2	3,2		25	6,7		47	12,2	1221
3	3,3		26	6,9		48	12,5	1253
4	3,4					49		1285
5	3,5							1318
			33	8,3		61	17,2	
			34	8,6		62	17,6	
			35	8,9		63	18,0	
			36	9,1		64	18,5	
			37	9,4		65	18,9	
12		443	38	9,6		61	17,2	
13	4,5	458	39	9,9				
14	4,7	473	40	10,2				
15	4,9	488						

### NORMAL OPERATION

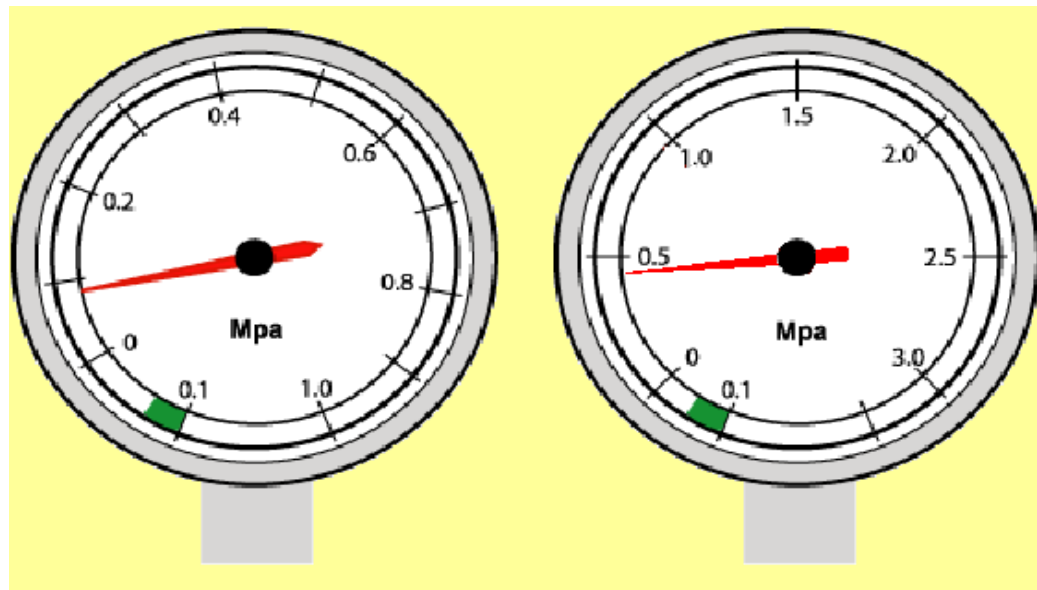
Low pressure  
 $\pm 0.2 \text{ MPa}$



High pressure  
 $\pm 1.0 \text{ MPa}$

### INSUFFICIENT REFRIGERANT

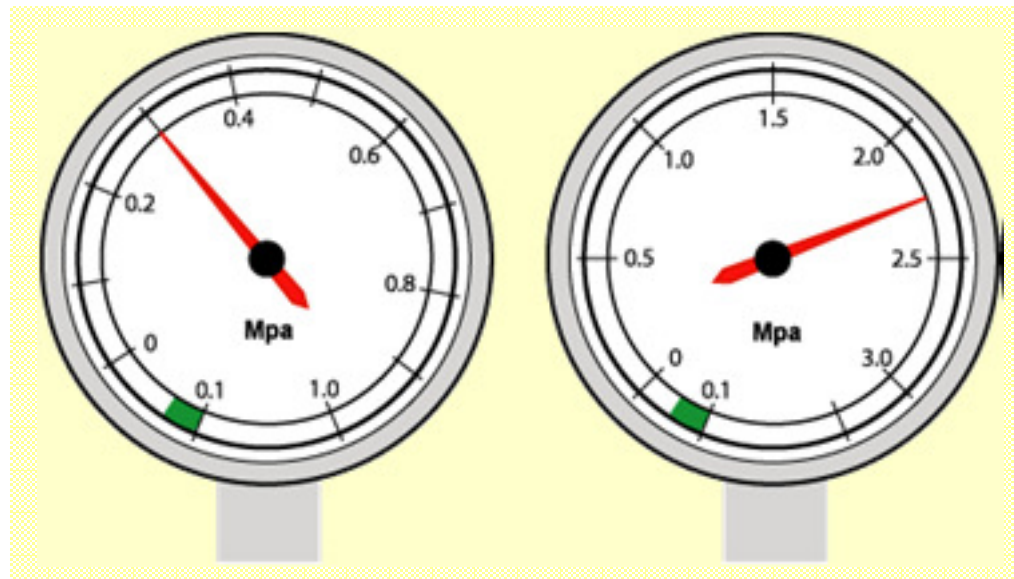
Low pressure  
=  
Too low



High pressure  
=  
Too low

### EXCESSIVE REFRIGERANT OR INSUFFICIENT CONDENSER COOLING

Low pressure  
=  
Too high



High pressure  
=  
Too high

### BLOCKED SYSTEM

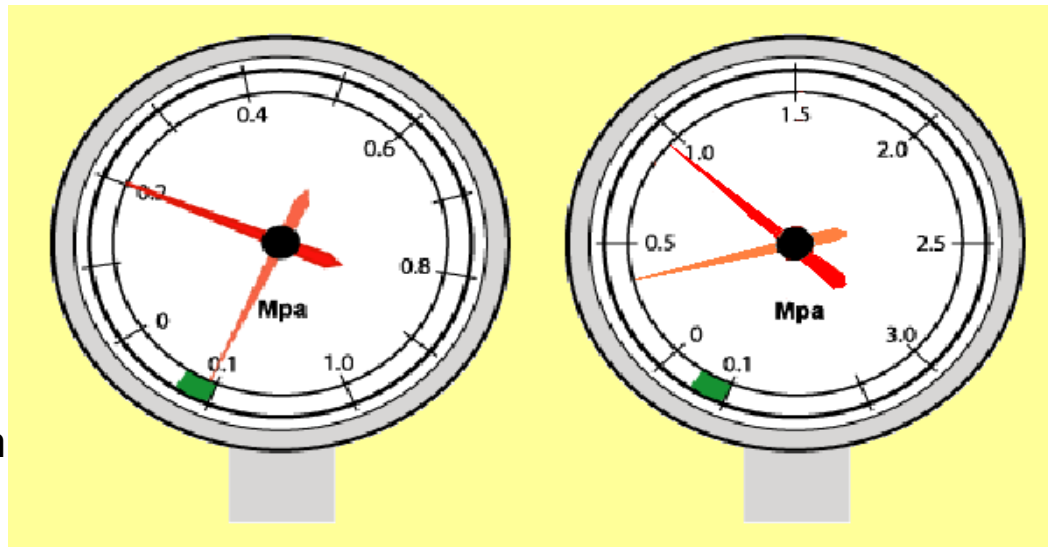
Low pressure  
=  
vacuum



High pressure  
=  
Low

### MOISTURE MIXED WITH REFRIGERANT

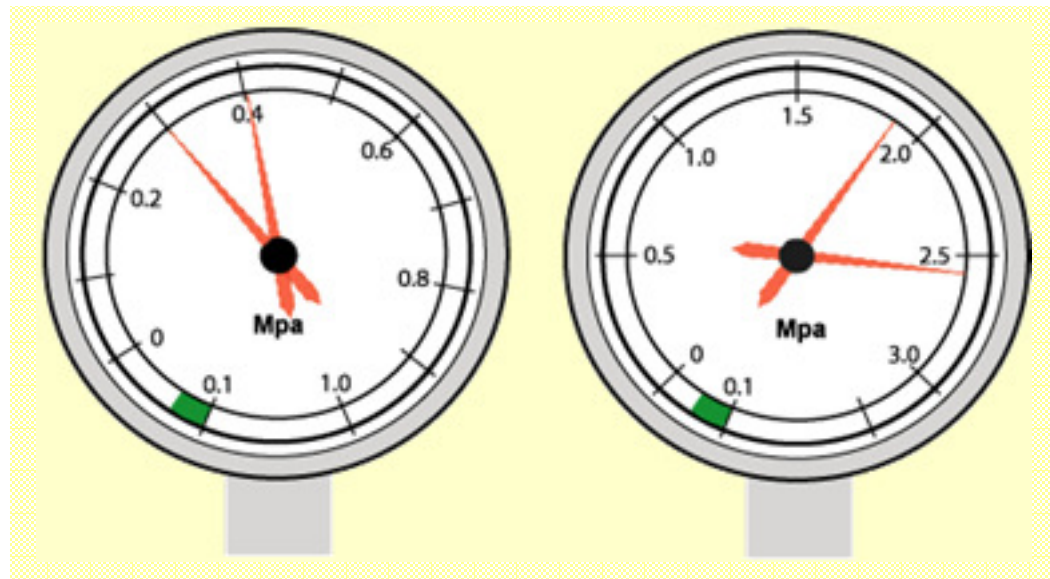
Low pressure  
changes between  
normal and vacuum



High pressure  
changes between  
normal and low

### AIR MIXED WITH REFRIGERANT

Low pressure  
=  
Too high

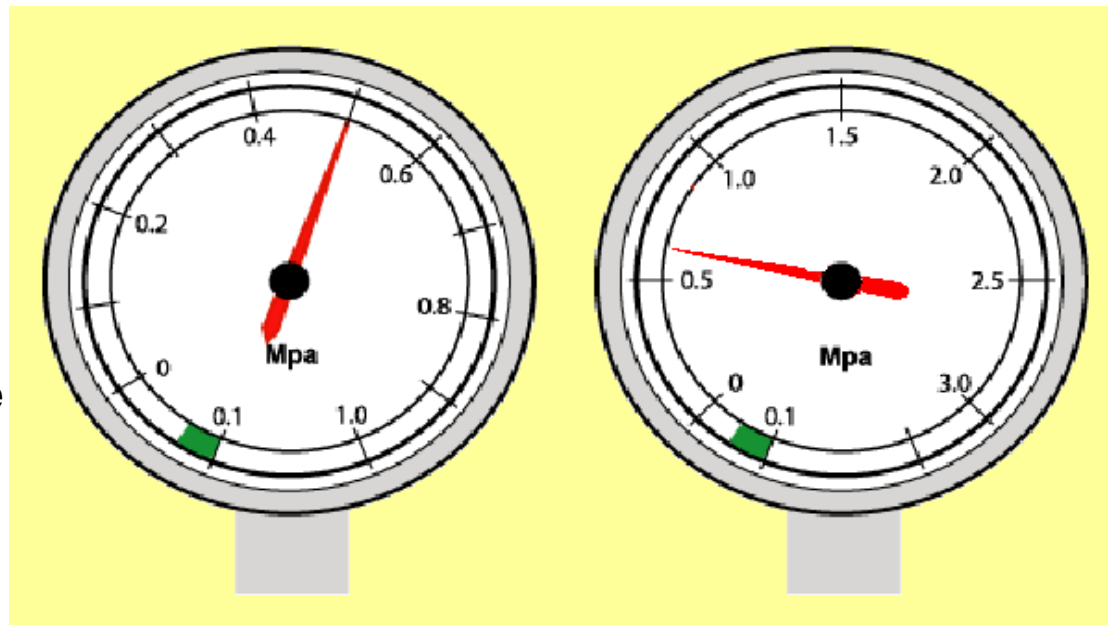


High pressure  
=  
Too high



### COMPRESSOR FAILURE

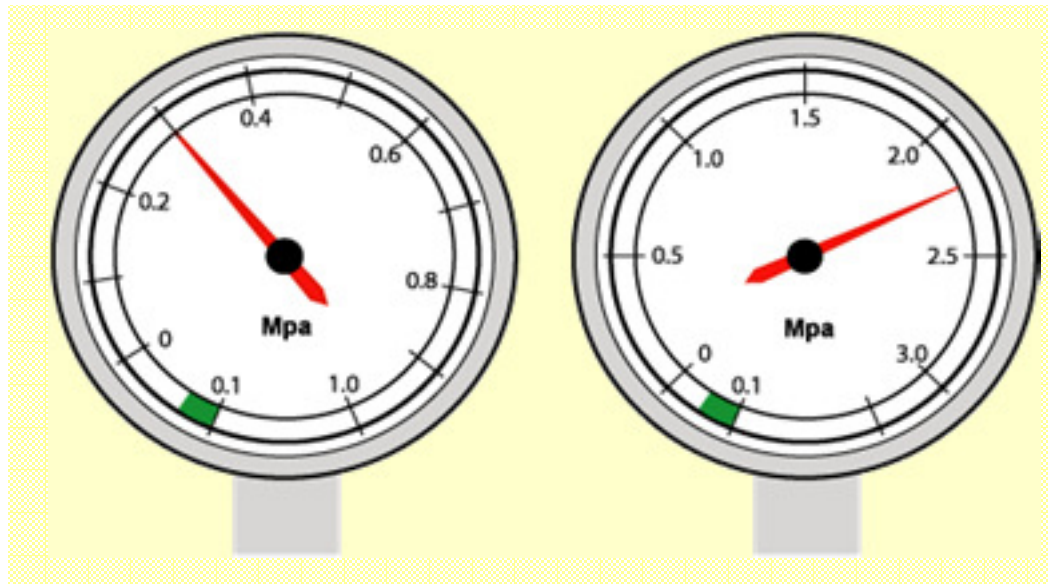
Low pressure  
=  
Too high



High pressure  
=  
Too low

### EXPANSION VALVE OPENS TOO WIDE

Low pressure  
=  
Too high



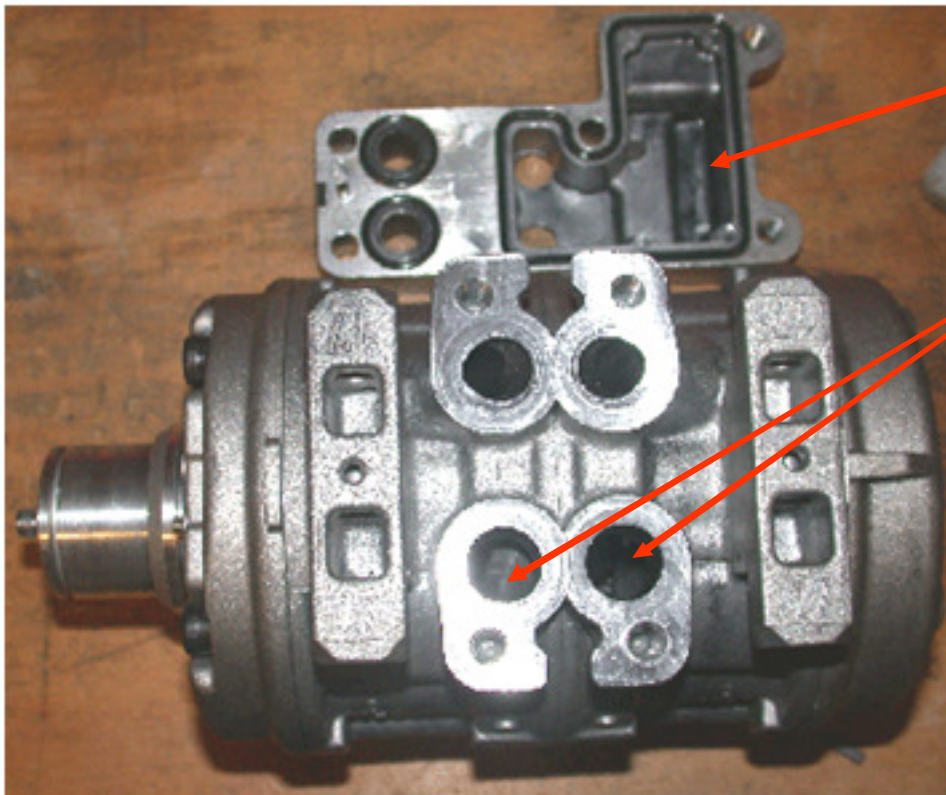
High pressure  
=  
Too high



# **Basic Car Air Conditioning**

### BAD REPAIR

#### INSUFFICIENT CLEANING

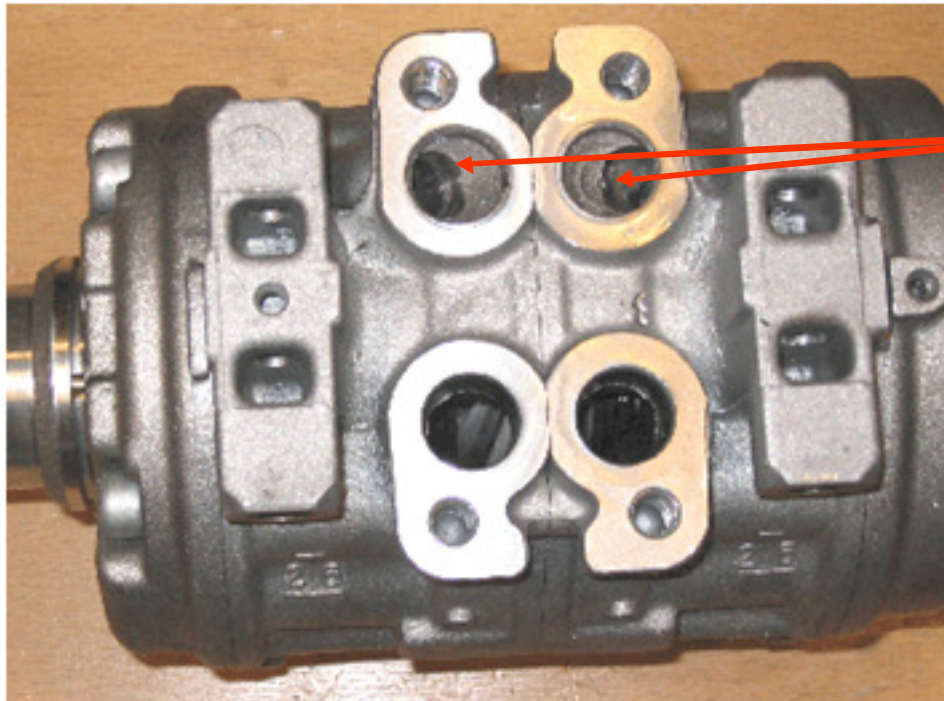


Black residue and  
small metal particle's  
at Suction side

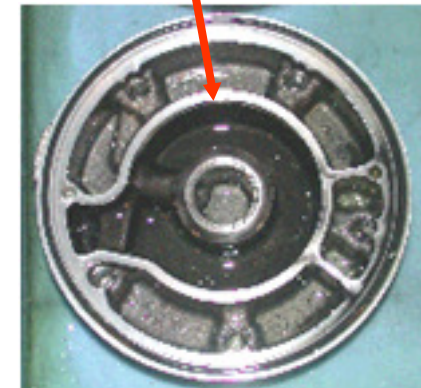
Black residue at Suction side

### INSUFFICIENT LUBRICATION

LOW REFRIGERANT / OIL AMOUNT



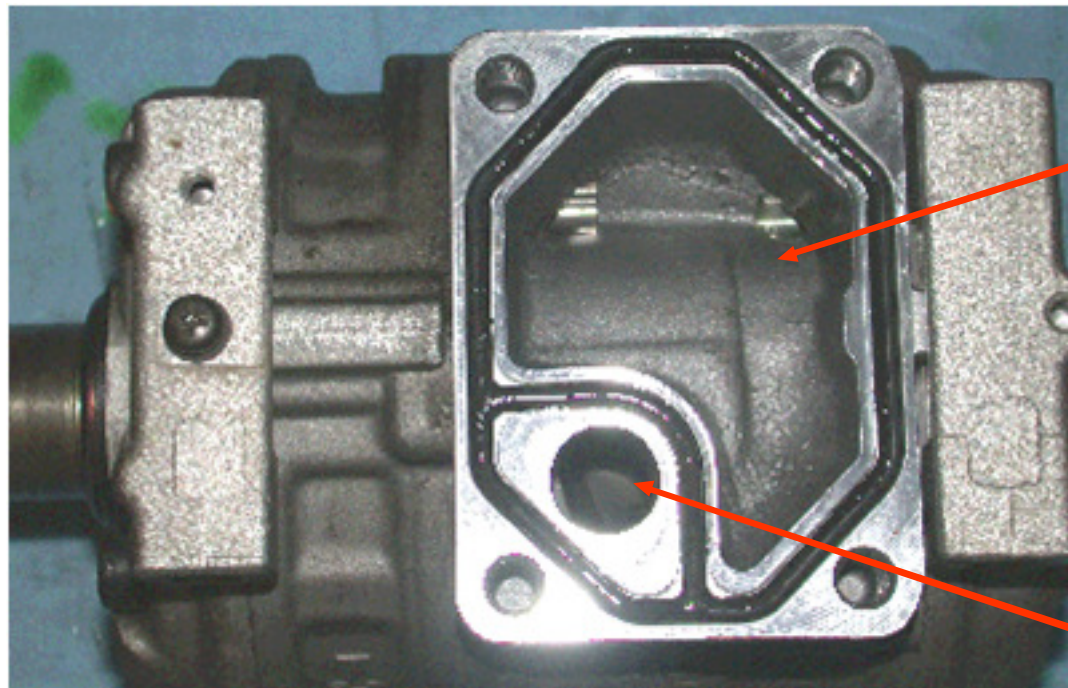
Black residue  
at  
Discharge side



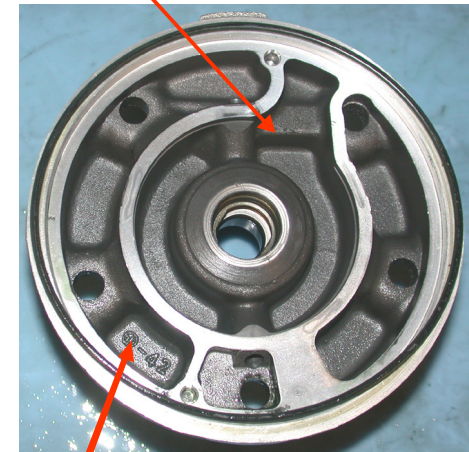


### INSUFFICIENT LUBRICATION

#### NO RUN-IN PROCEDURE



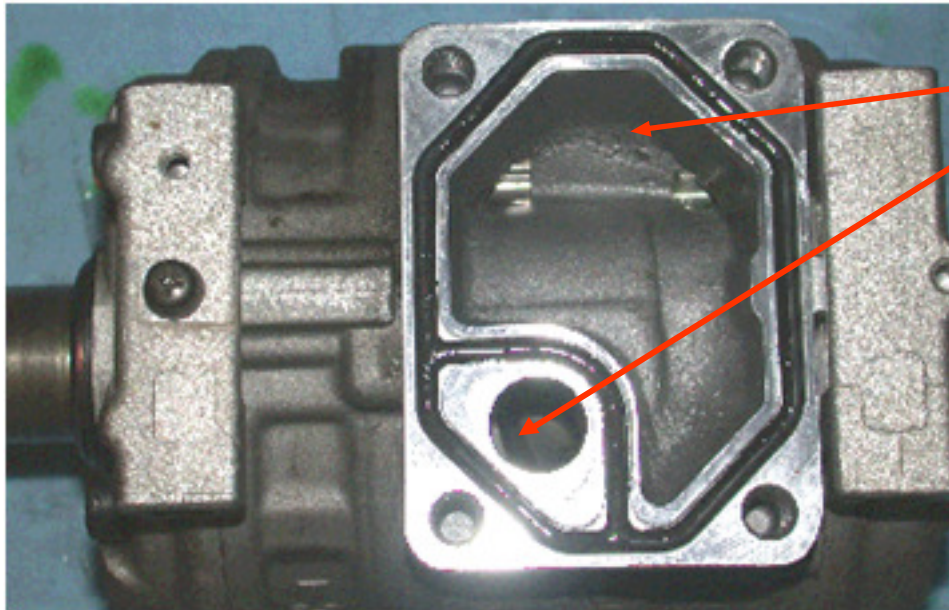
Discharge side is  
clean and lubricated



Suction is clean  
and dry

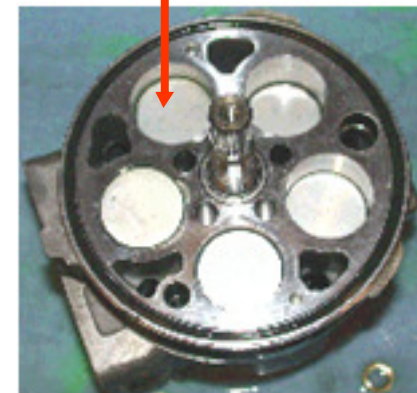
### LIQUID LOCK

TOO MUCH COMPRESSOR OIL



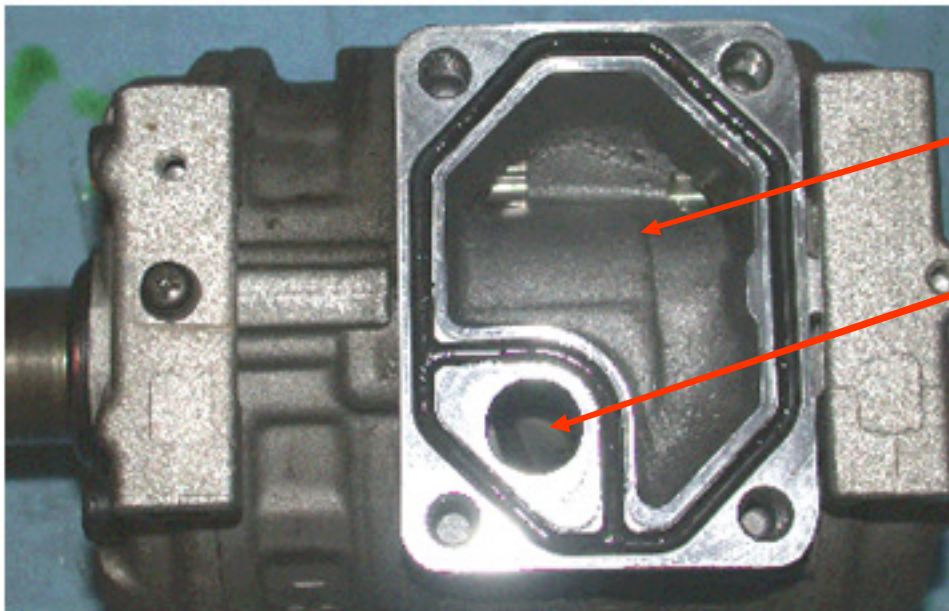
Discharge and Suction are  
Clean and wet by Oil

All cylinders are filled with oil



### LIQUID LOCK

**INCORRECT CHARGING** (liquid charging at Suction side)



Discharge is clean  
and wet by oil

Suction side is  
clean and dry

Swash plate damage due to  
impact of Ball-shoe

