



U-3ARC TRAINING WEBINAR #20

MODULATING REGULATORS

Ridha JABLAOUI

April 29, 2023



- 1- MODULATING REGULATORS
- 2- PILOT VALVES FOR **"PM or ICV"** MODULATING REGULATORS
- 3- ICV Flexline™ MODULATING REGULATORS
- 4- **"PM1 / ACS1"** MAIN VALVE
- 5- ALL OR NOTHING REGULATION **"PM1/ICS1"**
- 6- **"PM1/ICS1"** EVAPORATION PRESSURE REGULATION
- 7- **"PM1/ICS1"** SUCTION PRESSURE REGULATION
- 8- **"PM1/ICS1"** CONDENSING PRESSURE REGULATION
- 9- ELECTRONIC REGULATION OF MEDIUM TEMPERATURE **"PM1/ICS1"**
- 10- **"PM1/ICS1"** AIR CONDENSER LIQUID BOTTLE PRESSURE REGULATION
- 11- MEDIUM TEMPERATURE REGULATION OR FORCED CLOSE/OPEN **"PM1/ICS1"**
- 12- EVAPORATION PRESSURE CONTROL + CHILLED WATER OUTLET TEMPERATURE **"PM1/ICS1"**
- 13- MULTIFUNCTION MODULATING REGULATORS
- 14- MODULATING REGULATORS OF THE COOLING CAPACITY OF THE COMPRESSOR
- 15- ICM Flexline™ MODULATING REGULATORS
- 16- ICLX Flexline™ MODULATING REGULATORS



□ DESIGN:

PM or ICS modulating controllers are servo-operated main valves onto which pilot valves can be screwed or with pilot valves mounted on an external pilot line.

□ USES:

PM or ICS modulating regulators are used to regulate the pressure and temperature of installations:

- refrigeration,
- freezing,
- air conditioning.

1 - MODULATING REGULATORS



PM or ICS modulating controllers are used in refrigeration installations:

- direct expansion
- with recirculation by pumps
- with natural circulation.

PM or ICS modulating regulators can be used on both high and low pressure sides, in wet and dry suction lines and in liquid media lines without phase change.

1 - MODULATING REGULATORS



□ REGULATION MODES:

PM or ICS main valves alone and pilot valves offer a very large number of functions in the areas of:

- all-or-nothing regulation,
- P-regulation
- PI regulation.

□ REFRIGERANTS :

Suitable for non-flammable HCFC, HFC, R717 (ammonia) and R744 (CO₂) refrigerants. **The use of pilot valves with flammable hydrocarbons is not recommended.**

2 - PILOT VALVES FOR “PM & ICV” MODULATING REGULATORS



2 -1 /Old Pilot Valves for direct mounting in main valves

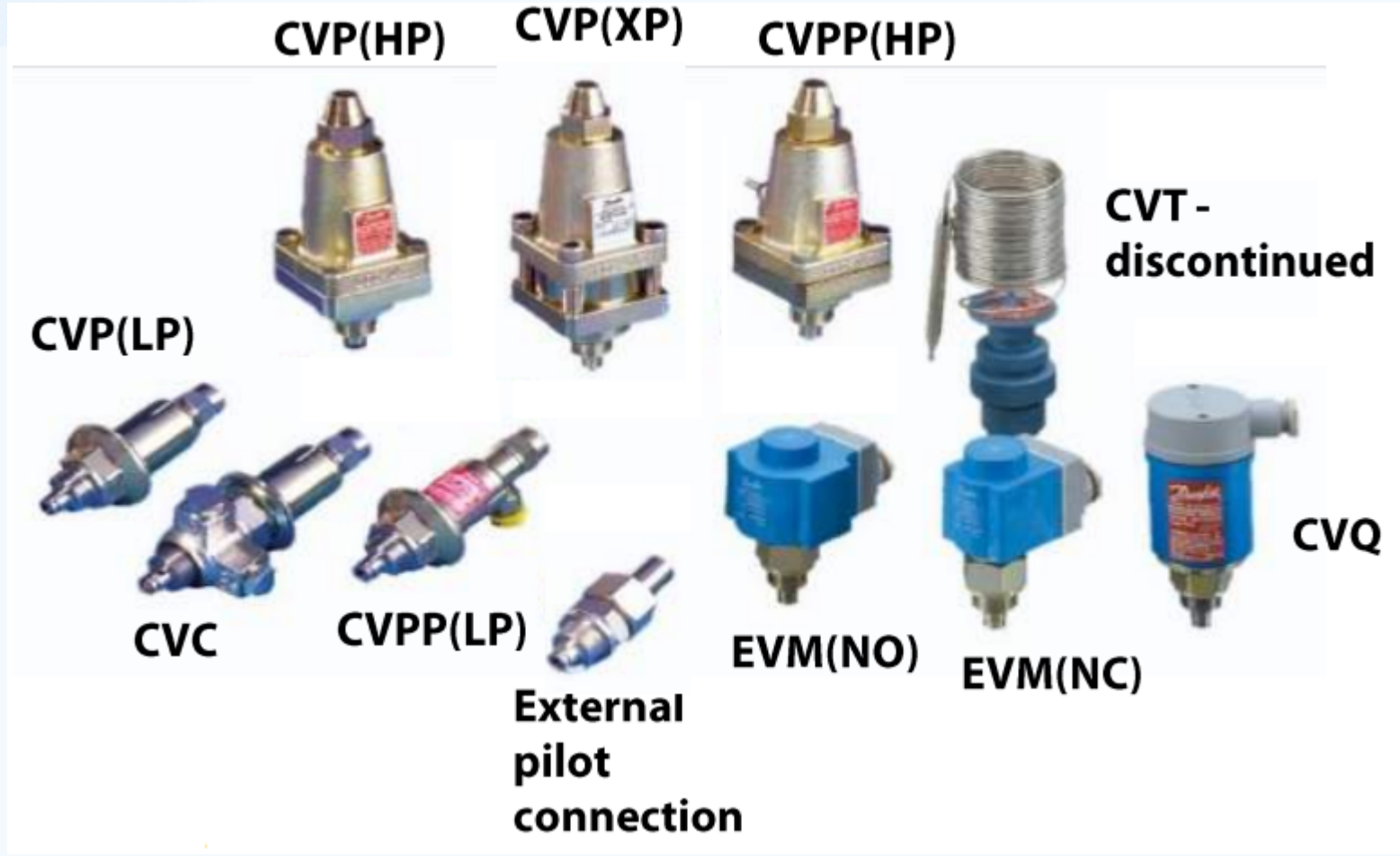


La gamme des vannes pilotes se compose de:

- Vannes pilotes à pression constante, type CVP (LP) et CVP (HP)
- Vannes pilotes à pression différentielle, type CVPP (LP) et CVPP (HP)
- Vanne pilote à haute pression, type CVP (XP), idéale pour le dégivrage des conduites de gaz chaud CO₂
- Vannes pilotes pressostatiques avec raccord pour pression de référence, type CVC
- Vannes pilotes thermostatiques, type CVT (indépendantes de la pression)
- Vannes pilotes à pression constante à commande électronique, type CVQ (dépendantes de la pression)
- Électrovannes pilotes, type EVM (NF)
- Électrovannes pilotes, type EVM (NO)
- Corps pour vannes pilotes type CVH, destinés à être montés sur des conduites de pilotage externes.



2 - PILOT VALVES FOR "PM & ICV" MODULATING REGULATORS



2 - PILOT VALVES FOR “PM & ICV” MODULATING REGULATORS



The new range of pilot valves includes the following models:

- Constant pressure pilot valve, type CVP
- Differential pressure pilot valve, type CVPP
- Pressostatic pilot valve, with reference pressure connection, type CVC
- Constant pressure electronic pilot valve, type CVE
- Pilot solenoid valve, type EVM (NC)
- Pilot solenoid valve, type EVM (NO)
- Base, type CVH for pilot valves, for mounting on external pilot lines





3-1: Replacement of old PM valves

by

The ICV Flexline™ range





PM1



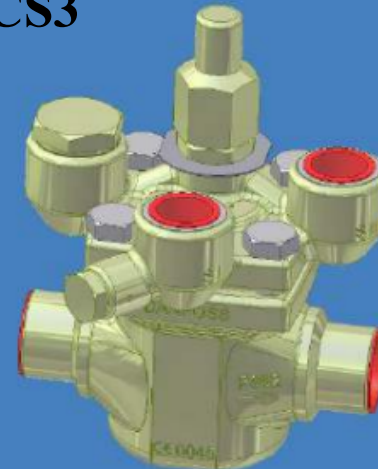
PM3



ICS1



ICS3





3-2: "ICS Flexline™" SERVO PILOT VALVE

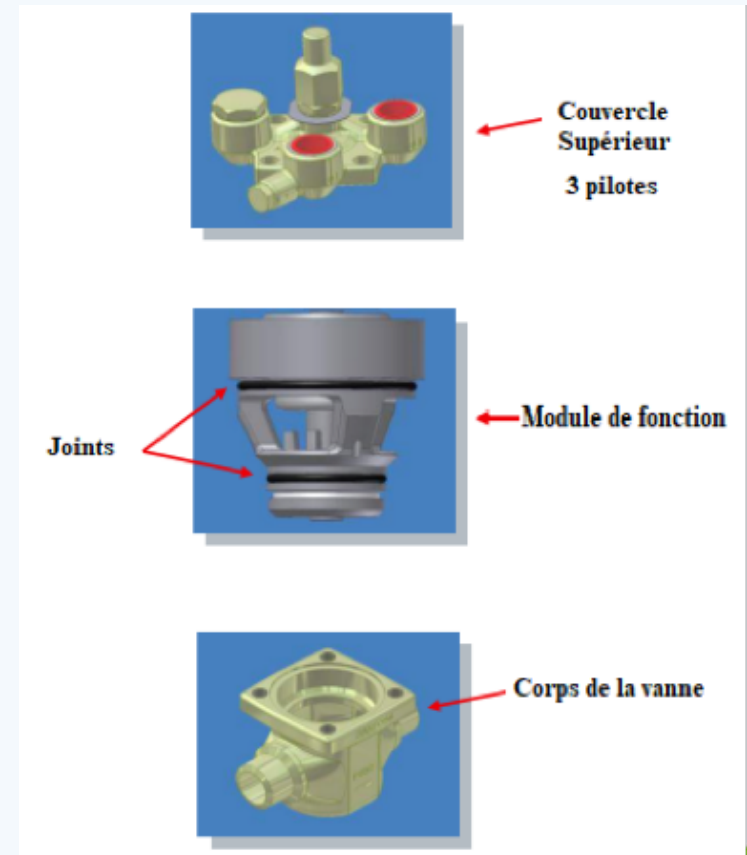
ICS(1 or 3) are compact servo-operated control valves. These ICS valves are used for the regulation of pressure, temperature and on/off functions in refrigeration systems. They can be used on both high and low pressure sides, on dry or wet suction lines and on liquid lines without phase change. The ICS valve consists of three main components: a valve body, a function module, and an end cover.



Only one pilot valve can be mounted in the pilot port for **ICS1**



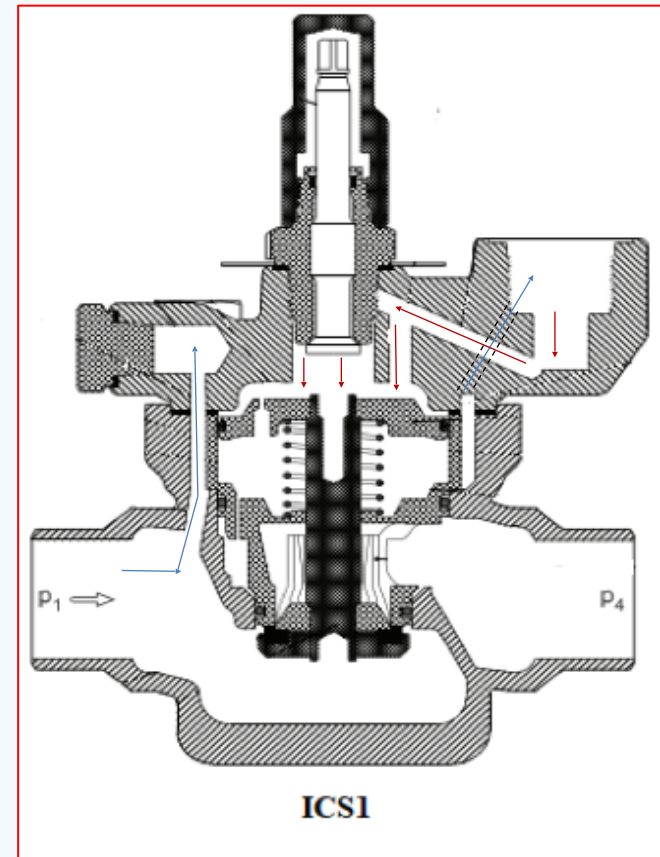
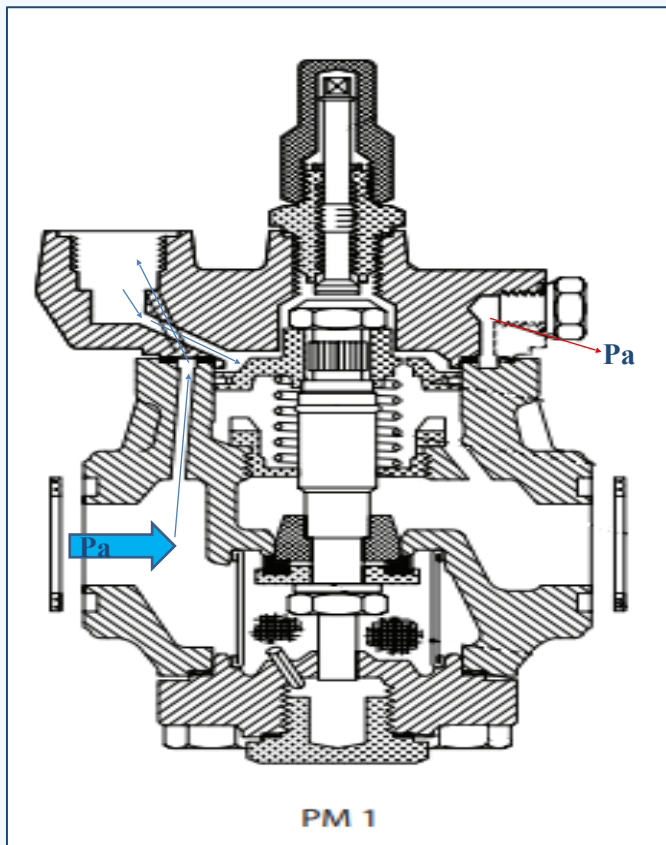
Three pilot valves can be mounted in the pilot ports for **ICS3**



4 – “PM1/ICS1” MAIN VALVES



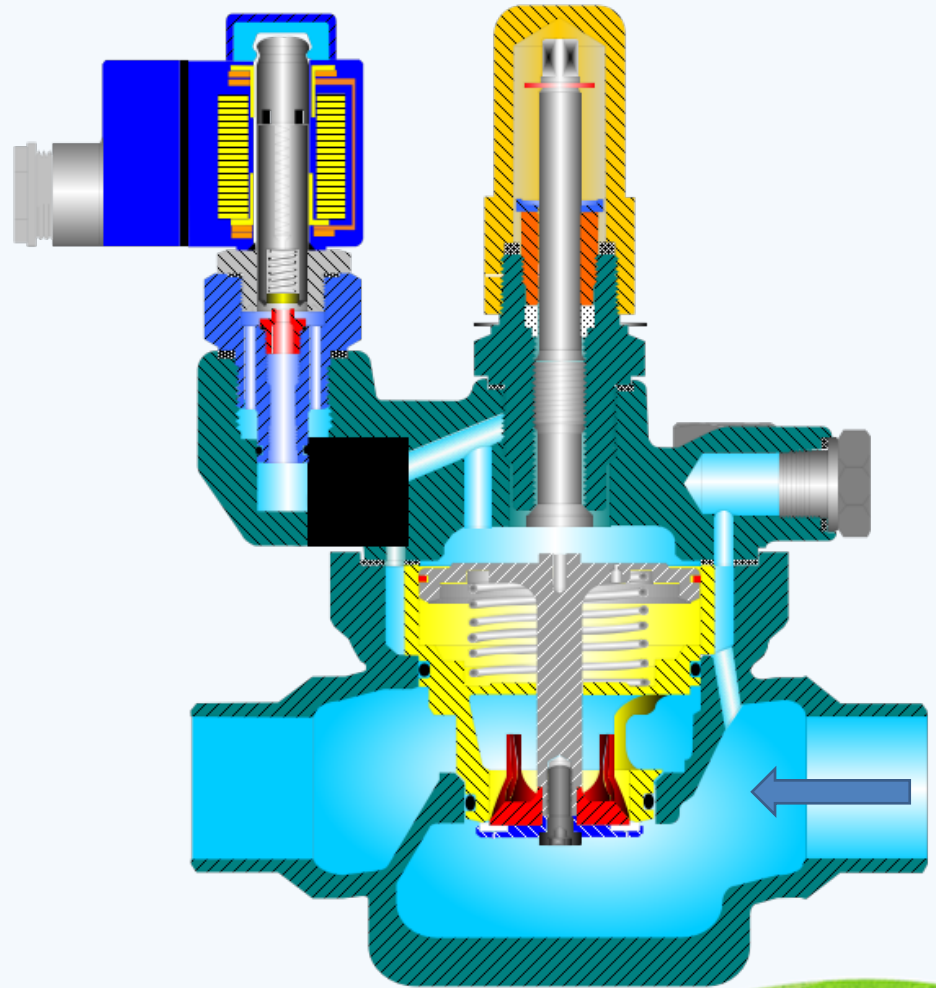
The PM1 or ICS1 main valve is equipped with a single connection for the pilot valve, and a pressure gauge connection.



5 – "PM1/ICS1" ALL OR NOTHING CONTROL



The **PM1** or **ICS1** main valve on which an **EVM**-type pilot solenoid valve is screwed acts as a solenoid valve for electrical isolation in the suction lines, liquid lines, condensate lines or bypasses.

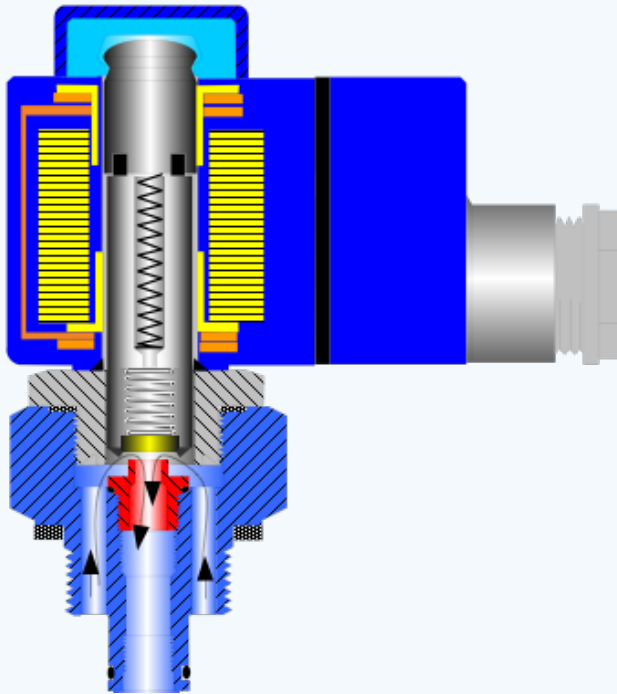


5 – "PM1/ICS1" ALL OR NOTHING CONTROL



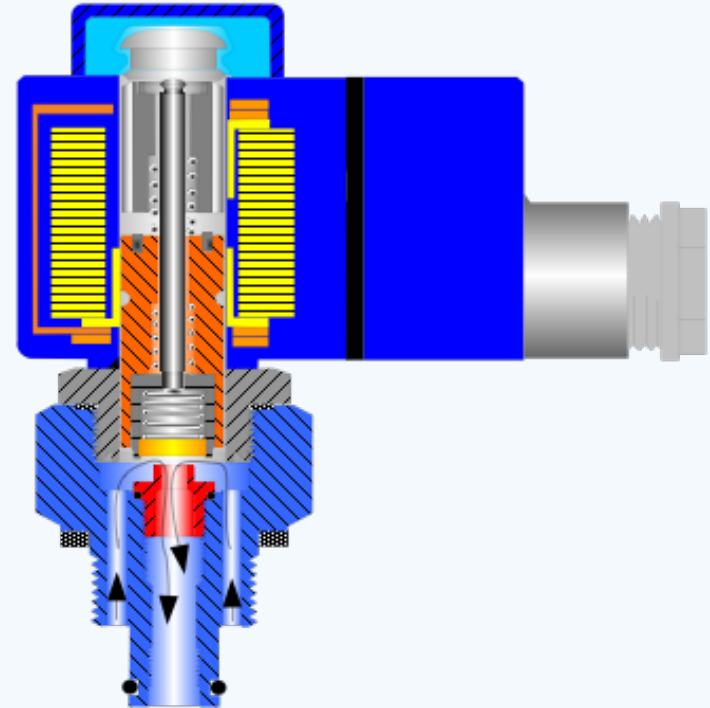
EVM – NC

Shown with flow
i.e. coil is energized



EVM – NO

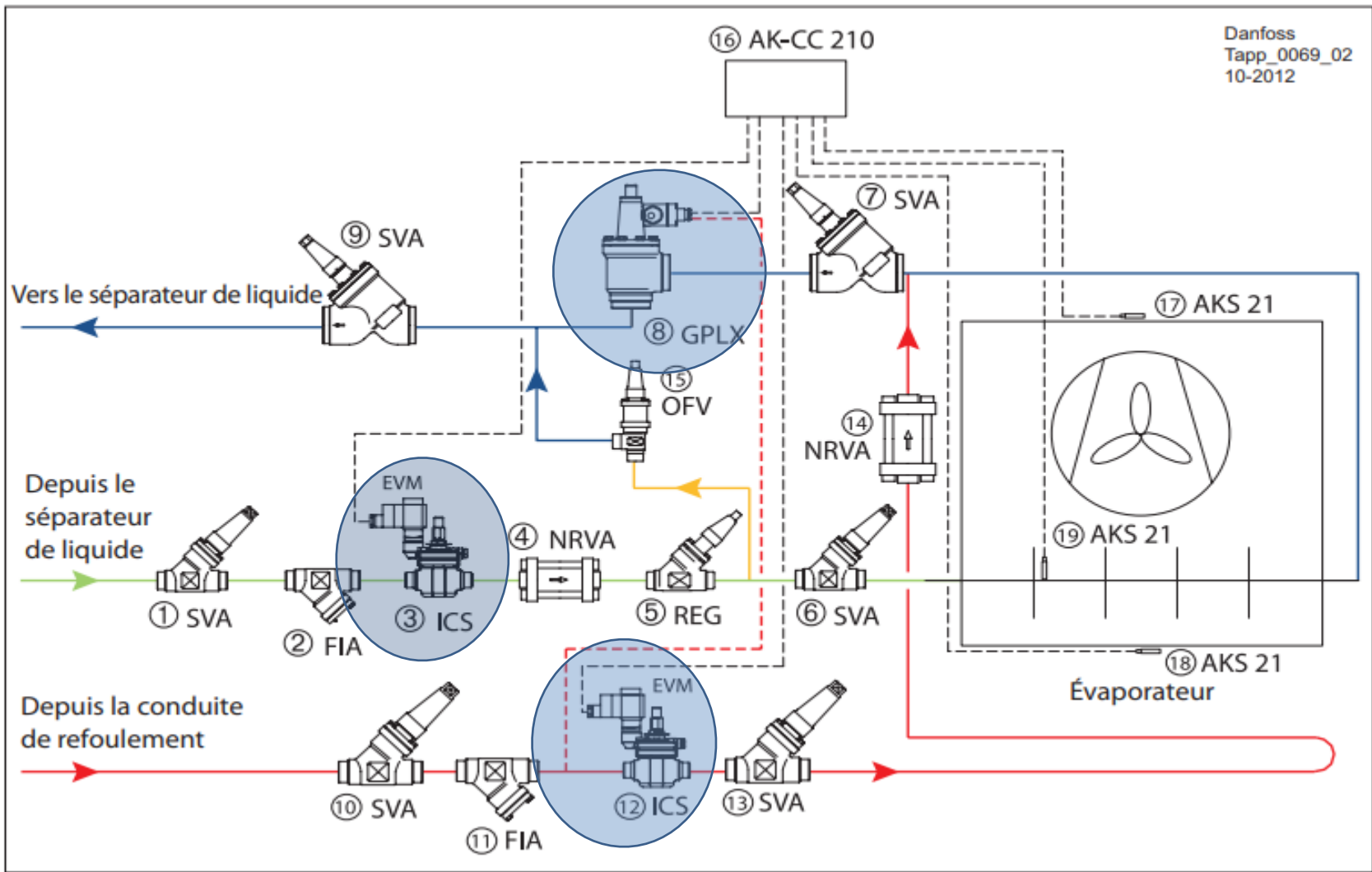
Shown with flow
i.e. coil is de-energized



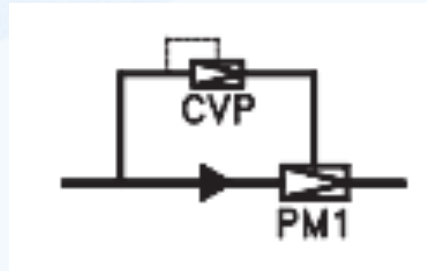
5 – "PM1/ICS1" ALL OR NOTHING CONTROL



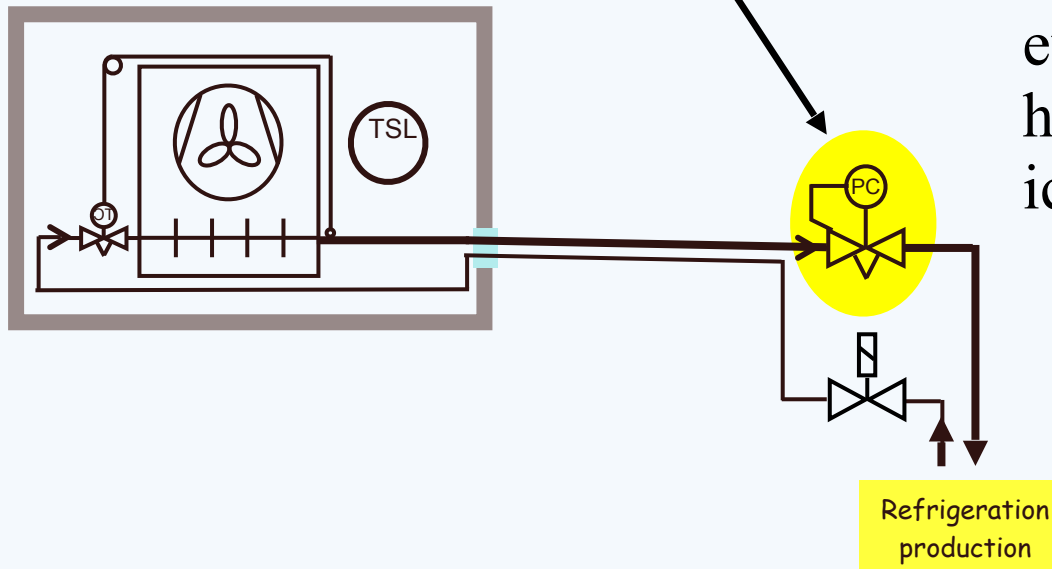
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6 – "PM1/ICS1" EVAPORATION PRESSURE REGULATION



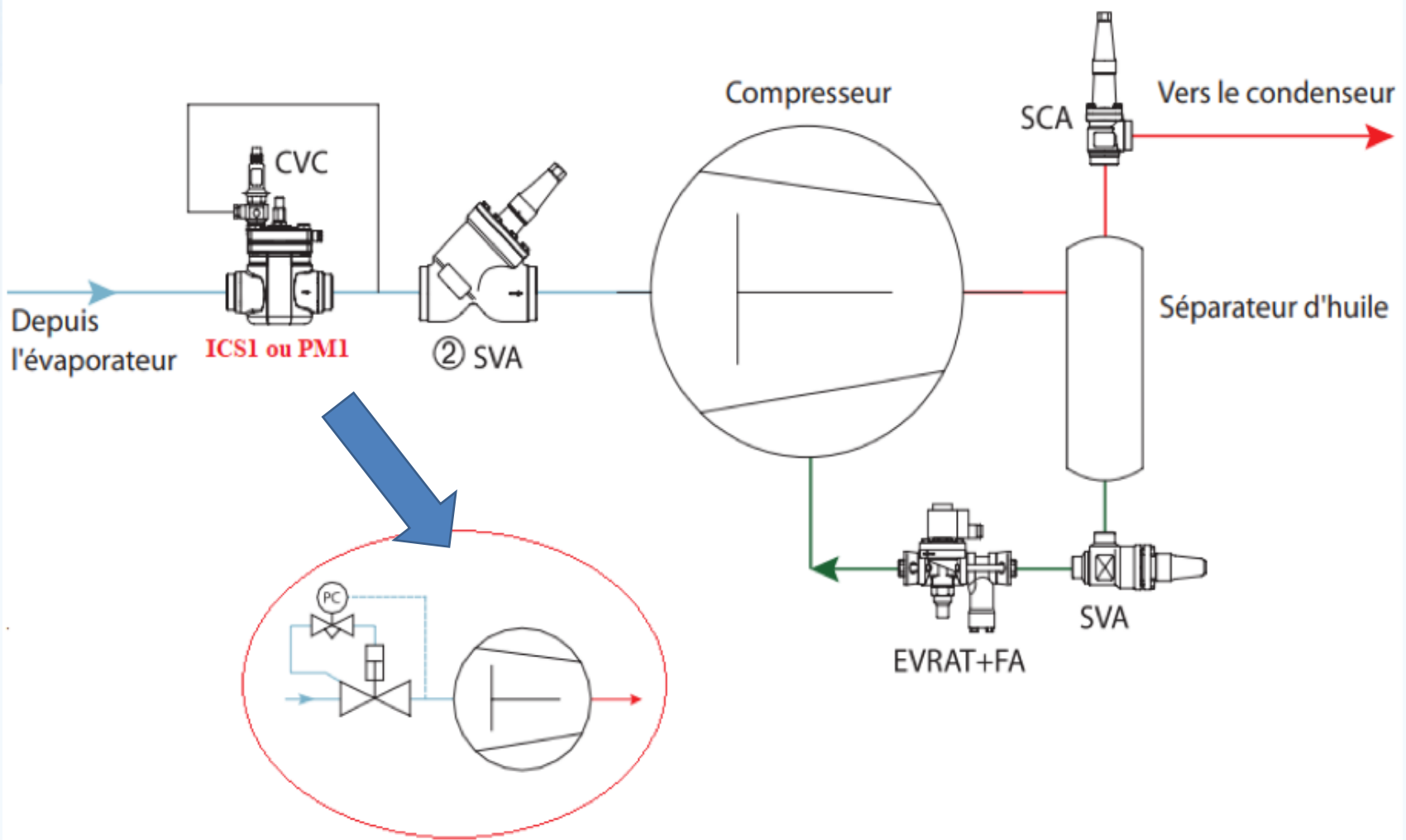
PM1
or
ICS1
+
CVP
(BP)



Maintains constant evaporation pressure and therefore constant evaporation temperature.

Prevents too low evaporation pressure and hence the formation of ice in water coolers.

7 – "PM1/ICS1" SUCTION PRESSURE REGULATION



7 – "PM1/ICS1" SUCTION PRESSURE REGULATION



Application

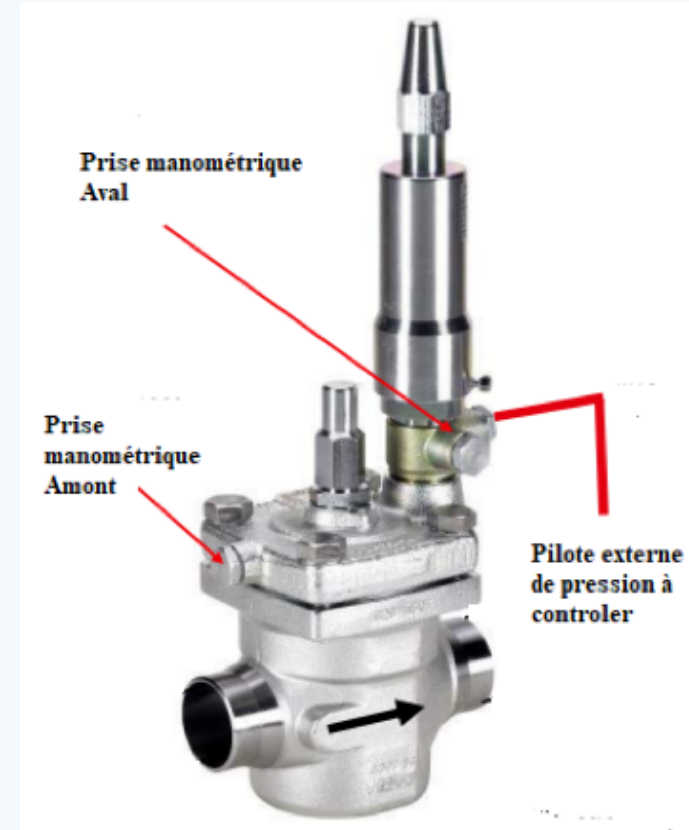
Applies to reciprocating compressors.
Normally used for small to medium sized systems

Benefits

Simple and reliable. Effective in protecting reciprocating compressors at start-up or after hot gas defrosting

Boundaries

Causes a constant pressure drop in the suction line.

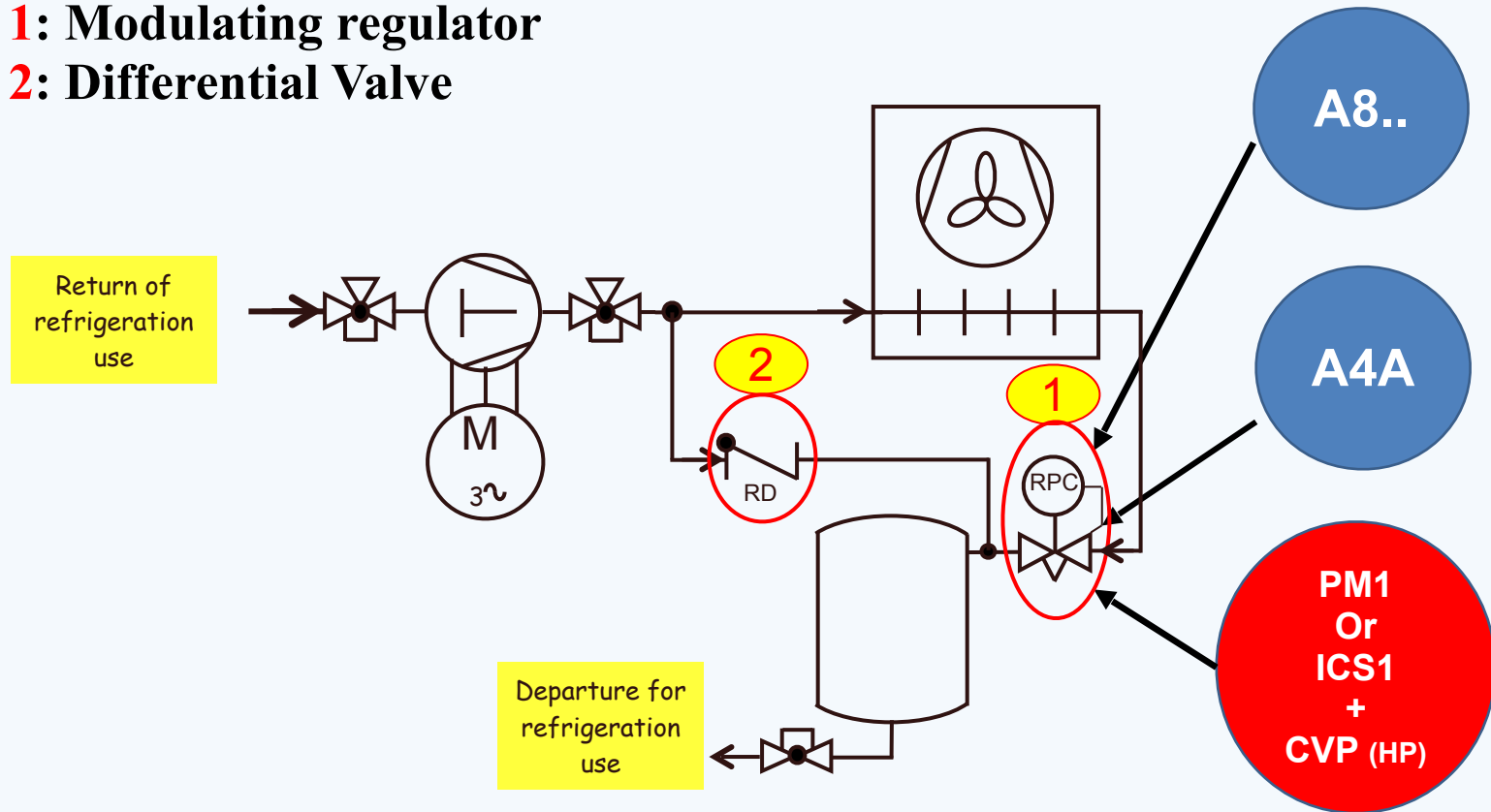


ICS1 and HVAC

8 – "PM1/ICS1" CONDENSING PRESSURE REGULATION



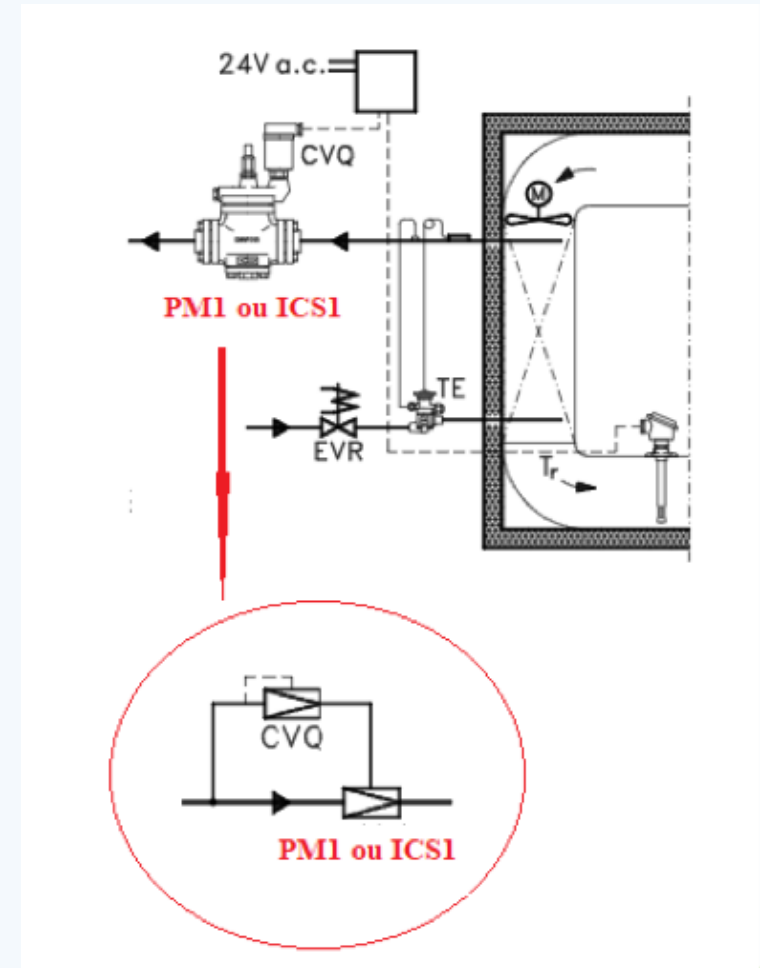
- 1: Modulating regulator**
- 2: Differential Valve**



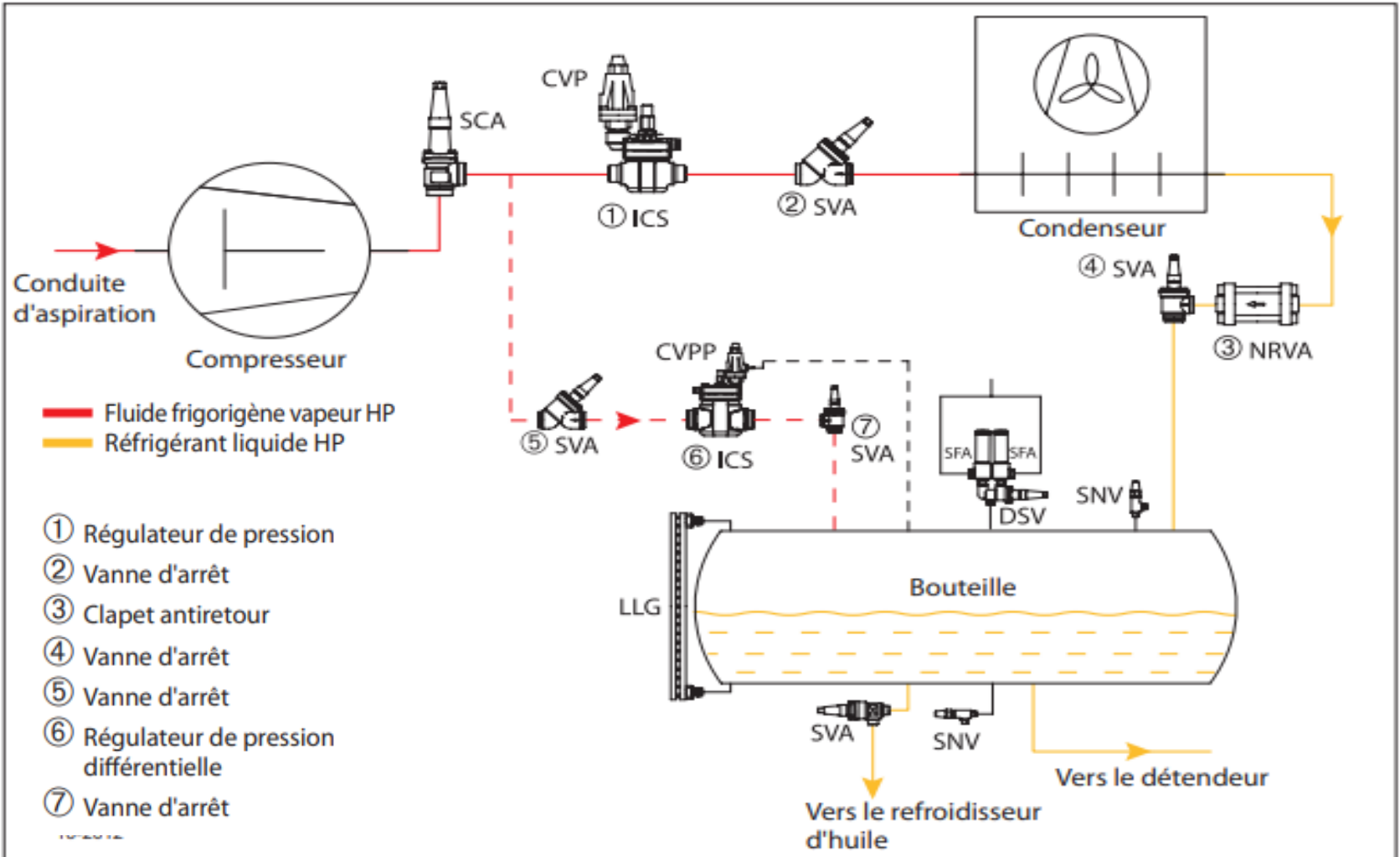
9 – ELECTRONIC MEDIUM TEMPERATURE REGULATION “PM1/ICS1”



Maintains constant medium temperature with an accuracy of $\pm 0.25^{\circ}\text{C}$
Independent of the evaporation pressure regulation.



10 - LIQUID BOTTLE PRESSURE REGULATION FOR AIR CONDENSER:

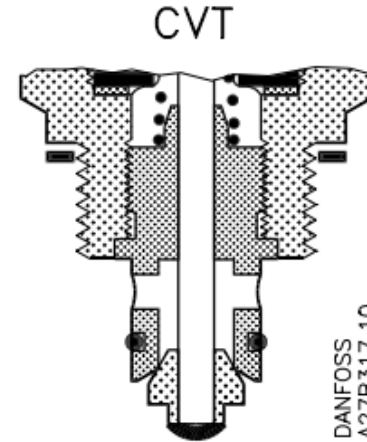


1 – MEDIUM TEMPERATURE REGULATION OR FORCED CLOSURE / OPEN "PM1/ICS1"



CVT

Temperature regulation. -40 to 60°C .
Open when the temperature rises.
independent of pressure

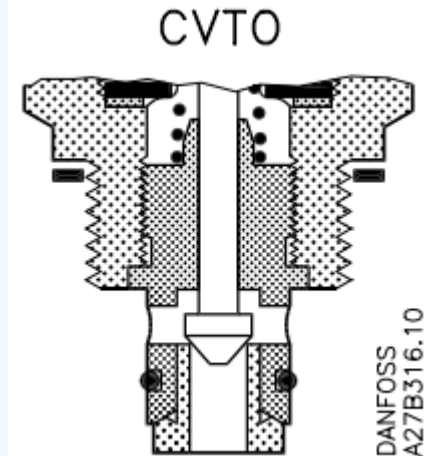


Embase, type CVH pour les vannes pilotes, pour montage sur des conduites pilotes externes



CVTO

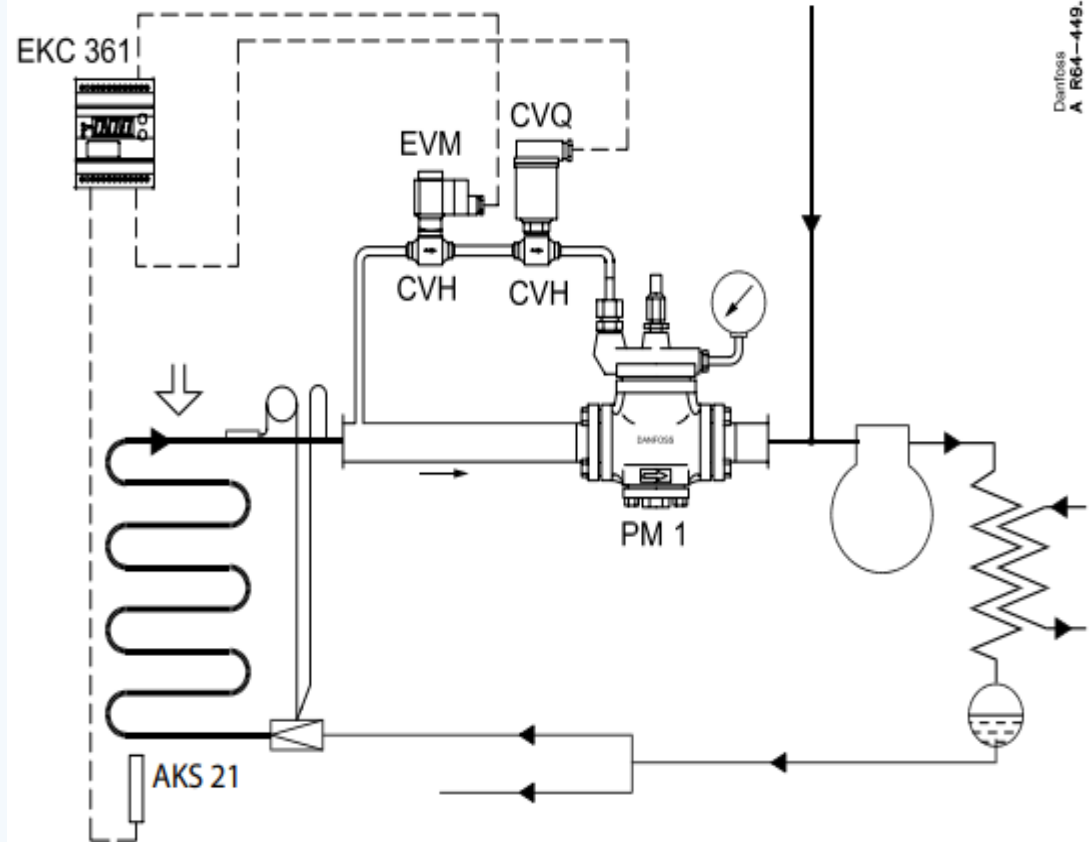
Temperature regulation. -40 to 60°C .
Close when temperature rises.
Independent of pressure.



1 – MEDIUM TEMPERATURE REGULATION OR FORCED CLOSURE / OPEN "PM1/ICS1"



The system is very suitable for a large number of applications in: freezing, Refrigeration the air conditioning sectors as well as in process industries with central control.



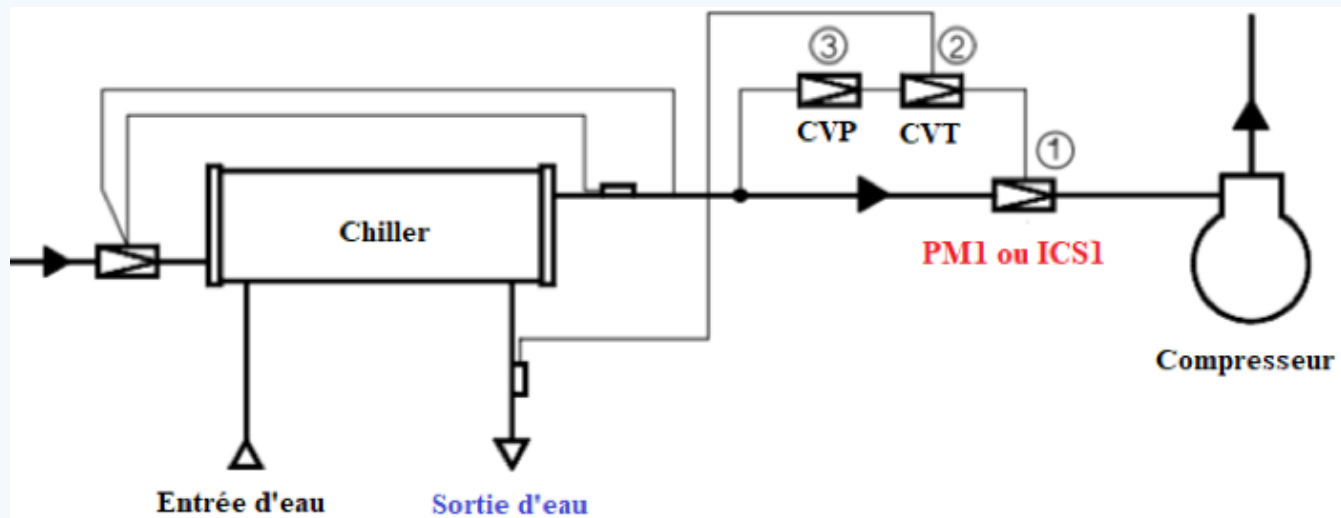
12 -EVAPORATION PRESSURE ADJUSTMENT + CHILLED WATER OUTLET TEMPERATURE:



The CVP pilot valve is connected in series with CVT so that evaporation is maintained.

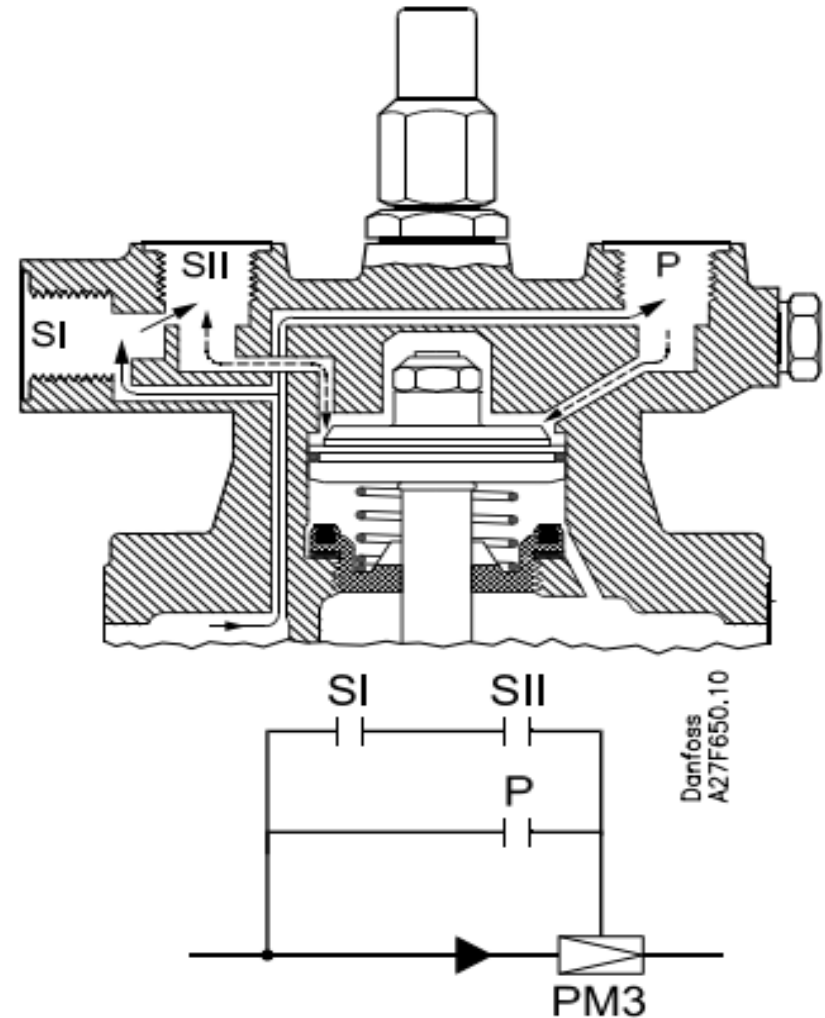
the CVT pilot valve sensor (2) is fitted to the chiller water outlet to regulate in this way the desired water temperature is maintained.

The PM1 or ICS1 main valve (1) ensures the evaporation pressure and the chilled water outlet temperature





The **PM3** or **ICS3** main valve is equipped with three connections for pilot valves: the first two, marked **“SI”** and **“SII”**, are connected in series, while the last, marked **“P”**, is connected in parallel to the other two fittings, and a pressure gauge connection .

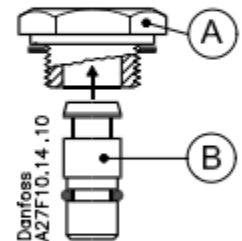
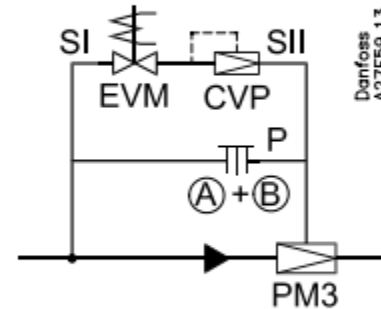
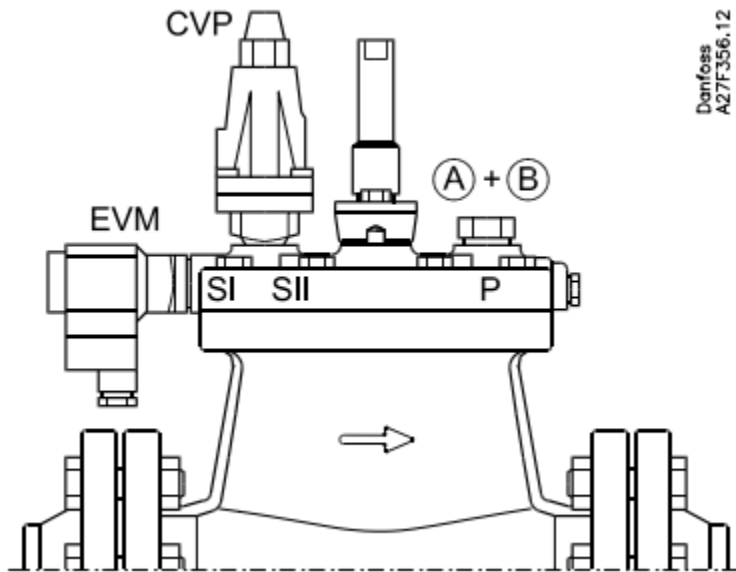


13 - MULTIFUNCTIONAL MODULATING REGULATORS



❑ Constant pressure regulation + electric forced closing

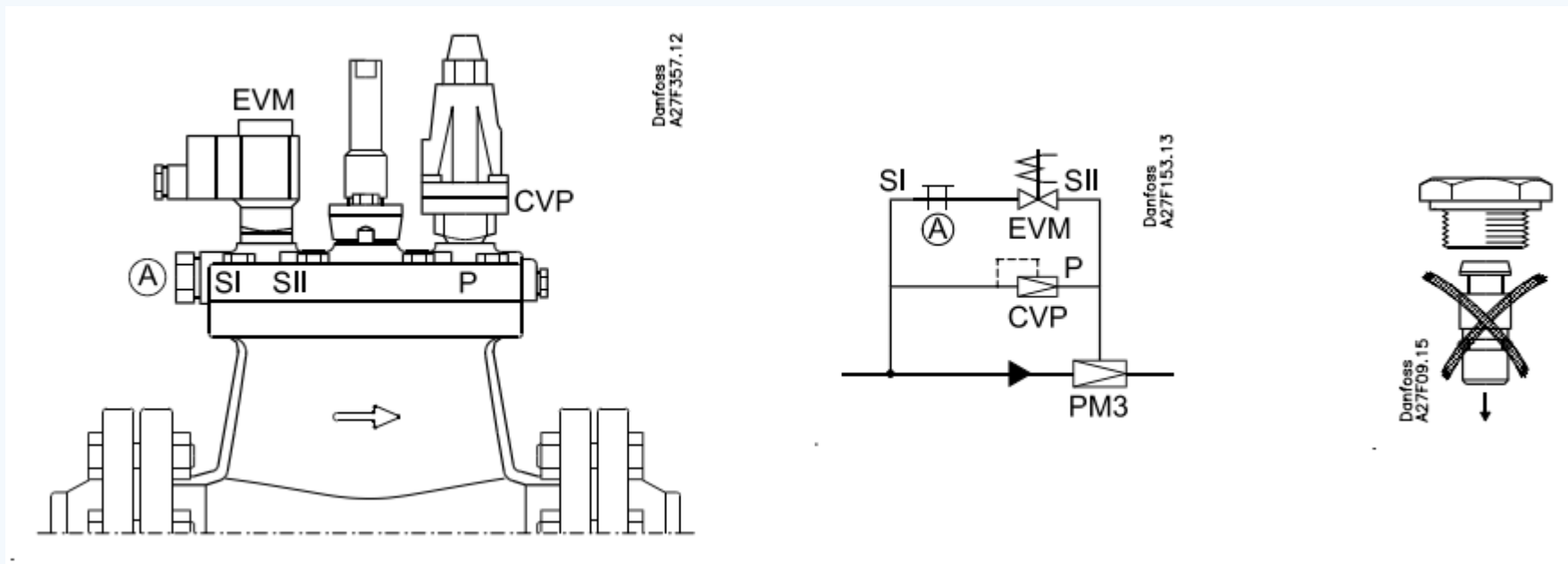
Maintains constant evaporation pressure combined with electric forced shut-off. **PM3** or **ICS3** main valve on which are screwed an **EVM** type pilot solenoid valve and a **CVP**(BP) type pressure operated pilot valve.





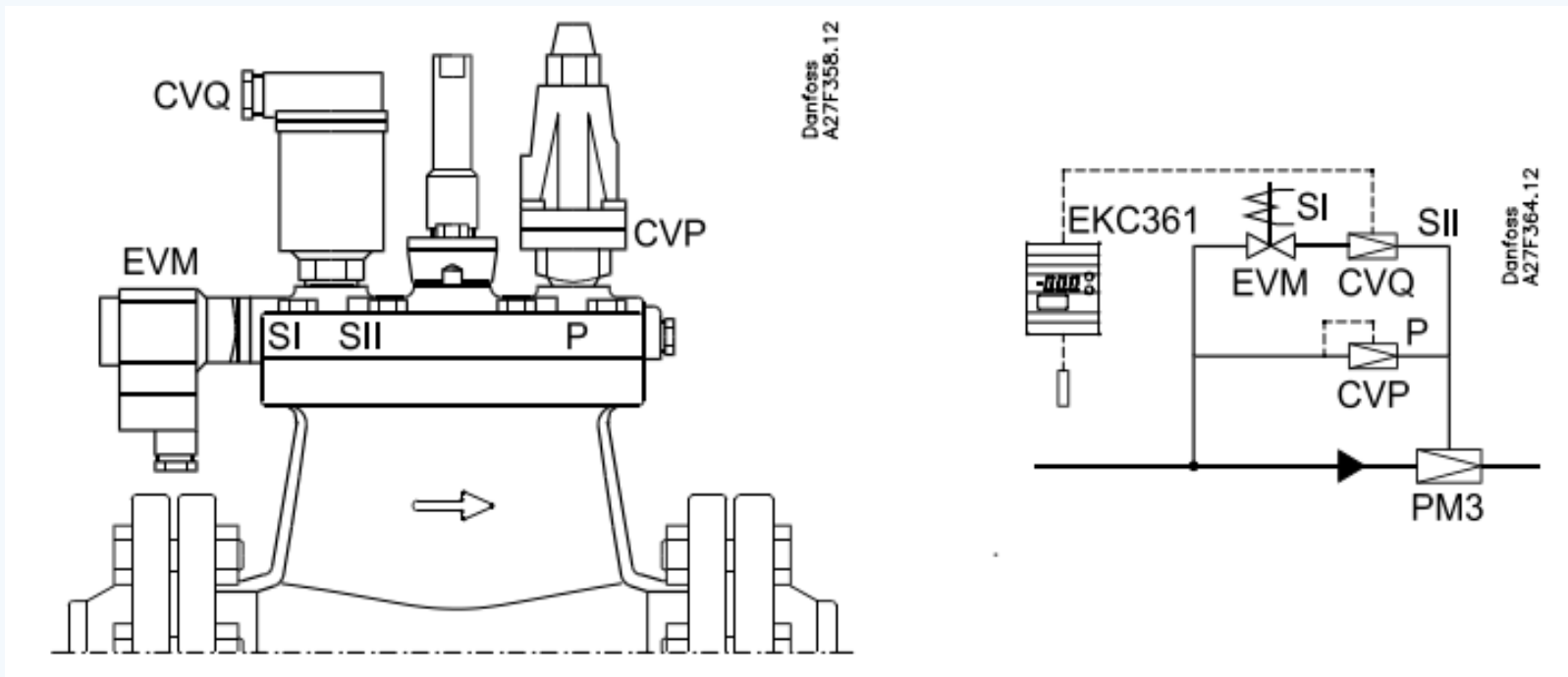
❑ Constant pressure regulation + electric forced opening

Maintains constant evaporation pressure combined with electric forced opening. **PM3** or **ICS3** main valve onto which are screwed an **EVM** type pilot solenoid valve and a **CVP**(HP) type pressure operated pilot valve.





- ❑ **Electronic regulation of the medium temperature with forced electric shut-off and changeover to constant pressure regulation**





□ Suction pressure regulation + electrical forced opening:

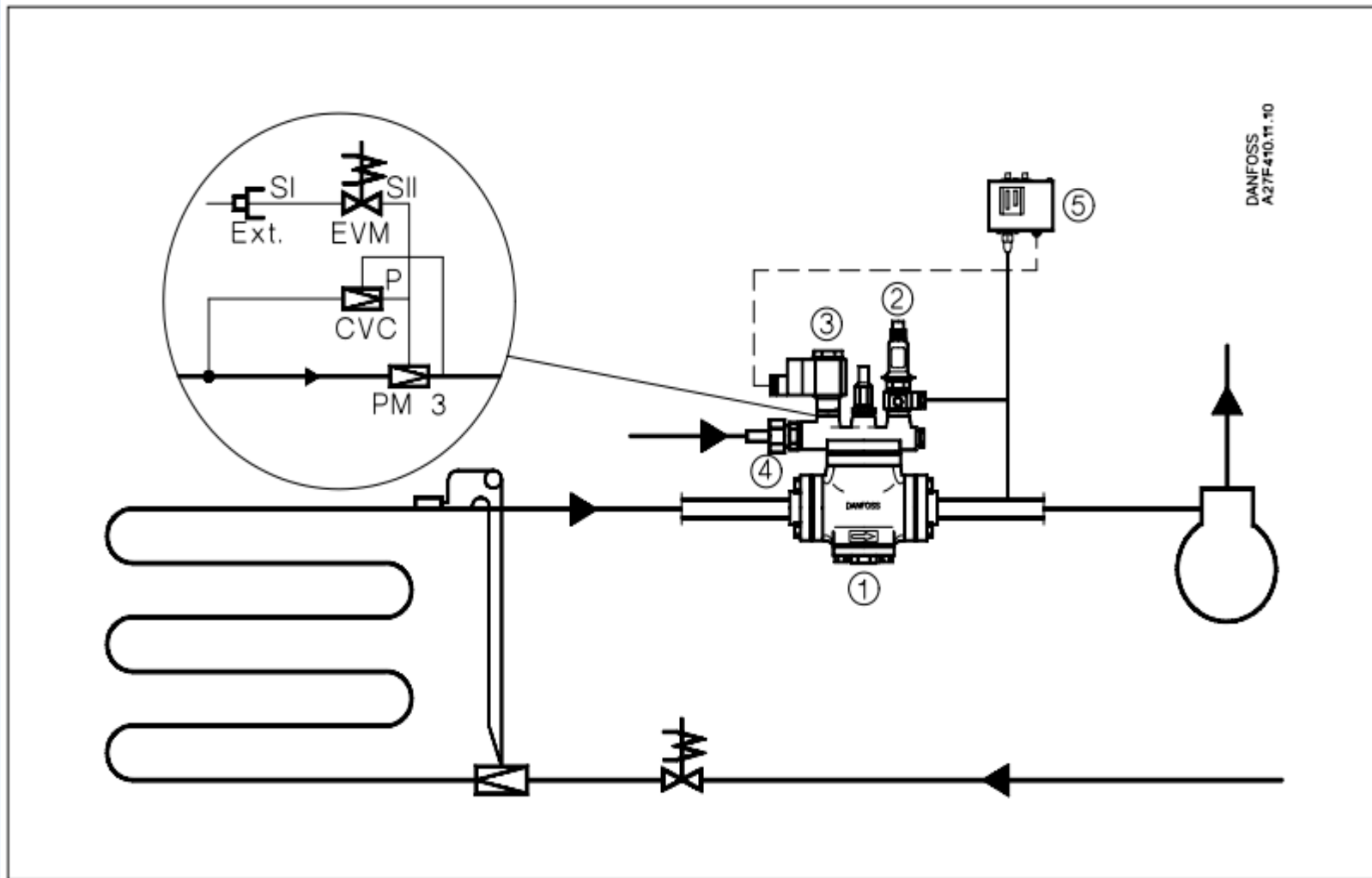
Function

When the pressure in front of the compressor exceeds the pilot HVAC setting (2), the **PM3 or ICS3** main valve (1) closes and thus maintains the upper limit of the suction pressure.

When the service pressure has been reached, the pressure control **KP 1** (5) starts the forced opening of the **PM3 or ICS3** (1).

PM3 or ICS3 (1) is then full forced opening by the EVM pilot (3) and hot gas from the external connection, station (4).

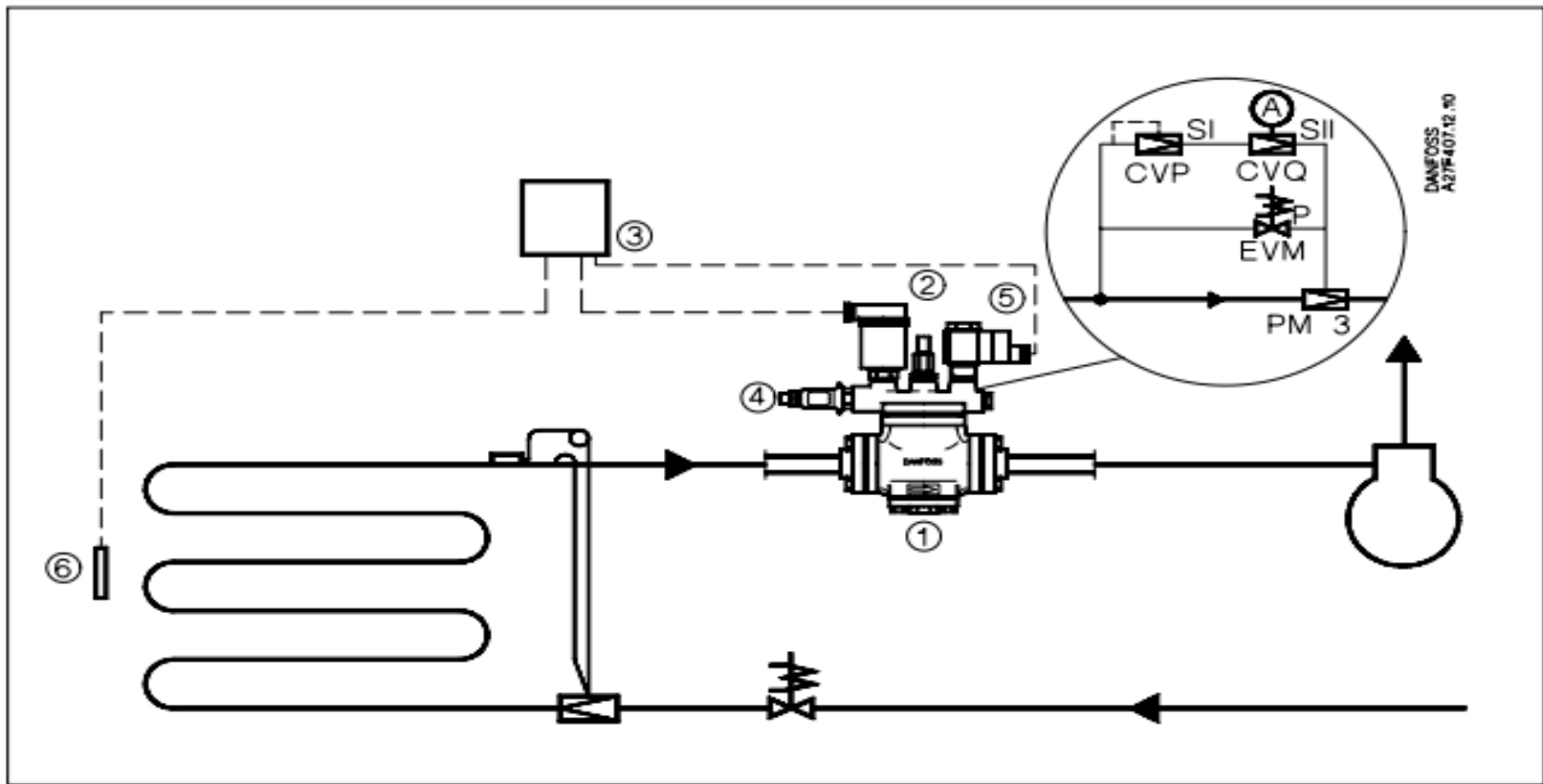
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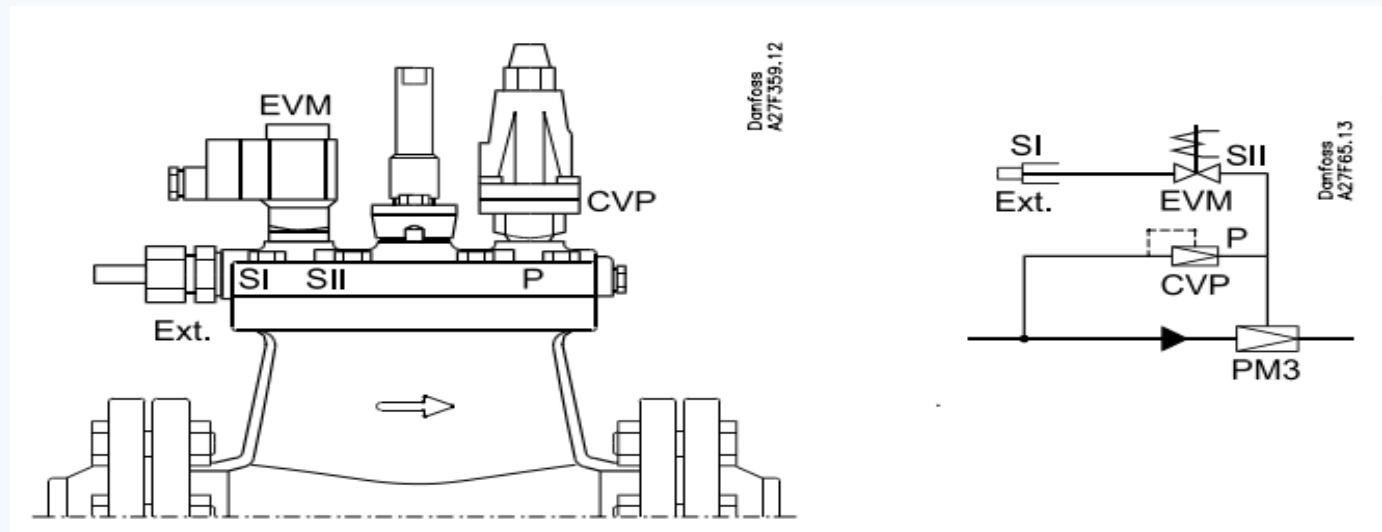
- Electronic regulation of the temperature of the medium with regulation of the evaporation pressure and passage to forced electric opening





External control pressure with on/off control + evaporating pressure control

The **PM3 or ICS3** regulator opens without pressure drop, when using gas from the HP high pressure side, e.g. **PM3 or ICS3** main valve on which are screwed an external pilot connection, an EVM type solenoid valve and a **CVP** type pressure-operated pilot valve (BP or HP)



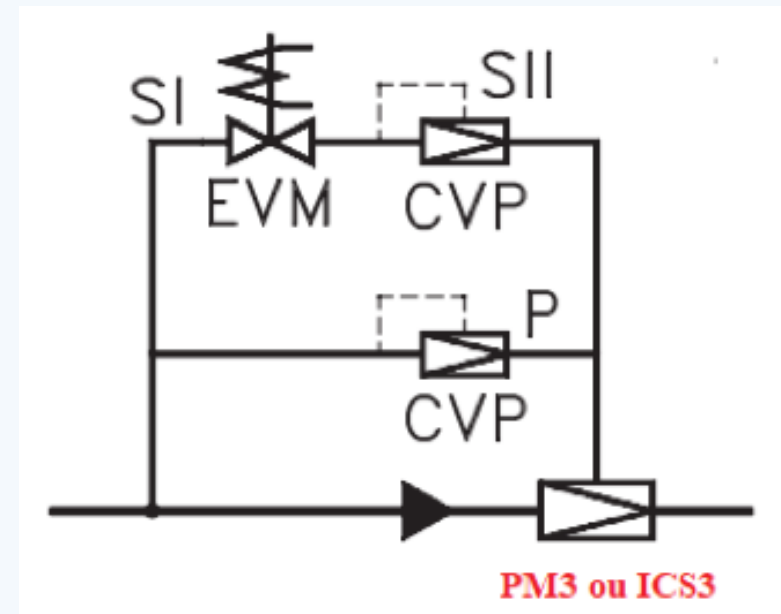
13 - MULTIFUNCTIONAL MODULATING REGULATORS



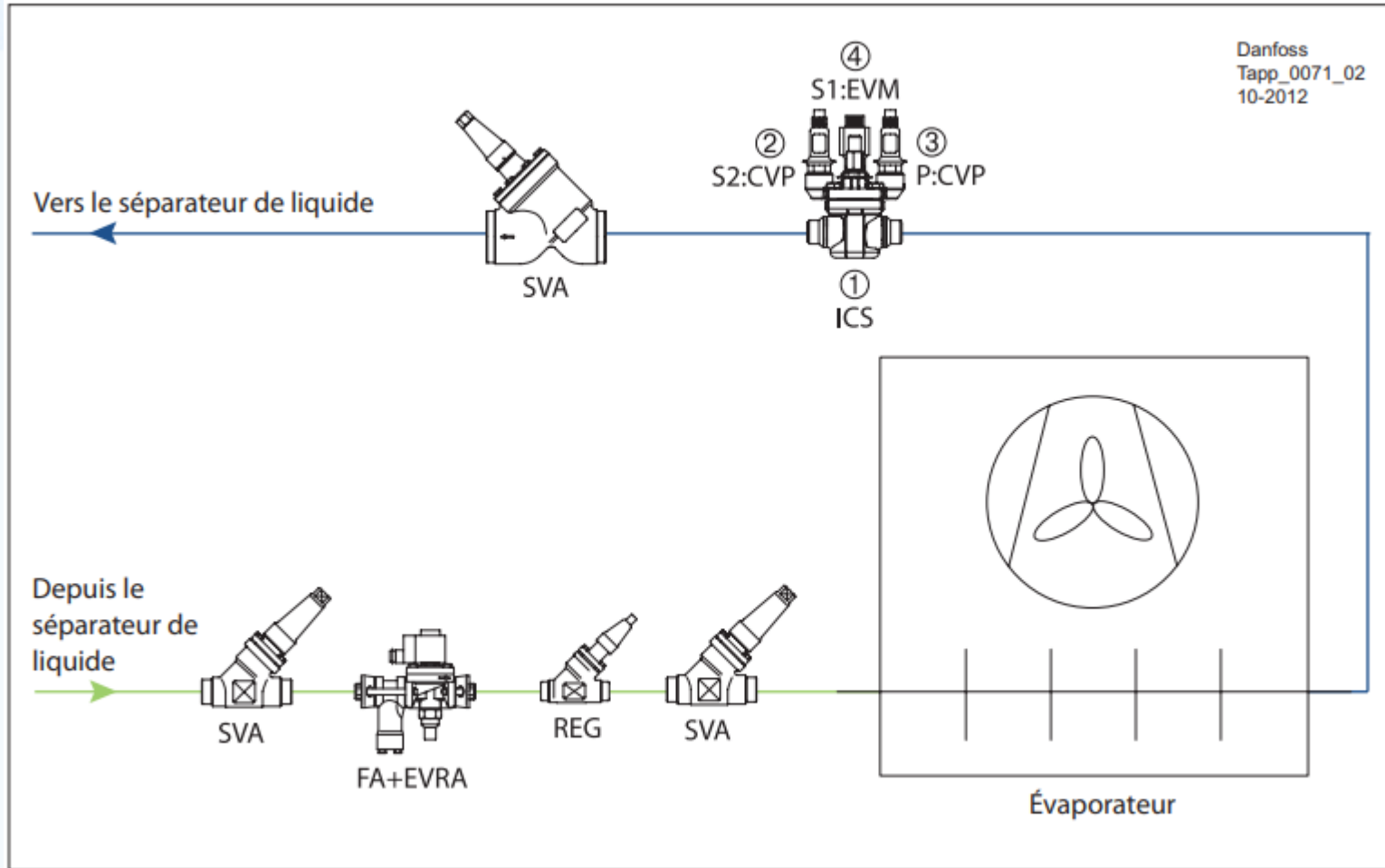
- ❑ Constant pressure regulation with passage between two preset evaporation pressures.

The **ICS3** or **PM3** main valve is fitted with one **EVM** (NC) solenoid valve in the S1 port and two **CVP** constant pressure pilot valves in the S2 and P ports respectively.

a **PM3** or **ICS3** with two **CVP** pilots in cascade control with Force Control can perform such a task.



13 - MULTIFUNCTIONAL MODULATING REGULATORS



15 - MODULATING REGULATORS

"ICM Flexline™"



The ICM is a very compact, direct operated motorized valve. **ICM** valves are designed to control expansion in liquid lines with or without phase change, or control pressure or temperature in dry or wet suction lines and hot gas lines. Their design also balances the opening and closing forces, which is why only three sizes of **ICAD** actuators are needed to cover the full range of **ICM valves from DN 20 to DN 150**. The **ICM** motorized valve/actuator assembly **ICAD** offers a very compact unit with small dimensions. The **ICM** motorized valve consists of three main components: a valve body, a function module/end cover combination, and an **ICAD** actuator.



Actionneur ICAD



Module de fonction avec couvercle supérieur



Corps de la vanne

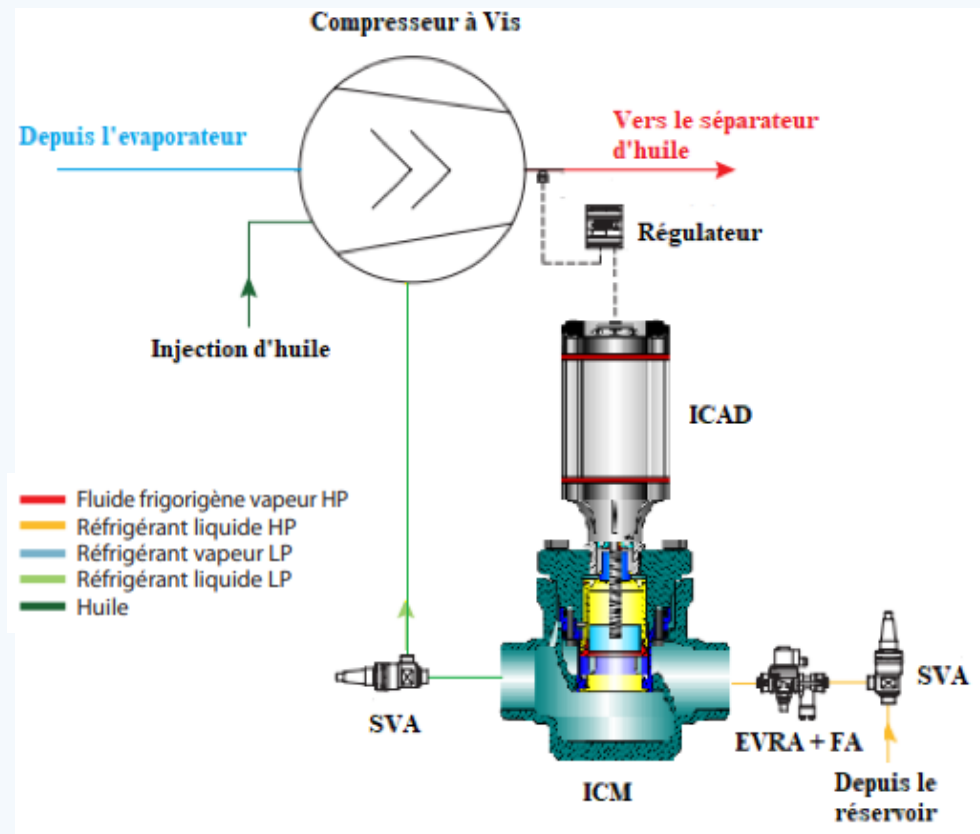
15 - ICM Flexline™ MODULATING REGULATORS



❑ DELIVERY TEMPERATURE CONTROL BY LIQUID INJECTION WITH MOTORIZED VALVE

Liquid injection regulation is obtained with the **ICM** motorized valve.

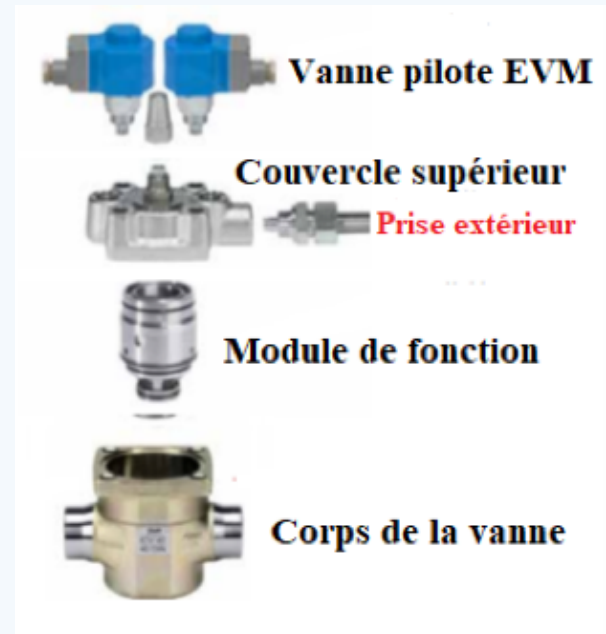
- The temperature sensor registers the discharge temperature and sends the signal to the temperature controller.
- The regulator controls the **ICAD** actuator which adjusts the opening level of the **ICM** motorized valve in order to limit and maintain the discharge temperature



16 - MODULATING REGULATORS "ICLX Flexline™"



ICLX valves are used on suction lines with a high delta P at opening, for example after hot gas defrosting in **large industrial refrigeration systems with ammonia, fluorinated fluids or CO2**. The ICLX servo-operated valve consists of five main components: valve body, end cover, function module and 2 pilot solenoid valves





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Merci
Thanks
Gracias
Obrigado



QUESTIONS
/ REPOONSES