

INTERNAL TRAINING ***Electronic Expansion Valve (EEV)***

DPF - LPF

Everything you need to know about
SANHUA EEV

JG – May 2022

Electronic Expansion Valves

EEV

Unipolar Valves

- DPF TS1
- DPF S03
- DPF-R
- LPF
- LPF-D



Small capacities
Unipolar driver
Valve and coil are separated

Bipolar Valves

VPF



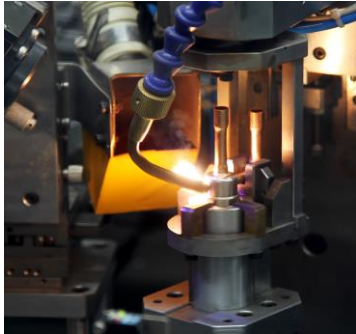
Big capacities
Bipolar driver
Motor + valve together

Old Versions : DPF TO1 / DPF Q - O - T

Electronic Expansion Valves

SANHUA EEV in few numbers

N°1 in the market share
+ 30 000 000 pieces ship / year
Full automatic production line in China
1 EEV produced every 8 seconds



Electronic Expansion Valves



Unipolar Valves

DPF TS1

Air
Conditioning

HFC-HFO-HC Capacity from 1 to 40kW

DPF S03

HFC-HFO-HC Capacity from 2 to 124 kW

DPF – R

Refrigeration

Co2 (140 bar) - Capacity till 45 kW

LPF

HFC-HFO-HC Capacity till 35 kW

LPF-D

Co2 (60 bar) - Capacity till 28 kW

Electronic Expansion Valves

Unipolar Valves - DPF

Designation construction

DPF TS1 1.8C - 69

DPF TS1 1.8C - 69 = Electronic Expansion Valve family

DPF TS1 1.8C - 69 = EEV Series

DPF TS1 1.8C - 69 = Orifice size

DPF TS1 1.8C - 69 = MOP (45 bar)

DPF TS1 1.8C - **69** = Internal design number



Unipolar Valves - LPF

Designation construction

LPF - 24D

LPF - 24D : Electronic Expansion Valve Family

LPF - 24D : Orifice size (2.4)

LPF - 24D : for Co2

Electronic Expansion Valves

Unipolar Valves - Main features



DPF TS1
Bi-flow

9 models from 1.0 to 3.2
1kW to 40kW (R410a)

DPF S03
Bi-flow

4 models from 4.0 to 6.5
2kW to 125kW (R410a)

LPF
Mono-Flow

7 models from 0.8 to 3.2
0.5kW to 33kW (R410a)

500 steps - 32±20 opening steps
Medium temperature : -40°C / +85°C
Ambient temperature : -30°C / +60°C
Max Pressure = **49 bar**
Relative humidity: 0 to 95% RH
Certifications: according to LVD or PED,
UL/CSA

Suitable with the EN 60335-2-24 / 2-40 / 2-89

500 steps - 32±20 opening steps
Medium temperature : -40°C / +70°C
Ambient temperature : **-40°C** / +60°C
Max Pressure : **42 bar**
Relative humidity: 0 to 95% RH
Certifications: according to LVD or PED,
UL/CSA

Suitable with the EN 60335-2-24 / 2-40 / 2-89

Electronic Expansion Valves

Unipolar Valves – Coils



DPF TS1
Bi-flow

DPF S03
Bi-flow

LPF
Mono-Flow

PQ-M10

PQ-M03

PQ-M24

12 VDC
1-2 phase excitation mode
Protection class : IP67

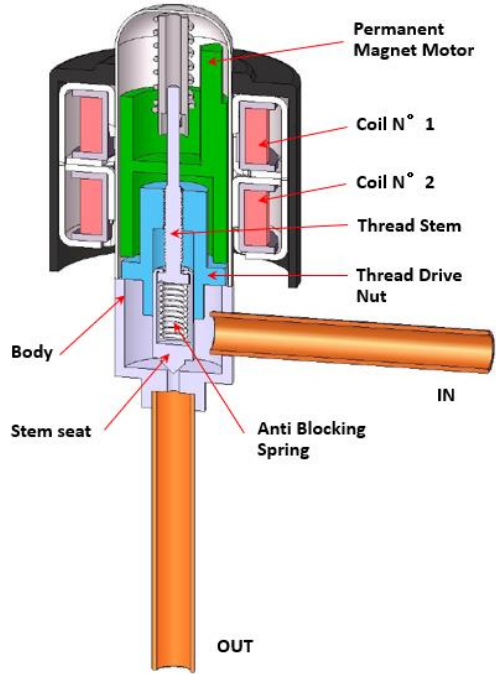
Excitation rate : 30 to 90 pps
Current : 260 mA
Resistance : 46 Ω

Excitation rate : 30 to 40 pps
Current : 375 mA
Resistance : 32 Ω

Excitation rate : 30 to 90 pps
Current : 260 mA
Resistance : 46 Ω

Electronic Expansion Valves

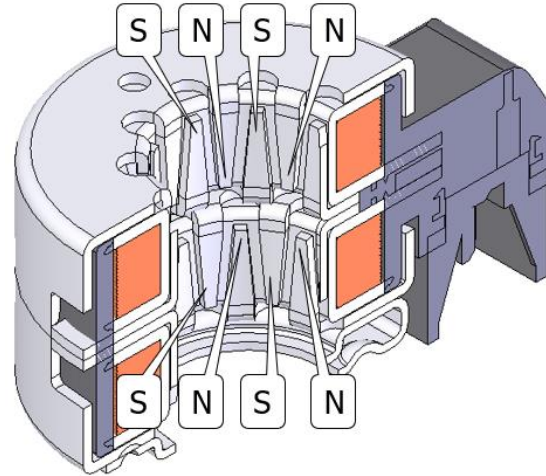
Unipolar Valves



PQ-M10 = 20+20 electromagnets

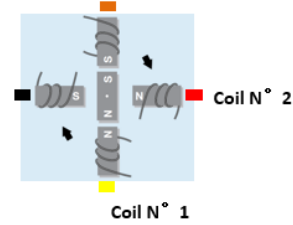
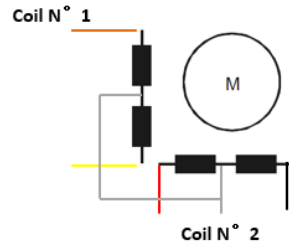
PQ-M03 = 24+24 electromagnet

PQ-M24 = 20+20 electromagnets



Electronic Expansion Valves

Unipolar Valves – Coil Excitation

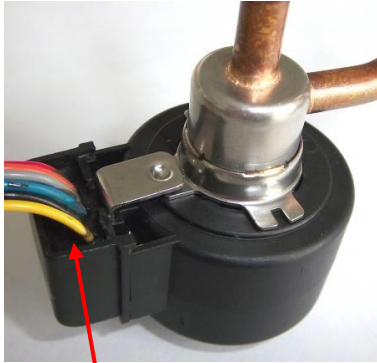


OPENING	STEP	Coil n° 1 - A	Coil n° 1 - \bar{A}	Coil n° 2 - B	Coil n° 2 - \bar{B}	Common	CLOSING
		Orange	Yellow	Red	Black	Gray	
↓	1	ON	OFF	OFF	OFF	Ground	↑
	2	ON	ON	OFF	OFF	Ground	
	3	OFF	ON	OFF	OFF	Ground	
	4	OFF	ON	ON	OFF	Ground	
	5	OFF	OFF	ON	OFF	Ground	
	6	OFF	OFF	ON	ON	Ground	
	7	OFF	OFF	OFF	ON	Ground	
	8	ON	OFF	OFF	ON	Ground	
	1	ON	OFF	OFF	OFF	Ground	

Electronic Expansion Valves

Unipolar Valves

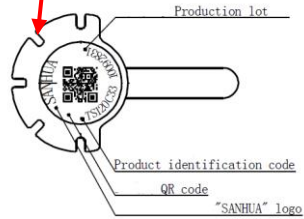
DPF



Resin

Laser welding for the body
– Completely hermetic

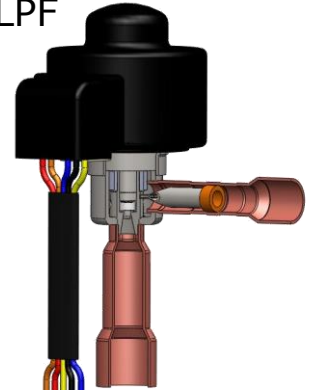
5 lock points



Laser printing



LPF

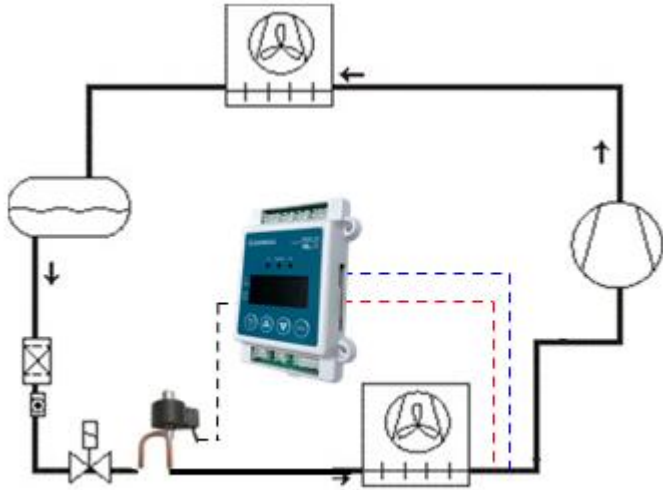


O-ring
PTFE seat sealing
Filter

Electronic Expansion Valves

Unipolar Valves – Application

EEV used as **Expansion Valve**



Advantages :

More efficient than TXV

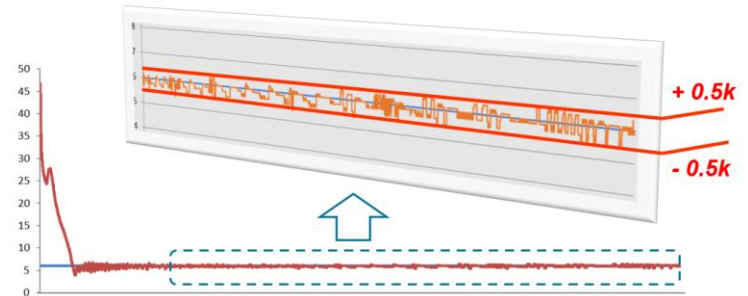
More stable : constant flow in the evaporator vs Pulse valves

Fast reaction

Mandatory with variable speed compressor

Bi flow, so perfectly suitable for reversible circuit

Can't be used with oil free system due to plastic nut inside



Electronic Expansion Valves

Unipolar Valves – Application



28%
Savings

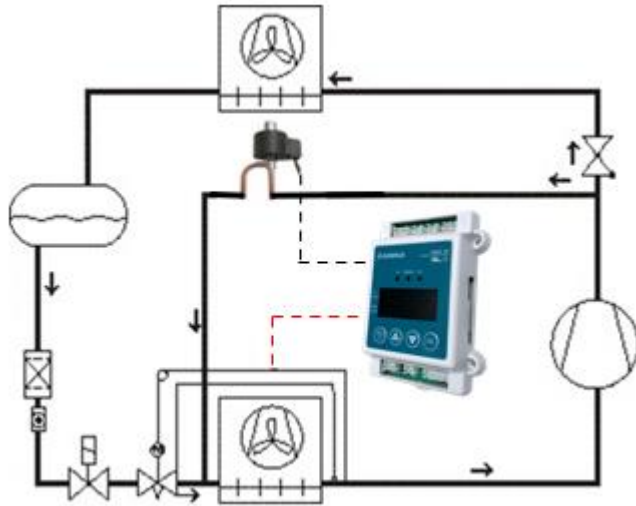
Field Benchmark result : Average Saving 28%(Cold Room)
Power consumption with TXV: total 6,800kWh
Power consumption with EEV: total 4,900kWh

- Fast pull down : better exchange in the evaporator
- Stable Superheat whatever the external conditions (1K=3% COP)
- Stable Evap Temp : avoid low temp and defrost cycle

Electronic Expansion Valves

Unipolar Valves – Application

EEV used as **Hot gas bypass**



DPF can be used for hot gas bypass to defrost the evaporator

Electronic Expansion Valves

Unipolar Valves – Competitors

Danfoss – ETS 6

Saginomyia – UKV

Carel – E2V

Fujikoki

ALCO EX

Parker / Sporlan - ESX



Electronic Expansion Valves

Unipolar Valves – Document at your disposal



PRODUCT DATA



Electronic Expansion Valve Series DPF-TS/S

TS/S series electronic expansion valves are designed for use in air conditioning and refrigeration systems or in heat pumps. The valve controls the automatic adjustment of refrigerant flow rate and makes the system work under optimized conditions for the purpose of fast cooling or heating, precise temperature control and energy saving. The valve can also be used e.g. for suction line pressure controls. These valves provide bidirectional operation to control the refrigerant flow rate in heating or cooling mode.



Datasheets

Features

- Applicable for reversible systems: bidirectional flow
- Smaller installation space: low height, small volume, light weight
- Optimized flow path design for noise reduction
- Fast operation, energy saving

General Specification

- Applicable for all common HFC, HFO refrigerants such as: R134a, R404A, R407C, R410A, R448A, R449A, R450A, R452A, R513A, R507A
- And also for flammable refrigerants like R32, R290, R1234ze(E), R1234yf.
- Cooling capacity: 2 to 121 kW (for R410A)
- 500 steps (full stroke); 32 x 30 opening steps
- Medium temperature TS min./max.: -40°C / +85°C (duty cycle rate below 50%)
- Ambient temperature min./max.: -30°C / +60°C (duty cycle rate below 50%)
- Relative humidity: 0 to 95% RH
- Certifications: UL/CSA and declaration according to LVD or PED
- Suitable with the EN 60535-2-24 / 2-40 / 2-49

Copyright ©SANHUA 2021
Subject to change without notice

PRODUCT DATA



Electronic Expansion Valve Series LPF

LPF series Electronic Expansion Valves are especially designed for use in refrigeration systems. Thanks to the soft-sealing seat design, it can be as tight as a solenoid valve once it is completely shut off thus to prevent liquid refrigerant migrate to evaporator or compressor.



Features

- Extremely high internal tightness, which is as good as with solenoid valves ($1\text{cm}^3/\text{min}$)
- Equal percentage flow design for better flow regulation
- Snap-on top for easier installation
- Coil with IP67 works safely in extremely environment
- Applicable for oil-free system
- Built-in strainer at inlet
- Flow direction: Uni-flow
- LPF - D: 60 bar design for R744 refrigerant

General Specification

- Applicable for all common HFC, HFO and HFO refrigerants such as R134a, R404A, R407C, R410A, R448A, R449A, R450A, R452A, R513A, R507A and also for flammable refrigerants like R290, R1234ze, R454C, R455A, R1234yf and R744 (CO₂)
- 500 steps (full stroke); 32 x 30 opening steps
- Medium temperature TS min./max.: -40°C / +70°C (duty cycle rate below 40%)
- Ambient temperature min./max.: -40°C / +60°C (duty cycle rate below 40%)
- Relative humidity: 0 to 95% RH
- Design Pressure: 42 bar, MOPD: 35 bar (LPF series)
- 60 bar, MOPD: 35 bar (LPF - D series, designed for R744 refrigerant)
- Reverse operating pressure difference 2.21 bar

Copyright ©SANHUA 2021
Subject to change without notice

Instruction

INSTRUCTIONS



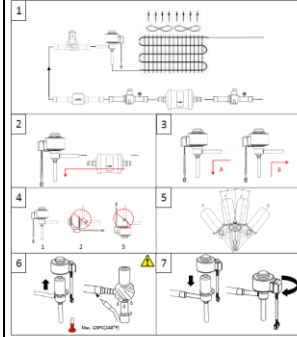
ELECTRONIC EXPANSION VALVE DPF series

Applicable to R404a and refrigerants of GROUP 2 according to Directive 2014/68/EU

Medium temperature: -40°C to +85°C (-40°F to +187°F)

Design Pressure (PS): 42bar (320psi)

PART 1: INSTALLATION



Copyright © SANHUA 2020
Subject to change without notice

Certificate



浙江三花智能控制股份有限公司
ZHEJIANG SANHUA INTELLIGENT CONTROLS CO., LTD.
Add: Kailiang, Xinchang, Tel: +86-575-86551976
Zhejiang, China 311203 Fax: +86-575-86221696

The EU Declaration of Conformity

Issued in accordance with
The Pressure Equipment Directive 2014/68/EU
The Low Voltage Directive 2014/35/EU

The manufacturer's name and address:

Company: Zhejiang Sanhua Intelligent Controls Co., Ltd
Address: Kailiang, Xinchang, 311200, Zhejiang, China
Authorized Representative: Ian Peing
Authorized Company: Verhuus International Europe S.L.
Tel: +34 91 654 49 52 Fax: +34 91 65 83 37 02 E-Mail: ian@sanhuasveurope.com
Address: C/ José Celestino Mula, 4, 21 28703 San Sebastián de los Reyes - Spain

Section 1 - The Pressure Equipment Directive 2014/68/EU

Declaration

Electronic Expansion Valves (DPF/TS/S series), shown in table 1, are classified "Pressure equipment" in the sense of the Pressure Equipment Directive 2014/68/EU, Article 2 point (3). The Refrigerant proper to the Group 1 and 2 as defined in article 23 (1) (b) of Directive 2014/68/EU. Refrigerant cannot be classified as hazardous substance or mixture as defined in points (7) and (8) of Article 2 of Regulation (EC) No. 1272/2008.

• Refrigerant of Group 1 is classified as hazardous substance or mixture as defined in points (7) and (8) of Article 2 of Regulation (EC) No. 1272/2008
• Refrigerant of Group 2 cannot be classified as hazardous substance or mixture as defined in points (7) and (8) of Article 2 of Regulation (EC) No. 1272/2008.

SANHUA SERIES	MODEL	PS (bar)	TS (°C)	PED category	Pressure Directive
DPF(TS)	DPF(TS)XXX-XX	49	-40°C / +85°C	Art. 4.3	Not applicable

Quick Finder