

FSY / FSM

Electronic Speed Controllers

Electronic Speed Controllers FSY / FSM control the speed of fan motors depending on pressure. FSM together with the FSF-N/Lxx filter cable assemblies meet the electromagnetic compatibility requirements of EC 89/336/EC.

Features

- Pressure actuated fan speed control
- High Voltage Triac (800 Volts)
- Integrated Protection circuit against voltage and current peaks
- EMC-Filter included in connector EN 175301-803
- Multi-position Plug incl. 1,5 m (opt. 3 and 6 m) cable for flexible installation
- No additional gasket required (complete molded into plug)
- For all common refrigerants including R410A
- UL Certification E183816 for FSY



A1

**FSY / FSM Controller
incl. Filter Cable Assembly FSF-Nxx**

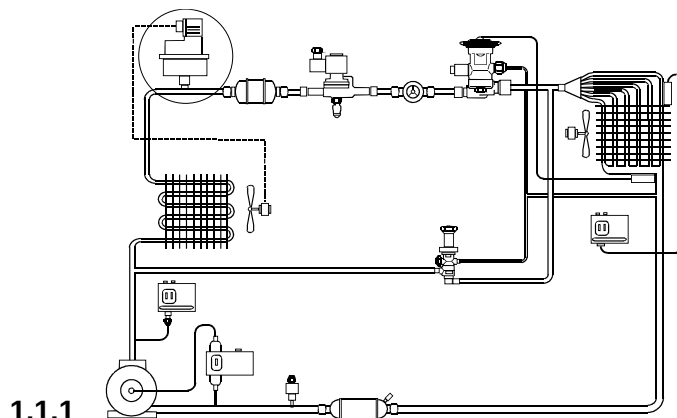
Introduction

FSY / FSM electronic speed controllers are designed to control the speed of fan motors in commercial refrigeration system depending on condensing pressure changes. It is suitable for single phase and 3-phase motors (see page 2 for more information) with manufacturer's approval for variable speed control by means of varying the supply voltage. **FSY / FSM** can be implemented in air-cooled condensers, air-cooled condensing units and air-conditioning units.

In order to ensure compliance with EC-Directive 89/336/EC (electromagnetic compatibility requirements of the European Community) **FSY / FSM** must be used in combination with **FSF-N15** cable assembly. It has a filter installed to satisfy the requirements of European standards EN 55014-1:2000.

Using variable fan speed controllers offers following benefits in commercial refrigeration or air-conditioning applications:

- Head pressure can be kept high enough to ensure proper operation of the expansion valve, and hence, sufficient mass flow through the expansion valve to feed the evaporator. This maintains the required cooling capacity.
- Efficiency increase of the compressor by controlling the head pressure, improved performance and energy saving for the complete system.
- The noise level of fan motors can be kept at a minimum by avoiding permanent on/off cycling.



Description of control behaviour

FSY / FSM control behaviour can be easily described by looking at the function of output voltage versus input pressure (see figure 1) and by dividing it into *maximum*, *proportional* and *minimum range*.

In the *maximum range* the speed controller provides a constant output voltage of approximately 1% below the supply voltage. The fan runs at maximum speed.

Along the *proportional range* the output voltage varies between maximum and minimum voltage of approximately 50% of the supply voltage. This causes the fan speed to slow down from maximum speed to minimum speed.

Further decrease of pressure in the *minimum range* leads to cut-off of the fan motor. Reincrease of input pressure will start the motor with a hysteresis of approximately 0.7 bar to avoid cycling (Fig.1).

The pressure from which motor is cut off (**FSY**), or is running with minimum speed (**FSM**) is adjustable, see column "pressure range" in the selection chart. The proportional range is fixed at approximately:

2.5 bar for FSY-41_ / FSM-41_

3.8 bar for FSY-42_ / FSM-42_

4,6 bar for FSY-43_ / FSM-43_

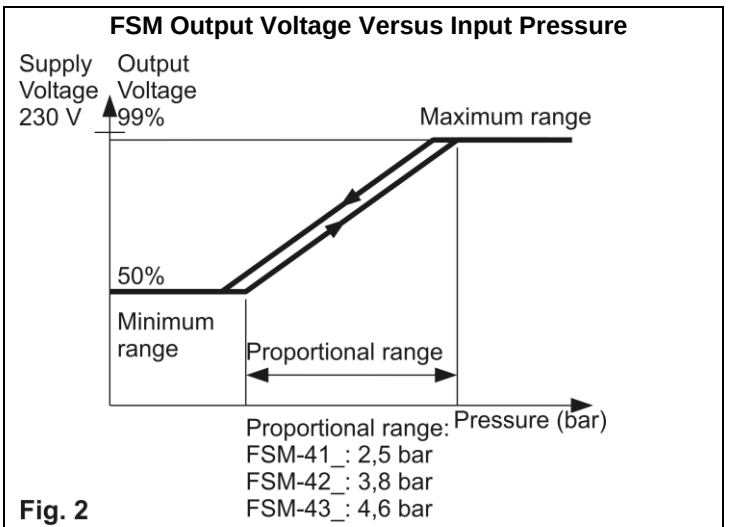
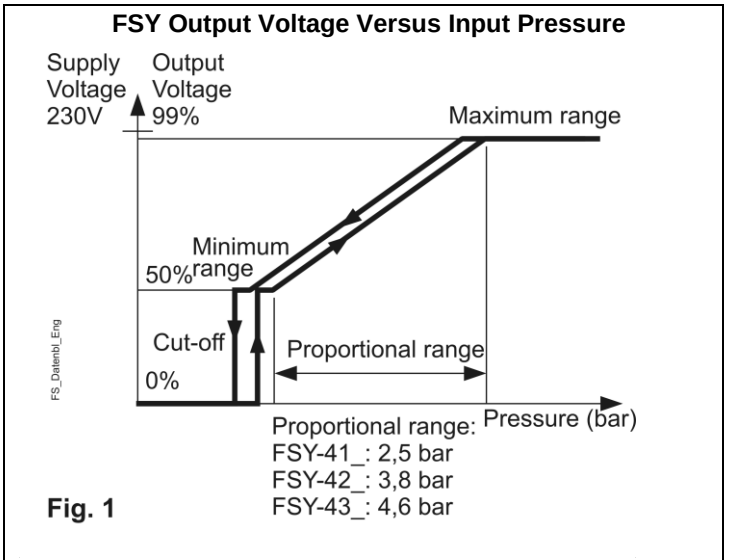
FSM works similar than **FSY**, but there is no cut-off mode (Fig.2). In the minimum range the motor stays running with minimum speed.

Electromagnetic Compatibility

Series **FSY / FSM** in combination with the **FSF-N15** conforms with the requirements of the Directive 89/336/EEC and is CE-marked. The CE mark remains valid when the product is correctly installed according to the installation instructions. It should be considered that when two or more EMC compliant components are combined into a system the resulting system may not be compliant. The **FSY / FSM** was tested for emissions according EN 55014-1:2000.

Motor

The performance of the motors used with the **FSY / FSM** speed controller can vary. An important factor is the ratio between **starting current and nominal current**. Especially during winter periods many starts can occur. Some types of motors consume **more current during partial speed than the nominal current stated**. For that reason these points have to be considered when selecting fan speed controls. Please consult literature of the motor manufacturer for required data.



Selection Chart Fan Speed Controllers With Cut-off Mode

Type	Part Code Nr.	Pressure range * bar	Factory setting * bar	Max. operating Pressure PS bar	Test Pressure PT bar	Pressure connection
FSY-41S	0 715 533	4.0 ... 12.5	8.0	27	30	7/16"-20 UNF female
FSY-42S	0 715 534	9.2 ... 21.2	15.0	32	36	7/16"-20 UNF female
FSY-42U	0 715 535					6mm - ODF
FSY-42X	0 715 536					1/4" - ODF
FSY-43S	0 715 537	12.4...28.4	21.8	45	50	7/16"-20 UNF female
FSY-43U	0 715 538					6mm - ODF

Selection Chart Fan Speed Controllers With Min. Speed Mode

FSM-41S	0 715 520	4.0 ... 12.5	8.0	27	30	7/16"-20 UNF female
FSM-42S	0 715 521	9.2 ... 21.2	15.0	32	36	
FSM-43S	0 715 522	12.4...28.4	21.8	45	50	

* Pressure at which fan is switched off (FSY) or at which fan is running with minimum speed (FSM)

Selection Chart Cable Assemblies

Type	Part Code Nr.	Temperature Range °C	Cable length mtr.
FSF-N15	804 852	-50/+80	1,5
FSF-N30	804 853		3,0
FSF-N60	804 854		6,0

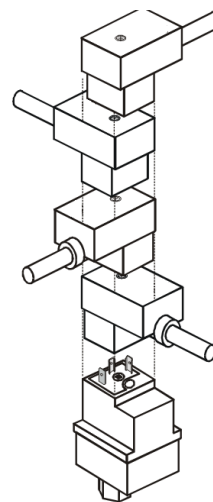
Accessories and Options

- Bulk pack 20 pcs.
- Copper gasket (100 pcs. pack) Part Code Nr. 803 780
- FSO plug without filter, for OEM customers only. When FSY is used with FSO there is no compliance with EC-Directive 89/336/EC because EMC requirements are not met.

Order instructions

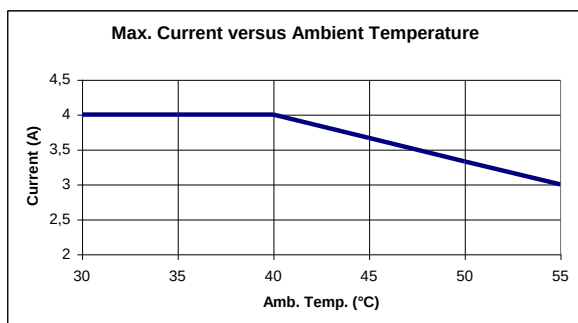
Example: FSY-42S Single package, allen key Part Code Nr. 0 715 534
FSF-N15 Cable assembly Part Code Nr. 804 640

Multi-Position Plug FSF-N15

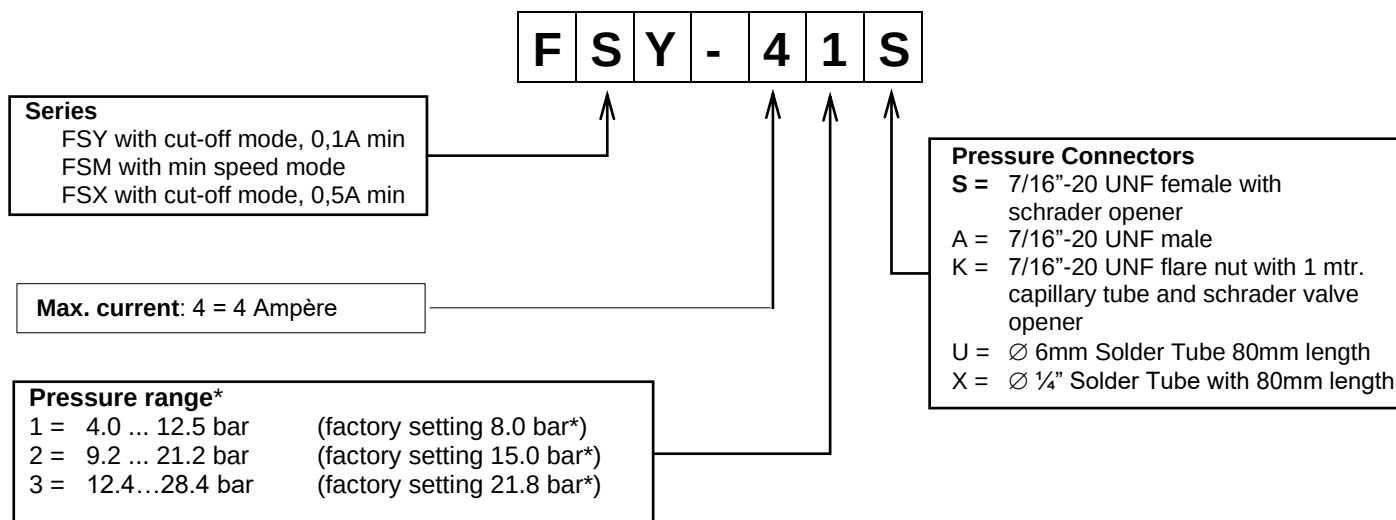


Technical Data

Supply voltage	230VAC +15%, -20% (50-60 Hz)	Pressure changes per turn of adjusting screw	Pressure range 1: 4.0 ... 12.5:
Nominal current FSM	0,5-4 (3) Ampère (see diagram below)		clockwise ~ +1,2 bar
Nominal current FSY			counter clockwise ~ -1,2 bar
Starting current	0,1-4 (3) Ampère (see diagram below)		Pressure range 2: 9.2 ... 21.2:
Temperature range			clockwise ~ +2,5 bar
Storage and transportation	-30 °C to 70 °C	counter clockwise ~ -2,5 bar	
Ambient	-20 °C to 55 °C (40°C, see diagram below)	Pressure range 3: 12.4...28.4 bar	
Medium	-20° C to 70° C	clockwise ~ +3,3 bar	
Protection class (IEC529/DIN 40050)	IP 65 (with fitted connectors)	counter clockwise ~ -3,3 bar	
Housing material	PC and PA	Weight FSY / FSM 41, 42 0,12 kg	
Medium Compatibility	R410A R134a R404a, R507 R407C R407A R407F R1234ze R452A R448a R449a R450A R513A R22	Weight FSY / FSM 43 0,15 kg	
		Weight FSF-N15 0,14 kg	
		Weight FSF-N30 0,20 kg	
		Weight FSF-N60 0,33 kg	

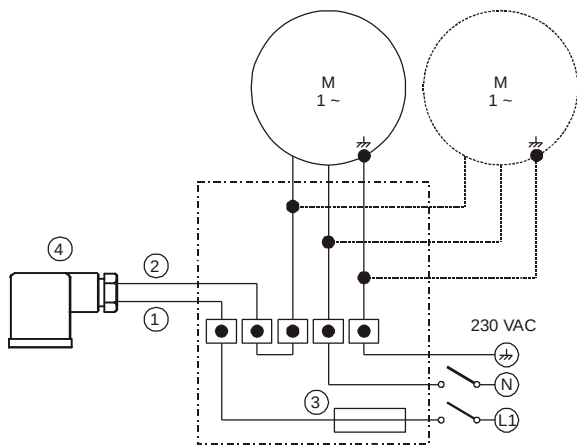


Name Scheme

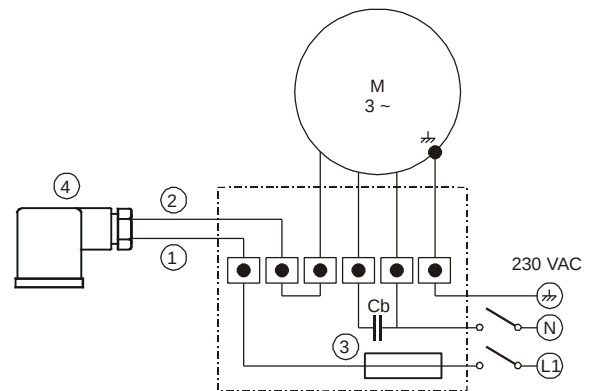


* Pressure at which fan is switched off (FSY/FSM) or at which fan is running with minimum speed (FSM)

Single Phase



Three Phase



- ① Wire color blue, from L1 power line
- ② Wire color brown, output to motor
- ③ Fuse 4A

„STEINMETZ WIRING with 3-Phase Motors“

Several **3-phase fan motors** (220-240Δ/380-420Y/3/50) can be speed controlled with **the 1-phase FSY/FSM** by using a capacitor between 2 of the 3 phases (see Fig. 3 - 4). This wiring has an impact on the performance of the fan motor.

Therefore please contact the motor manufacturer to verify this possibility. The run capacitor should be sized per motor manufacturer's recommendation. Information for capacity sizing can be found in published literature.

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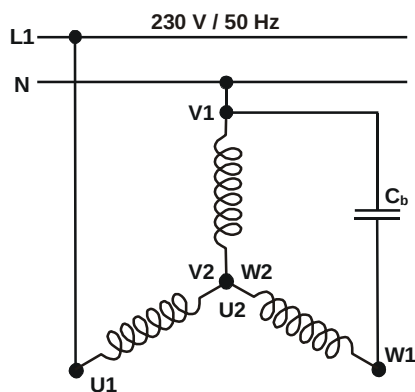


Fig. 3: Y-wiring

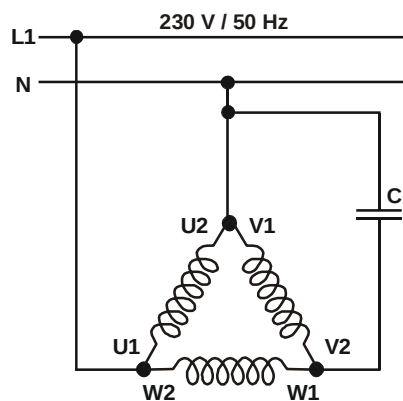
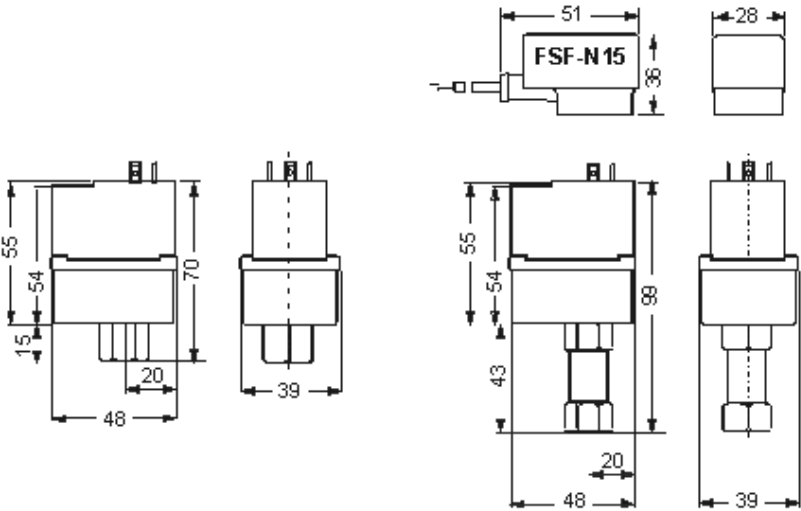


Fig. 4: Δ-wiring

Dimensions (mm)

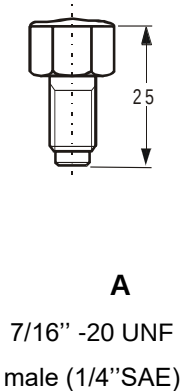


FSY / FSM-41S FSY / FSM-42S FSY / FSM-43S

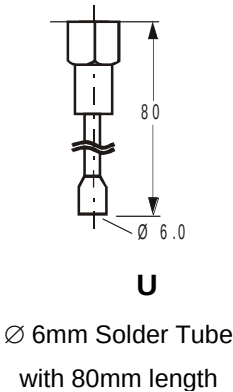
Pressure connection: S

7/16"-20 UNF, 1/4" SAE female flare
with schrader opener

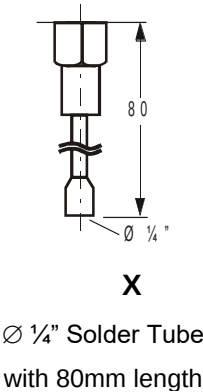
Other pressure connectors



7/16" -20 UNF
male (1/4"SAE)



Ø 6mm Solder Tube
with 80mm length



Ø 1/4" Solder Tube
with 80mm length

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