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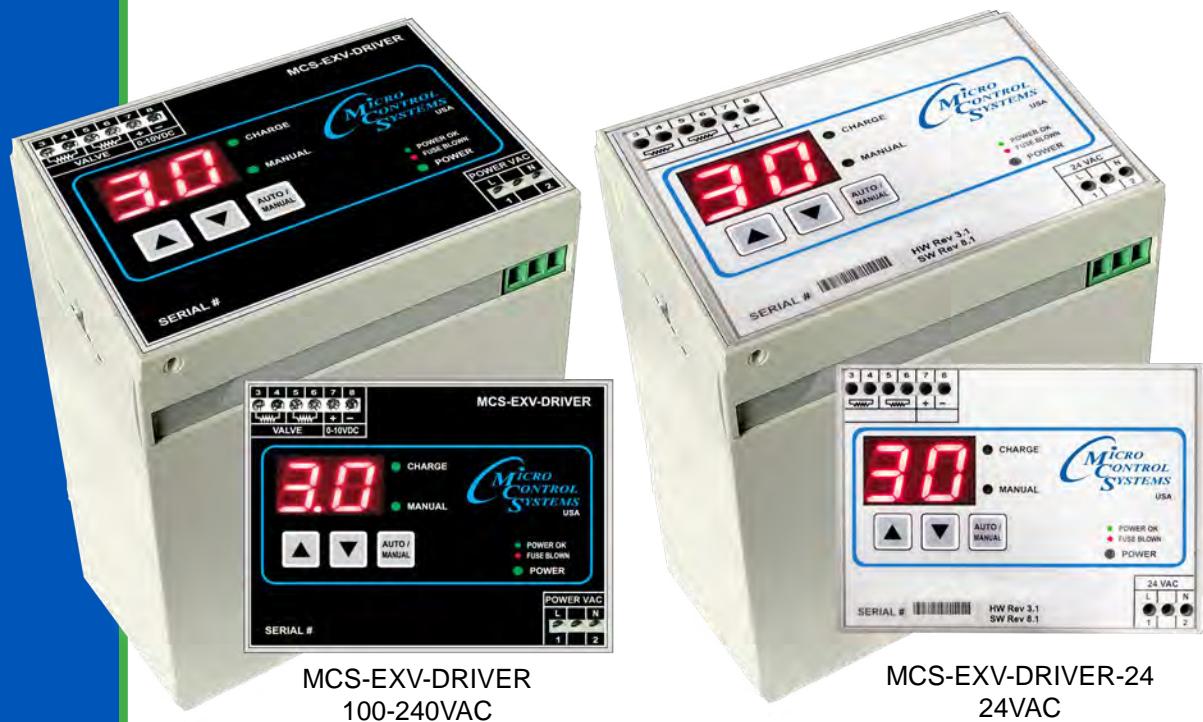
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MCS-EXV DRIVER

Operation Manual Control of Bipolar Expansion Valves Rev 2.5.9

Supports - Hardware version - 3.1
Firmware version - 8.1 and up



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Chapter - 1. Safety Precautions And Warnings



Please read the following safety precautions and warnings prior to installing your device.

- Check that the supply voltage is correct prior to connecting the MCS-EXV-DRIVER (110 to 240 VAC or 24 volts).
- **DISCONNECT ALL ELECTRICAL CONNECTIONS BEFORE PERFORMING ANY KIND OF MAINTENANCE.**
- Verify the maximum current that can be applied to the MCS-EXV-DRIVER through the power supply being utilized.
- Before connecting any valve make sure that the unit is configured for driving that particular valve.
- The analog control voltage input should never exceed 10 VDC.
- Maintain proper polarity of analog control voltage input.

Chapter - 2. Introduction/Overview

The **MCS-EXV-DRIVER** is used to move an electronic stepper expansion valve. The position of the valve is based on an analog input voltage of 0-10 VDC (0 VDC = 0% valve is closed, 10 VDC = 100% valve is fully opened).

The MCS-EXV-DRIVER supports several electronic valve manufacturers including Sporlan, Alco, Danfoss and Carel.

The MCS-EXV-DRIVER also supports overdriving on full opened and full closed voltage signals.

Another advantage of using the MCS-EXV-DRIVER is that it eliminates the need for having a liquid line solenoid. The MCS-EXV-DRIVER has capacitors that store enough power to close the valve when input power fails.

The amount of time to charge can be seen from the LED indicator. At power up the LED indicator will blink until the storage system is fully charged. At power off the valve is driven closed and the LED indicator will blink.

When the valve is closed and the storage system is depleted the LED indicator will be off.

FEATURES

- Modes of operation: Auto/Manual
- Closing of the valve on loss of power.
- Universal main supply operation (accepts 110 to 240 VAC \pm 10% (50/60 Hz); 44 VA or 24 VAC \pm 10% (50/60 hZ)
- Supports a variety of expansion valves (SEE CHART ON FOLLOWING PAGES)
- POWER OK indicator LED
- FUSE BLOWN indicator LED
- If a power failure occurs it activates the MCS-EXV-DRIVER into power down mode AND CLOSES THE VALVE.



Chapter - 3. New Release Features

3.1. HARDWARE 3.0 - Firmware Version 6.7 or greater

New Feature was added for MCS-EXV-DRIVER with firmware 6.7 or greater.

OO= Steps to Overdrive when Opening

OC= Steps to Overdrive when closing

Both are separate variables and can be set with a value between 2 to 8%

Old version of firmware was set to over overdrive the valve fixed at 10% of total steps.

By using the new feature settings, the valve will not have to be overdriven as much.

These setting are made by MCS prior to shipping the MCS-EXV DRIVER.



A trained technician now has the ability to change these number percentages by following the instruction later in this manual.

Example: Old Firmware Version 6.6

Valve Code	# of Steps	EXV TYPE	10% OVERDRIVEN
A1	750	Alco EX4-EX5-EX6	10% = 825 steps
D3	3810	Danfoss ETS-250/400	10% = 4191 steps

Example: New Firmware Version 6.7

Valve Code	# of Steps	EXV TYPE	% OVERDRIVEN
A1	750	Alco EX4-EX5-EX6	8% = 810 steps
D3	3810	Danfoss ETS-250/400	4% = 3963 steps



IMPORTANT
These new overdrive parameters are just when the MCS-EXV-DRIVER is running and voltage asked for full open or full closed. When the MCS-EXV-DRIVER is powered up, the valve must still be overdriven the total steps + this overdrive amount.

Have to assume worst case at power up, the valve is fully open.

Chapter - 4. Installation and Wiring

The MCS-EXV-DRIVER is usually mounted by the HVAC/R equipment manufacturer.

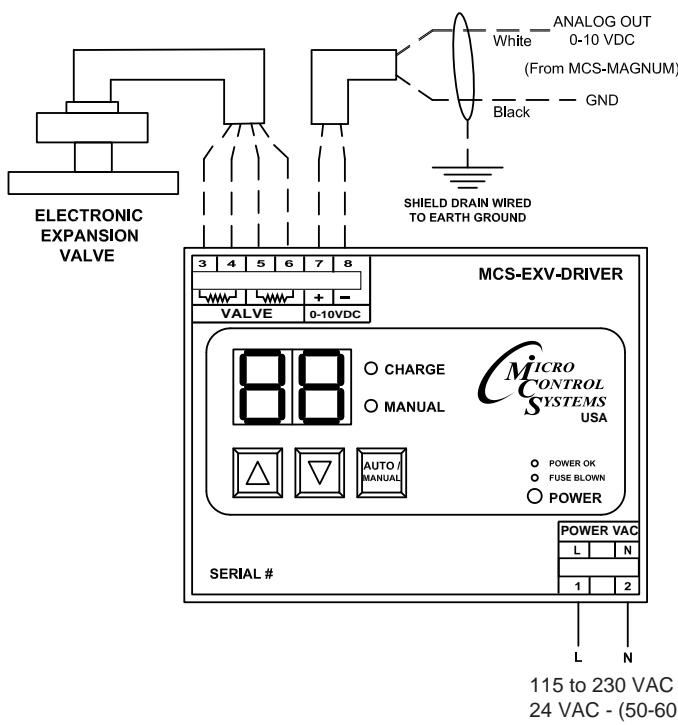
In some instances, such as upgrading, a contractor/installer may be required to mount the MCS-EXV-DRIVER. There are environmental restrictions to consider for the location such as temperature and humidity.

We also recommend it be protected from moisture. Typically, mounting inside the electrical control panel of a package unit is your best option.

MCS-EXV-DRIVER

Electronic Expansion Valve Interface

Wiring Diagram

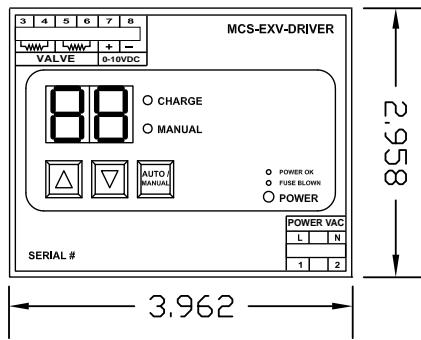


MCS-EXV DRIVER		ALCO	SPORLAN	DANFOSS	CAREL	SANHUA
Connection	Numbering	EX4, EX5, EX6, EX7, EX8, Alco-Trane® RTHC	SEI, SDR, SER, SEH, SERI, CDS, MTW, GC, FGB	ETS	E2V, EV3, EV4, EV5, E6V, E7V	VPF12.5, VPF25, VPF50 VPF100, VPF150, VPF250, VPF400
3	Black	Red	Red	Green	Red	
4	White	Green	Green	Brown	Green	
5	Brown	White	White	White	Black	
6	Blue	Black	Black	Black	Yellow	White

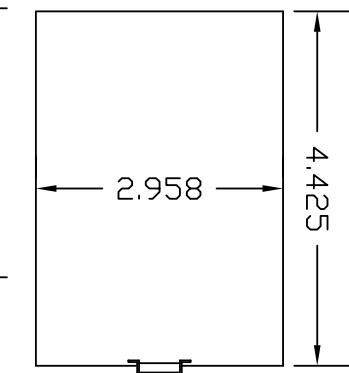
Refer to the Manufacturer's Datasheet of the Valve for Verification of Wiring



Top



Side



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MCS-EXV-DRIVER Wiring Diagram (2022-09-23)

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The maximum distance between and MCS-EXV-Driver and a valve must not exceed 30 feet (10 meters).

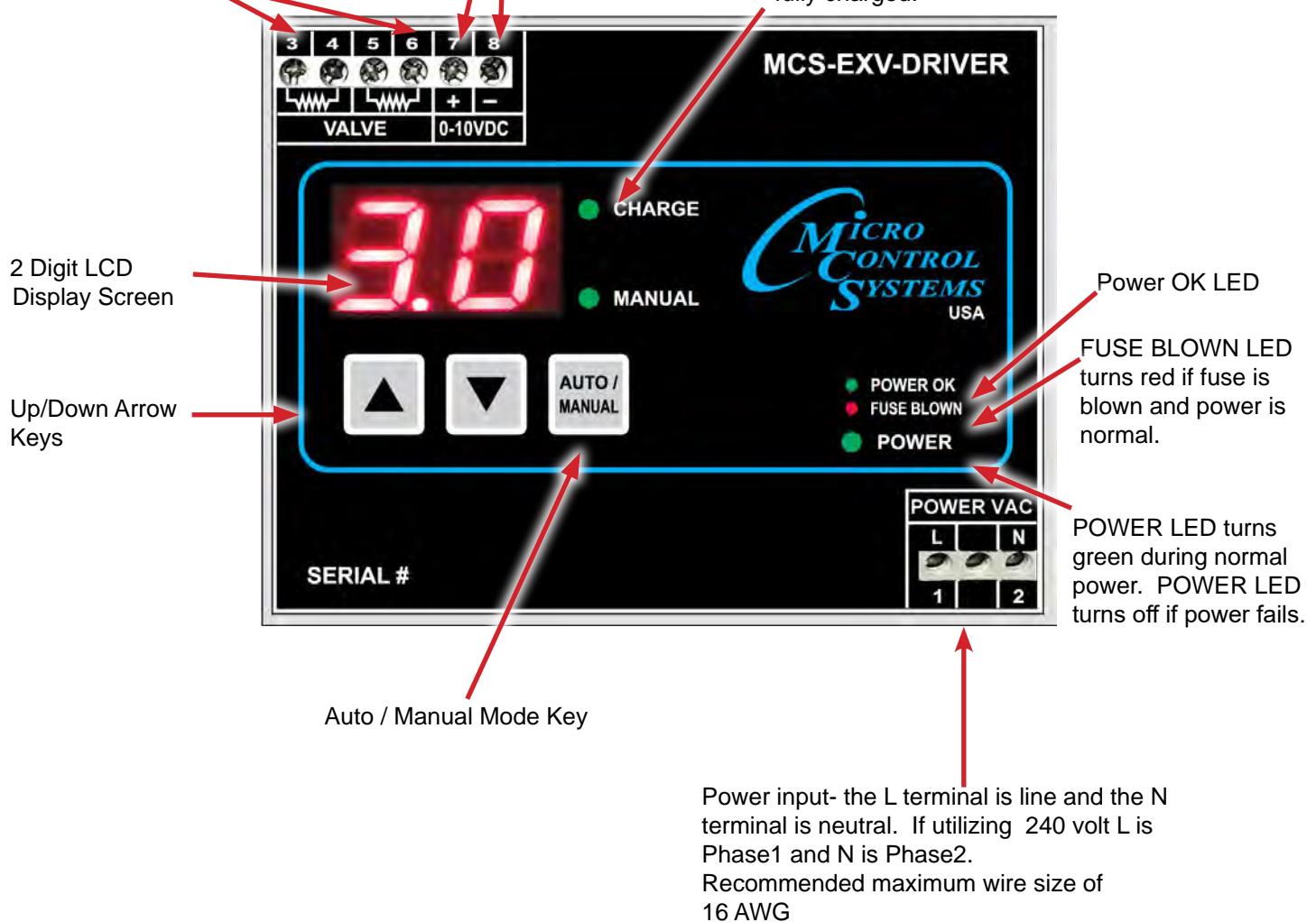
To avoid possible problems, before connecting the electronic expansion valve verify that the correct valve type is programmed. After you verify that the correct valve is programmed connect your electronic expansion valve.

Chapter - 5. User Interface

The #7 terminal is Analog Input +
 #8 terminal is Analog Input - (ground).
 Recommended #22-2 Shielded Wire

The #3 through #6 terminals are for
 wiring the EXV valve. See table page
 6 for wire color coding.

Once power is
 applied, the charge
 LED will pulse until
 fully charged.



Chapter - 6. MCS-EXV-DRIVER DISPLAYS



DISPLAY	FUNCTION
00	Auto Mode Display-This display appears when the MCS-EXV-DRIVER is in Auto Mode. The valve position is controlled by the analog control voltage input from the controller
AA	Pressing AUTO/MANUAL key for 5 seconds will bring up the Activation Display.
PS	Press the UP and DOWN keys simultaneously for 5 seconds to get to the 'PS' Password Display.
47	Use the UP and DOWN keys to enter password 47 on the display. You now are authorized to make changes.
ES	After you have entered the password, to enter into the config mode press UP and DOWN keys simultaneously for 5 seconds, the display shows ES . (Expansion valve select identifier screen)
00	Steps to Overdrive when Opening - Setting can be changed from 2% to 8%
0C	Steps to Overdrive when Closing - Setting can be changed from 2% to 8%
AA	Standby - Unit will return to Auto Mode
EA	Used by Factory
Fr	When in Auto mode press both the UP and DOWN and AUTO/MANUAL keys simultaneously 'Fr' will be displayed for firmware version.
7.1	Example of Firmware Version number
hr	When in Auto mode press both the UP and DOWN and AUTO/MANUAL keys simultaneously 'hr' will be displayed for hardware version.
3.0	Example of Hardware Version number
ES	When in Auto mode press both the UP and DOWN and AUTO/MANUAL keys simultaneously this will display the valve type.
S5	Example showing the setting for Valve Type; 'S5 (Sporlan)'

Chapter - 7. OPERATION OF MCS-EXV-DRIVER

7.1. START UP - AUTO MODE

Switch on the power

7.1.1 POWER UP SEQUENCE:

1. Power okay-LED lights up
2. Charge light blinks GREEN
3. When fully charged the MCS-EXV DRIVER **GREEN Light will be solid**



Valve is over driven CLOSED



- The MCS-EXV-DRIVER defaults to this mode after every power up. Whenever Auto Mode is enabled, the screen will display as shown in above screen.
- The MCS-EXV-DRIVER controls the valve position according to the analog control voltage input from the controller.

NOTE:

If the Analog input voltage goes **below 0.01 volts** - The MCS-EXV DRIVER is over driven closed.

If the Analog input voltage goes above 9.9x volts - The MCS-EXV DRIVER is over driven open.

Chapter - 8. CONFIGURATION MODE

7.2. USING THE CONFIGURATION MODE

The configuration mode has two uses:

1. Setup the amount of steps needed to over drive the valve open and closed by using the 'oo' (over drive when opening), or 'oc' (overdrive when closing)
2. The configuration mode is also used to choose the EXV valve that the MCS-EXV-DRIVER will be controlling.

NOTE: WHEN MAKING ANY CHANGES TO THE MCS-EXV DRIVER YOU MUST POWER DOWN THE COMPRESSOR UNIT FIRST.



3. Enter into the '**config mode**' by pressing **UP** and **DOWN** keys simultaneously for 5 seconds, the display will show '**ES**'.



4. Use the UP AND DOWN keys to choose what you want to configure.

This example we will use the 'oo' to set a new number from 02 -08 to step the valve open.

You must enter a password to make any changes.



5. Pressing both the UP and DOWN keys for 5 seconds shows the 'PS' password screen.



6. Use the **UP AND DOWN** keys to enter password on the display.



Hold both the UP and DOWN keys for 5 seconds to accept the password.



7. Using the **UP AND DOWN** keys we will set the 'oo' setting to 08.

The valve is now set to open 8% of the total steps for EXV valve that is being controlled.

Example:

Valve Code	# of Steps	EXV TYPE	% OVERDRIVEN
D3	3810	Danfoss ETS-250/400	8% = 4115 steps



THE SETUP FOR 'OC' IS THE SAME AS ABOVE, BUT YOU CAN CHOOSE ANY NUMBER BETWEEN 02 TO 08 FOR THE OVERDRIVE OF THE VALVE CLOSED.



Pressing UP and DOWN keys for 5 seconds saves the currently selected value in memory

8. The display will change as shown in the screen on the right and the unit will count down and return to AUTO mode.



Chapter - 9. CHANGING VALVE TYPE

Follow the instructions below to change what type of EXV valve the MCS-EXV DRIVER will be controlling.

1. Pressing both the **UP and DOWN** keys simultaneously for 5 seconds shows the '**ES**'
2. Release and then Press the **UP and DOWN** keys simultaneously again to see the '**PS**' (password)
3. Use the **UP or DOWN** key to enter the password '**47**'
4. Press the **UP and DOWN** key simultaneously to accept the password entered
5. Next use the **UP or DOWN** keys to navigate to the **EXV VALVE TYPE**



Pressing UP and DOWN keys for 5 seconds saves the currently selected valve in memory

See table below for a listing of expansion valve codes used by MCS-EXV-DRIVER

VALVE TYPE IDENTIFIER -

Valve Code	Firmware Ver.	# of Steps	EXV TYPE
A1	5.5	750	Alco EX4, EX5, EX6
A2	5.5	1660	Alco EX7
A3	5.5	2600	Alco EX8
CL	6.2	500	CAREL E2V, E3V, E4V, E5V, E6V, E7V
D1	5.5	2625	Danfoss ETS-12B, -24B, -25B, -50B, KVS-15
D2	5.5	3530	Danfoss ETS-100B
D3	5.5	3810	Danfoss ETS-250, -400, KVS-42
D4	5.5	600	Danfoss ETS-12C, -24C, -25C, -50C, -100C
D5	7.9	1100	Danfoss CCTM-2, CCMT-4, CCMT-8
D6	7.9	800	Danfoss CCMT-16
D7	7.9	1400	Danfoss CCMT-24
D8	7.9	2300	Danfoss CCMT-30
D9	7.9	2200	Danfoss CCMT-42
H3	7.5	2600	Sanhua VPF-12.5, -25
H4	7.5	2600	Sanhua VPF-50
H5	7.5	3500	Sanhua VPF-100
H6	7.5	3800	Sanhua VPF-150, -250, -400
P1	7.5	2500	Sporlan GC-10, -20, -30, -40, -50; FGB-60, -70
S1	5.5	1596	Sporlan SEI 0.5-11
S2	5.5	1596	Sporlan SER 1.5-20
S3	5.5	3193	Sporlan SEI 30; SDR -3, SDR-3X
S4	5.5	2500	Sporlan SER-AA, -A, -B, -C, -D; SER(I)-F, -G, -J, -K, -L; CDS -2, -4, -7
S5	5.5	6386	Sporlan SEI-50, SEH (I)-100, -175, -400, T; SEH-P; CDS -9, -16, -17; SDR -4, -5
T1	6.1	1596	Sporlan SEI 0.5-11 - two valves wired to one MCS-EXV-DRIVER
T2	6.1	1596	Sporlan SER 1.5-20 - two valves wired to one MCS-EXV-DRIVER
T3	6.1	3193	Sporlan SEI 30; SDR -3, SDR-3X - two valves wired to one MCS-EXV-DRIVER
T4	6.1	2500	Sporlan SER-AA, -A, -B, -C, -D; SER(I)-F, -G, -J, -K, -L; CDS -2, -4, -7 - two valves wired to one MCS-EXV-DRIVER
T5	6.1	6386	Sporlan SEI-50, SEH (I)-100, -175, -400, T; SEH-P; CDS -9, -16, -17; SDR -4, -5 - two valves wired to one MCS-EXV-DRIVER

Chapter - 10. MANUAL MODE

10.1. USING MANUAL MODE TO CHANGE VALVE POSITION



NOTE: WHEN MAKING ANY CHANGES TO THE MCS-EXV DRIVER YOU MUST POWER DOWN THE COMPRESSOR UNIT FIRST.

WARNING: IMPROPER MANUAL CONTROL OF EXV DRIVER CAN CAUSE COMPRESSOR DAMAGE

- When in Auto mode press the **AUTO/MANUAL** key for **5 seconds**, the following display is shown.



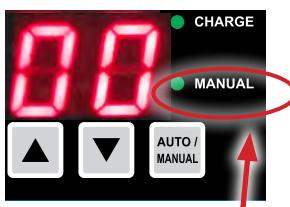
- Pressing both the UP and DOWN keys for 5 seconds shows the password screen.



- Use the UP and DOWN keys to enter password on the display.



Hold both the UP and DOWN keys for 5 seconds to accept the password.



The **MANUAL LED** turns on indicating the unit is in Manual mode. In this mode, the valve position can be controlled by the **UP** and **DOWN** keys. Example: If the valve is at 0% by pressing the up arrow incrementally, the valve will open until it reaches 99%. The unit switches back to auto mode after remaining idle for 120 seconds.

Chapter - 11. POWER DOWN MODE

If the power is disconnected, the **MCS-EXV-DRIVER** switches to the power down mode, using internal stored power to close the expansion valve.



THIS MODE OVERRIDES ALL OTHER MODES.

The valve is closed irrespective of the analog control voltage input.

Chapter - 12. SPECIFICATIONS OF MCS-EXV-DRIVER

12.1. SPECIFICATIONS

Range	
Dimensions	4.00" by 4.44" by 3.00"
Operating Temperature	-4 F to 158 F (-20 C to 70 C)
Input Power	110 to 240 VAC $\pm 10\%$ (50/60 Hz); 44 VA 24 VAC \pm (50/60 Hz)
Analog Control Voltage	0 to 10 VDC

12.2. FIRMWARE, HARDWARE VERSIONS AND VALVE TYPE

When in Auto mode press both the **UP, DOWN and AUTO/MANUAL keys** simultaneously.

Display shows:

Fr	- Firmware Heading	7.1	- Firmware version # = 7.1
hr	- Hardware Heading	3.0	- Hardware version # = 3.0
ES	- Expansion valve Heading	55	- Valve Type = Sporlan S5

12.3. FUSE REPLACEMENT

If the fuse blows on the MCS-EXV-DRIVER, the '**FUSE BLOWN**' light will light up. Follow the instructions below to change the fuse.

Locate the following: (not included)

2 amp - 250 volt fuse  available at local stores.

1. Open the top of the MCS-EXV-DRIVER by taking a small flat screw driver and prying up on the tab insert on one side and lifting the cover off.
2. On back of the circuit board, locate the small black fuse compartment, open and replace the blown fuse.



Chapter - 13. Ordering

When placing an order for the MCS-EXV-DRIVER please provide the valve code from the supported valve list below for proper programming of the device.

Example: Sporlan SER-K, ordering part # would be MCS-EXV-DRIVER-S4

VALVE TYPE IDENTIFIER -

Valve Code	Firmware Ver.	# of Steps	EXV TYPE
A1	5.5	750	Alco EX4, EX5, EX6
A2	5.5	1660	Alco EX7
A3	5.5	2600	Alco EX8
CL	6.2	500	CAREL E2V, E3V, E4V, E5V, E6V, E7V
D1	5.5	2625	Danfoss ETS-12B, -24B, -25B, -50B, KVS-15
D2	5.5	3530	Danfoss ETS-100B
D3	5.5	3810	Danfoss ETS-250, -400, KVS-42
D4	5.5	600	Danfoss ETS-12C, -24C, -25C, -50C, -100C
D5	7.9	1100	Danfoss CCTM-2, CCMT-4, CCMT-8
D6	7.9	800	Danfoss CCMT-16
D7	7.9	1400	Danfoss CCMT-24
D8	7.9	2300	Danfoss CCMT-30
D9	7.9	2200	Danfoss CCMT-42
H3	7.5	2600	Sanhua VPF-12.5, -25
H4	7.5	2600	Sanhua VPF-50
H5	7.5	3500	Sanhua VPF-100
H6	7.5	3800	Sanhua VPF-150, -250, -400
P1	7.5	2500	Sporlan GC-10, -20, -30, -40, -50; FGB-60, -70
S1	5.5	1596	Sporlan SEI 0.5-11
S2	5.5	1596	Sporlan SER 1.5-20
S3	5.5	3193	Sporlan SEI 30; SDR -3, SDR-3X
S4	5.5	2500	Sporlan SER-AA, -A, -B, -C, -D; SER(I)-F, -G, -J, -K, -L; CDS -2, -4, -7
S5	5.5	6386	Sporlan SEI-50, SEH (I)-100, -175, -400, T; SEH-P; CDS -9, -16, -17; SDR -4, -5
T1	6.1	1596	Sporlan SEI 0.5-11 - two valves wired to one MCS-EXV-DRIVER
T2	6.1	1596	Sporlan SER 1.5-20 - two valves wired to one MCS-EXV-DRIVER
T3	6.1	3193	Sporlan SEI 30; SDR -3, SDR-3X - two valves wired to one MCS-EXV-DRIVER
T4	6.1	2500	Sporlan SER-AA, -A, -B, -C, -D; SER(I)-F, -G, -J, -K, -L; CDS -2, -4, -7 - two valves wired to one MCS-EXV-DRIVER
T5	6.1	6386	Sporlan SEI-50, SEH (I)-100, -175, -400, T; SEH-P; CDS -9, -16, -17; SDR -4, -5 - two valves wired to one MCS-EXV-DRIVER

NOTES

Revision/Disclaimer Page

Date	Author	Description of Changes
5-24-14	KLM	Revision history added to manual. Version numbers added to manual - MCS-EXV-DRIVER Manual 10.01 Version numbering of hex file modified – EXDR_HW1.3_SW5.5.hex Added pictures indicating various screens Modified formatting
8-1-2014	MJW	Converted MCS-EXV-DRIVER Manual to MCS/Word format
12-11-2014	DEW	Converted to Indesign format
1-6-2015	DEW	Make edits-correct table of contents
1-9-15	DEW	Edits made from Chris
1-22-15	DEW	Edits made from Brian
4-20-15	DEW	Add new dwg, change Carel wiring
5-7-15	DEW	Edits made from Brian
5-11-15	DEW	Edits made from Josh, Chris, Ronnie
10-05-15	DEW	Edits on EXV types from Brian, add 24 volts, Sploran edits
10-10-16	DEW	Edits from James for S5 and T4
12-01/07-16	DEW	Edits and support for 6.7 firmware
04-20-17	DEW	Change wiring on Alco EX as per John B.
10-23-18	DEW	Add A4 Alco-Trane 200 Tons
10-20-19	DEW	ADD 'B' to Danfoss ETS USING D1 AND D2 CODE
11-25-19	DEW	Add Code D4 for Colibri valves from Danfoss
03-25-21- 04-01-2021	DEW	Added Code A5-CARRIER AND A6 Trane RTHC
05-19-21	DEW	Added Sploran MTW VALVES TO T5
01-21-2022	DEW	Added new Sanhua Valves, Sploran GC Valves, wiring change
03-23-2022	DEW	Change chart for Firmware used for driver
07-11-2022	DEW	Add Danfoss KVS valves
09-26-2022	DEW	add new EXV label update latest firmware
12-16-2022	DEW	Change VPF Types and Steps
05-23-2023	DEW	update exv chart REV 2.5.8
07-05-2023	DEW	change photo showing 24 vac



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