

ecoAZUR Modulating Dampers Procedure

I - MECHANICAL INSTALLATION

I.1 - Required Tools

- Drill.
- Thread locking fluid (Loctite or equivalent).
- 7/8" (2,2 cm) diameter hole saw.
- 1"1/4 (3,2cm) wrench.
- Flat control screwdriver.

I.2 - Damper Installation

1. Make sure that the damper installation location meets the following requirements :
 - 1.1. Enough space for the damper to make a complete rotation.
 - 1.2. Less than 18" (45 cm) away from an access door or the hood duct collar.
 - 1.3. As far away as possible from ducts elbows, junctions, and the duct collar while still meeting the other requirements.

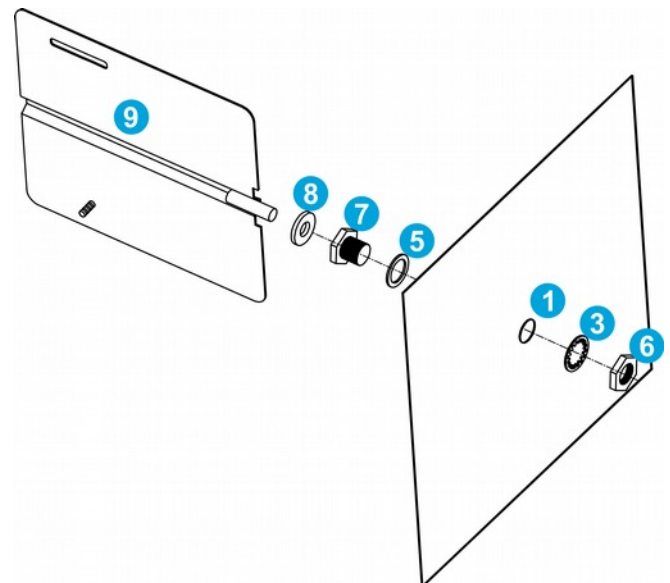
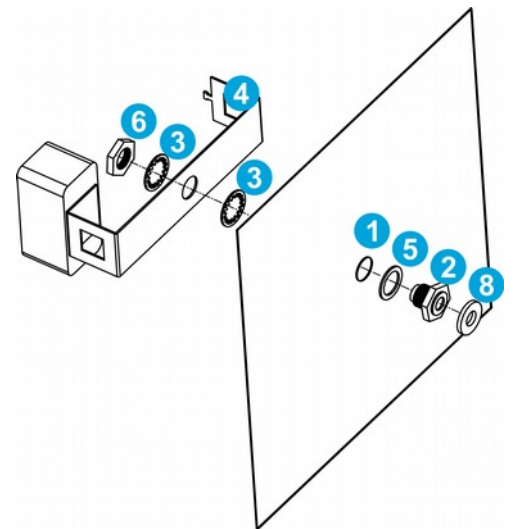
2. Drill two 7/8" (2,2 cm) holes (number 1 on the drawing), on both opposite vertical sides of the duct, each in the middle of its side (for rectangular ducts), to receive the MD damper shafts.

3. Make sure you have enough room on the actuator side for future maintenance operations. Install the through hole compression seal (2) as well as the fire gasket (5) on the actuator hole, from inside the duct.

From outside the duct, insert in the following order : a lock washer (3), the actuator mounting bracket (4), another lock washer (3), and a bolt (6). The actuator mounting bracket must either be perpendicular to the duct direction. Tighten fast.

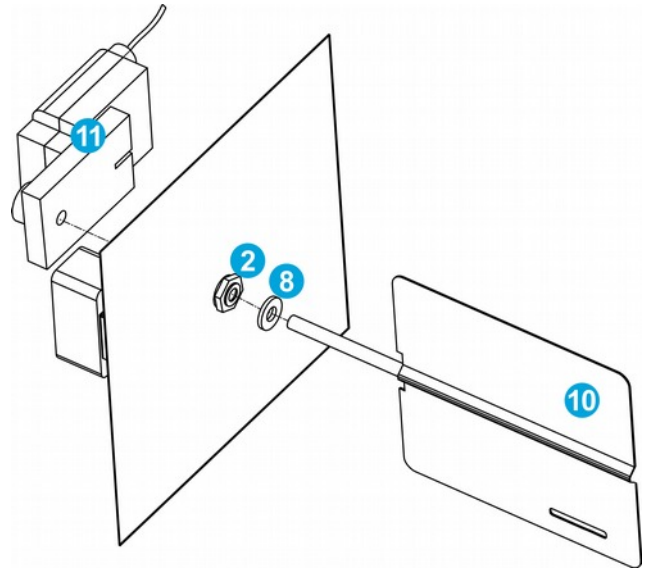
4. On the other hole, install the blind hole compression seal (7) with a fire gasket (5) from inside the duct. From outside the duct, insert a lock washer (3) and a bolt (6). Tighten fast.

5. Insert a brass washer (8) on the shaft of the free blade (9). Insert the free blade inside the blind hole compression seal (7). Make sure the shaft can rotate without friction.



6. Insert a brass washer (8) on the driving blade shaft (10). Insert them through the through hole compression seal (2). Both blades should be resting on top of the other, with their threaded bolts inserted inside the appropriate openings.

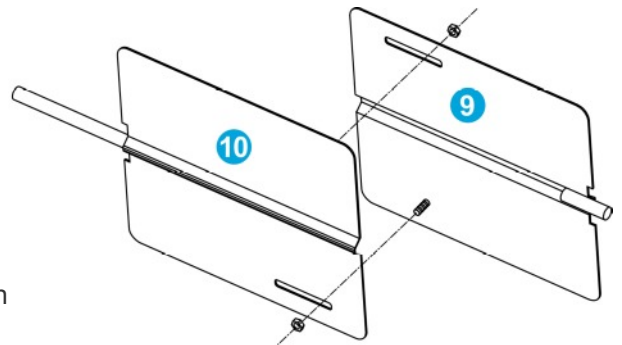
Make sure both blades can rotate without friction.



7. Expand the two blades to the maximum, then secure them in place by using loctite on both fixation studs and tightening the nuts.

Make sure the damper can rotate without friction.

8. Install the actuator (11) on the actuator mounting bracket (4).
9. Secure the shaft in fully opened position to actuator position 1. (if needed, use actuator black button to disengage motor gear and reposition the actuator)



I.3 - NFPA96 Conformity

When applied to the *ecoAZUR® MD Modulating Damper*, NFPA96 allows for 2 possible situations :

- An installation respectful of the present procedure, with the damper located inside the hood collar, is compliant with standard UL710 "Standard for Exhaust Hoods for Commercial Cooking Equipment".
- An installation respectful of the present procedure, with the damper located inside the duct, is compliant with standard UL1978 "Standard for Grease Ducts".

Furthermore, the *ecoAZUR® MD Modulating Damper* is part of the *ecoAZUR® DCKV* (Demand Control Kitchen Ventilation), and requires a complete *ecoAZUR® DCKV* system to function properly, and be compliant with standard UL2017 "Standard for General-Purpose Signaling Devices and Systems".



II - ACTUATOR START-UP

Note : This section is written for actuator model number NKQB24-SR from Belimo.

Conventions:

- Actuator position 1 = damper fully opened = fail safe position = 2V signal.
- Actuator position 0 = damper fully closed 10V signal.

Belimo NKQB24-SR LED status indicator lights sequence :

- Yellow off / Green on: operation OK, no faults
- Yellow off / Green blinking: fail-safe mechanism is active
- Yellow on / Green off: fault is detected
- Yellow off / Green off: not in operation / capacitors charging
- Yellow on / Green on: adaption running

II.1 - Initial setup

Before starting dampers characterization, make sure that the following steps have been completed during the *ecoAZUR*® programming phase.

- Dampers mechanical installation is complete.
- All sensors can increase appropriate fans and dampers speed when triggered.
- All Exhausts TC channel outputs have been set to 0–10V → 0–100%.
- All Dampers TC channel outputs have been set to 10–2V → 0–100%.
- All VFD programming are complete, and have been tested.

II.2 - Electrical Checklist

- Actuator is powered off, and properly wired up according to plan.
- Actuator mechanical stops are well secured to limit rotation span to desired positions 0 and 1.
- Actuator 'Fail safe position' is set at 'CW 1'.
- Actuator supply voltage level measurement confirms the value specified on plans (24VCA or 24VCC), and closing corresponding fuses in *ecoAZUR*® panel correctly powers actuators. (Green LED is on)
- Actuator Power Adaption process has been completed.
(When powered on, push actuator “Power Adaption” button until actuator starts detecting mechanical stops. Yellow and Green LEDs will light up during adaption process).
- Setting *ecoAZUR*® system to Max Mode correctly opens all dampers.
- Setting *ecoAZUR*® system to 0% speed correctly closes all dampers.
- Removing the 24V *ecoAZUR*® panel supply fuse opens all dampers to position 1 (fully opened).
- Fire signal (N.C. contact) on the '*ecoAZUR*® CU Processor' has been manually tested to fully opened dampers.
- No PLC, schedule interlock or any other third party system can prevent dampers to open upon fire.

III - CHARACTERIZATION

- *ecoAZUR*[®] does not monitor air flow through the dampers in real time. For that reason, dampers characterization must be done during start-up.
- When possible, it is advised to use an external PLC with a permanent static pressure sensor mounted inside the main duct to monitor static pressure, and correct VFD signal if necessary.
- In the following procedure :
- All dampers from a single exhaust fan are considered to have the same impact on air-flow, static pressure, and air speed.
- Without dampers, VFD fans are considered to draw an air flow proportional to their frequency. For that reason, only VFD fans related to dampers have their characterization corrected.

III.1 - Required tools

- During characterization process : A static pressure sensor in the main duct. (to be positioned at a distance of at least 3 times the duct section from ducts elbows, junctions, dampers and the duct collar).
- Air flow measurement tools.

III.2 - Dampers Characterization Procedure

Make sure the procedures described in the previous sections are completed before proceeding.

For each exhaust fan with dampers :

1. Set all dampers to fully opened position, set VFD to max speed (typically 60Hz in North America) by setting CU parameter 02-02 to : Commissioning = 'ON', D = '100%', E = '100%', M = '100%'.
Record the following values in table below (data point 4) :
 - 1.1. P_{ref} is the static pressure inside the duct.
 - 1.2. F_{max} is the total air flow exhausted by the fan.
 - 1.3. S_{max} is the air speed in the duct, typically around 1800 f/m.
 - 1.4. Make sure the VFD current draw is below the rated FLA.
2. Set all dampers to half-open position by setting CU parameter 02-02 to : Commissioning = 'ON', D = '50%'.
 - 2.1. Find the VFD frequency where duct static pressure is between $0,8 \times P_{ref}$ and P_{ref} (Actual factor may vary depending on specific fan curve, adjustments must avoid operating in fan stall zone) by trying different values on CU parameter 02-02 : 'E = '. Between different possible frequency values, select the one that best covers the air flow span.
 - 2.2. Record the actual VFD frequency, the air flow exhausted by the fan, the duct air speed in table below (data point 3).
3. Set all dampers to 25% open position by setting CU parameter 02-02 to : Commissioning = 'ON', D = '25%'.
 - 3.1. Find the VFD frequency where duct static pressure is around $0,5 \times P_{ref}$ and $0,8 \times P_{ref}$ (Actual factor may vary depending on specific fan curve, adjustments must avoid operating in fan stall zone) by trying different values on CU parameter 02-02 : 'E = '. Between different possible frequency values, select the one that best covers the air flow span.
 - 3.2. Record the actual VFD frequency, the air flow exhausted by the fan, the duct air speed in table below (data point 2).

Complete the **characterization table** :

Data Point	Dampers signal [V]	VFD frequency signal [V]	Duct Static Pressure [“H2O]	Air Speed [f/m]	Air Flow [cfm]	Air Flow [%]
4	2V (fully opened)	10V (60Hz)	$P_{ref} =$	$S_{max} =$	$F_{max} =$	100%
3	6V		$0,8 \times P_{ref} < \underline{\hspace{1cm}} < P_{ref}$			
2	8V		$0,5 \times P_{ref} < \underline{\hspace{1cm}} < 0,8 \times P_{ref}$			
1	10V (fully closed)	0V (0Hz)	-	0 f/m	0 cfm	0%

4. Set up the parameters in your *ecoAZUR*[®] system :
 - 4.1. For each damper, set table data point values to appropriate TC Output channel parameters 01-04 ‘Output PT1’ to 01-07 ‘Output PT4’. (menu *Physical Devices* > *TC-700#* > *TC-OUPUT#:D#*)
 - Value in Volts is the Damper Position Signal (2V = fully opened, 10V = fully closed),
 - Value in % is the Air Flow (100% = F_{max} maximum air flow)
 - 4.2. For the exhaust related to dampers, set table data point values to appropriate TC Output channel parameters 01-04 ‘Output PT1’ to 01-07 ‘Output PT4’. (menu *Physical Devices* > *TC-700#* > *TC-OUPUT#:E#*)
 - Value in Volts is the VFD Frequency Signal (With default VFD scaling : 0V = 0Hz, 10V = 60Hz),
 - Value in % is the Air Flow (100% = F_{max} maximum air flow)
 - 4.3. In *Ventilation* menu, set ‘PREP Mode’ parameter to a % value that has a sufficient air draw for preparation conditions. Test it using ‘Commissioning D-E-M’ 02-02’
 - 4.4. For each damper and exhaust, in *Ventilation* menu, make sure ‘Cooking Setpoint’ parameter is set to a % value for which the duct air speed is superior to 500 f/m (refer to the characterization table).
 - 4.5. Set CU parameter 02-02 ‘Commissioning’ = OFF.