



# ENGINEERING AIDS

**Pneumatic Recommendations for an Efficient and Safe Machine**



**Energy Saving Program Ver.2**



# Energy Conservation Products

## Automatic Leak Detection

Energy Savings



Series	ALDS
Features	<ul style="list-style-type: none"> <li>• Detects air leakages when they occur - even on a daily basis</li> <li>• Confirms the exact value of the leak</li> <li>• Provides maintenance personnel with a detailed report on where the leaks are located without the need to detect leaks in individual components</li> <li>• Operate an automatic test cycle outside production to detect leakages</li> <li>• Ability to integrate with the machine's software without the need for any external supervision system - scad, etc.</li> </ul>

## Manual Leak Detection

Energy Savings



Series	MLDS
Features	<ul style="list-style-type: none"> <li>• Portable air leakage measurement tool</li> <li>• Measures from 50 - 500 liters per minute</li> <li>• IP67 case</li> <li>• Rechargeable battery pack</li> <li>• Contact SMC's Energy Saving Team for more details</li> </ul>

## Data Logger

Energy Savings



	Data Logger
Features	<ul style="list-style-type: none"> <li>• Monitors pressure and flow characteristics from compressed air systems</li> <li>• Software allows a detailed report of pressure/flow fluctuations throughout the system</li> <li>• Can record 8 channels at once</li> <li>• DataQ acquisition equipment packaged for rough service</li> <li>• Contact SMC's Energy Saving Team for more details</li> </ul>

## Energy Saving Ejector

Energy Savings



Series	ZK2
Features	<ul style="list-style-type: none"> <li>• Monitors the vacuum level, and turns itself off when it doesn't need to operate</li> <li>• Ejector air consumption reduced by 90% (compared to conventional products)</li> </ul>

# Energy Conservation Products

## Air Preparation - "Smart" FRL

Energy Savings



Corrosion resistant  
epoxy coated option available!

Series	FRL
Features	<p><b>Know when filters need to be replace, and avoid unwanted pressure adjustments:</b></p> <p><b>Smarter FRL</b></p> <ul style="list-style-type: none"> <li>• Metal bowls protect against damage</li> <li>• Regulator with digital pressure switch prevents over-pressurization by operators</li> <li>• Differential pressure gauges ensure consistent air quality and warn you when filter changes are needed</li> <li>• Combination quick-dump, soft start, lock out/tag out valve to remove pressure when machines are idle</li> </ul> <p><b>Smartest FRL</b></p> <ul style="list-style-type: none"> <li>• Metal bowls protect against damage.</li> <li>• Optional epoxy coated bowls for wash-down</li> <li>• Digital differential pressure gauges to indicate when filter changes are required</li> <li>• Regulator with digital pressure switch prevents over-pressurization by operators</li> <li>• Combination quick-dump, soft start, lock out/tag out valve to remove pressure when machines are idle</li> </ul>

## Air Blow Gun

Energy Savings



Extension nozzle  
Available in 100, 150, 300 and 600mm lengths

Series	VMG
Features	<ul style="list-style-type: none"> <li>• Made of shock resistant resin</li> <li>• Uses 20% less energy than conventional air guns</li> <li>• Not affected by fluctuations in supply pressure</li> <li>• Maintains effective impact pressure at low inlet pressure</li> </ul>

## Air Saving Valve

Energy Savings



Series	ASR/ASQ
Features	<ul style="list-style-type: none"> <li>• ASR = pressure valve with regulator, check valve, and speed controller</li> <li>• ASQ = flow control valve with quick supply, exhaust valve, and speed controller</li> <li>• Cuts air consumption by operating the return stroke at a reduced pressure</li> <li>• Offers easy piping</li> <li>• Set pressure can be fixed or variable</li> </ul>



# Pneumatic Recommendations for an Efficient and Safe Machine

## General Recommendations

- Near the air inlet, there should be an identification plate showing the minimum air pressure required, the average air consumption per machine cycle, and the required flow rate (peak air flow). If an air quality standard for water content (pressure dew point) is called for, that qualifier should be noted here.
- The machine should be designed to operate with an air pressure as low as reasonable. Verify that the end user will have the compressed air capacity available to operate properly. If there are limited applications within the machine that require a higher pressure, consider the use of a booster to supply flow to just those locations.
- The operating program should include measures that will automatically shut off the inlet air during prolonged down time.

### SET POINT

**85 psi**

As indicated on the Panelview



VXD Series



## Air Preparation

- A **3 port shut-off valve** with lock-out/tagout should be included to remove inlet pressure during maintenance or extended down-time.
- An AMG Series **water removal filter** should be included to remove any water that might be present in the air lines.
- **Inlet Air Filter:**
  - Should be sized to minimize the pressure drop across the element (less than 3 psi).
  - The micron filtration rating should meet that of the recommendation of the components supplier. Should have an automatic drain to reduce routine maintenance.
  - Should use a differential pressure indicator to denote when the element should be replaced.
  - If a higher level of filtration is necessary, a **coalescing mist separator** and/or **odor removal filter** can be included.
  - A **pressure regulator** should have a fixed or tamper resistant pressure setting to avoid inappropriate changes.
  - If air pressures will need to be changed often, an ITV series **electro pneumatic regulator** tied to the machine's controller can be utilized.
  - A final Safety valve should include a combination E-stop, quick exhaust, soft start, and a second lock-out/tag-out. If shut down redundancy per ISO 13849-1 is required, consider a Category 3 and 4 Safety Shut-off Valve.
  - If the compressed air is lubricated, an exhaust reclassifier can be included to capture and contain the entrained oil rather than exhausting it to the work area.



VHS Series

AMG Series



AFF-X6

AR series  
pressure regulator



ITV Series



VG342  
Cat 3/4 valve



AMC



AVL Series

## Sustainability

- Install an **ALDS (Automatic Leak Detection System)** that will cycle through the pneumatic system during down time, measuring and recording any air leaks found at the component level.
- OR
- Install **Flow meters** and **pressure switches** at the air inlet to measure and record air usage.
- OR
- At minimum, flow meters and pressure switches should be installed on start-up to document initial air usage. Those start-up numbers can be compared with later measurements of air usage to determine if machine efficiencies have degraded over time.

ALDS



PF2A flow meters

# Pneumatic Recommendations for an Efficient and Safe Machine

## Air Power Components

- Minimize the distance between the directional control valves and the actuators to reduce wasted air volume.
- Use AS Series tamper resistant flow control valves on the actuators.
- Include KE Series residual pressure release valves at select locations for manual relief of trapped air pressures.
- If the flow control valves need to be adjusted often, consider the use of electronically controlled proportional valves tied to the machine controller.
- If significant areas of the machine can operate at lower pressures, install regulators to reduce pressure to those areas.
- If the machine will be subject to wash down, specify epoxy coated or stainless steel components.
- Any air-blow should include an engineered nozzle, a pressure regulator set for optimum impact force, and a solenoid valve to shut off the air supply during idle time.
- Blow guns, if included, should be of an efficient design and meet OSHA requirements.
- Low wattage coils (0.5 watts or less) should be employed on all solenoid valves.
- If actuators require thrust in one direction only, investigate lowering pressure on the return stroke. Alternative speed/pressure control valves may need to be included.
- If a machine failure might result in a cylinder causing tooling/product damage or operator injury, examine a fine-lock or end-lock option.
- Always include a high quality muffler on all air exhausts to minimize noise.



## Vacuum Components

- Venturi style vacuum ejectors can be employed in non-continuous applications, but should include:
  - Tamper resistant inlet air regulator to maintain optimum air pressure (usually no more than 65 PSI).
  - Multiple-stage vacuum ejectors for best efficiency.
  - Vacuum switches as part of a control system used to shut off the air supply when the part is adsorbed and restore air flow if the vacuum pressure degrades.
  - ZP2V series vacuum saving valves to isolate a failed pad within a multi-pad application employing a single ejector.
  - Minimal distance between the ejector and the end effector in order to reduce line volumes.



# Menu



Pneumatic basic calculation

Calculation for energy savings at a plant

Model Selection

Other calculations

Use SMC's Energy Saving Program to optimize energy consumption during the design phase. See below for some highlights, and go to [www.smcusa.com](http://www.smcusa.com) for free download!

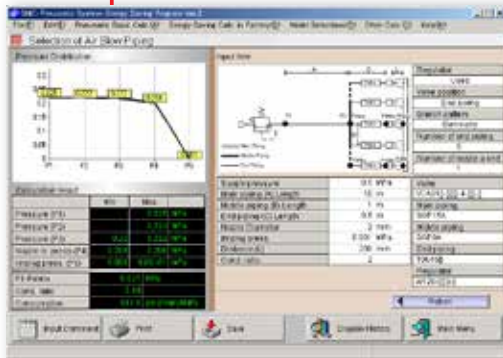
Indicates the added features and improvements in ver. 2.

## Selection and characteristic calculation for an air blow system

*It is possible to select and calculate the characteristics of different air blow nozzles and upstream piping.*

Pressure distribution can also be calculated.

Easy visual understanding with the help of graphs



No.	Registration name	Nozzle size (mm)	Nozzle length (mm)	Nozzle diameter (mm)	Nozzle material	Nozzle pressure (MPa)	Nozzle flow rate (m³/min)	Nozzle consumption (m³/min)	Nozzle cost (\$)
1	1. Air Blow Nozzle	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2	2. Air Blow Nozzle	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
3	3. Air Blow Nozzle	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4	4. Air Blow Nozzle	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0

## Air consumption of devices

*Air consumption calculations for actuators and air blowers are possible.*

Cost can be calculated.

### Accumulation function

The air consumption of each device can be calculated. The total volume of air consumption by device and line can be determined, as well as the total cost.

**A total of 88 different actuators are registered.**

**See the savings possible with dual-pressure circuits**

No.	Registration name	System name	System type	System pressure (MPa)	System flow rate (m³/min)	System consumption (m³/min)	System cost (\$)
1	1. Actuator	1.0	1.0	1.0	1.0	1.0	1.0
2	2. Actuator	2.0	2.0	2.0	2.0	2.0	2.0
3	3. Actuator	3.0	3.0	3.0	3.0	3.0	3.0
4	4. Actuator	4.0	4.0	4.0	4.0	4.0	4.0

Complicated calculations no longer need to be manually performed. The program offers quick results!

Complicated calculations such as the volume of air consumption and pressure drop are no longer required. Calculation results can be acquired by simply inputting user conditions.



## Pneumatic line net

### Calculation of pressure loss in pipeline networks



It is possible to successfully work with more complicated pipeline networks by using this new version.

Simplified input

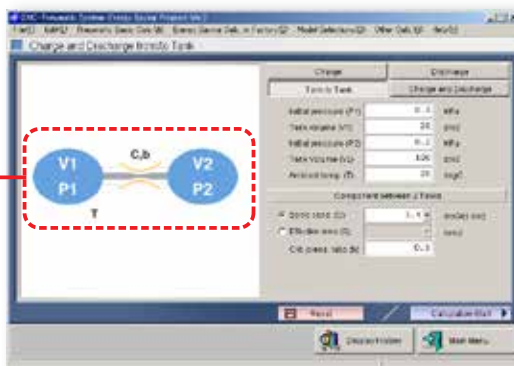
### Works with loop piping

Calculations can be performed on complicated pipeline networks which cannot be manually calculated.

### Work with a variety of pipelines.

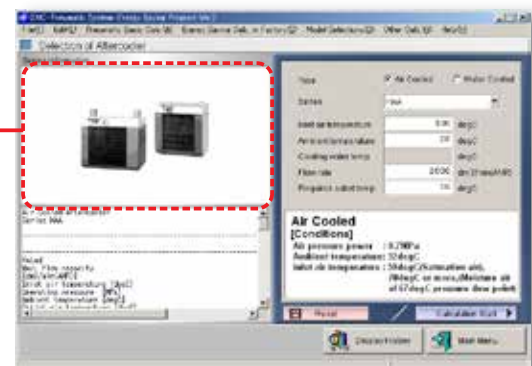
### Charge and discharge to/from a tank

Calculation on the charge and discharge between two tanks has been added.



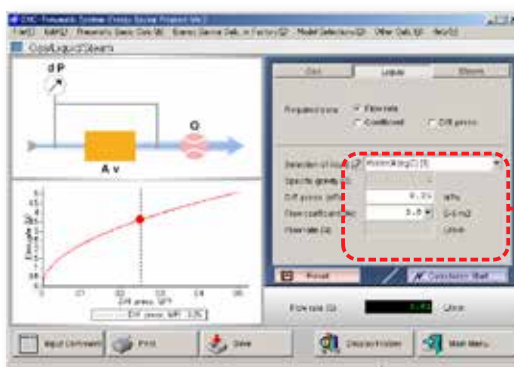
### Selection of devices

Selection of the following has been added: After cooler, air filter, regulator, and air tank.



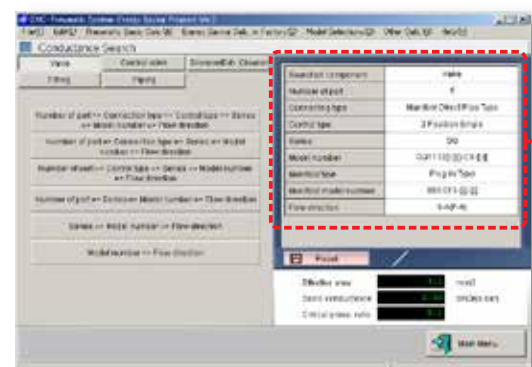
### Calculation of gases, liquids and saturated steam

It is possible to work with a variety of gases and fluids by entering their specific gravity.



### Search for the conductance of components

Selection of the following has been added: After cooler, air filter regulator, and air tank.



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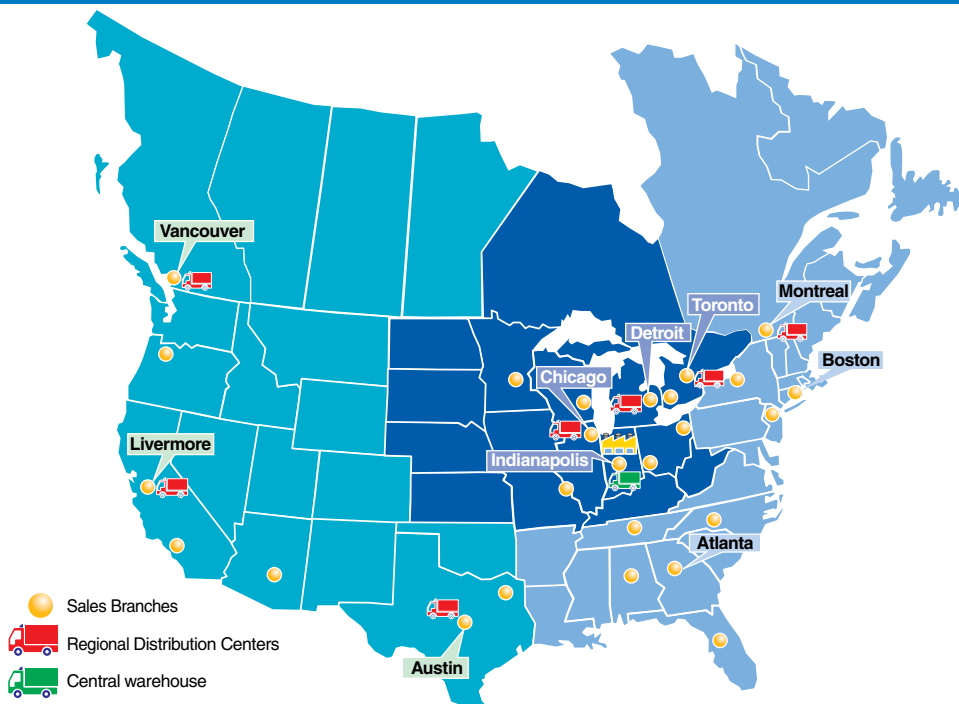
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