F.R.L.
F.R.
F (Filtr)
R (Reg)
L (Lub)
Drain Separ
Mech Press SW
Res press exh valve
SlowStart
Anti-bac/Bac-remove Filt
Film Resist FR
Oil-ProhR
Med Press FR
No Cu/ PTFE FRL
Outdrs FRL
Adapter Joiner
Press Gauge
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
Speed Ctrl
Silncr
CheckV/ other
Fit/Tube
Nozzle
Air Unit
PrecsCompn
Electro Press SW
ContactSW
AirSens
PresSW Cool
Air Flo Sens/Ctrl
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
Gas generator
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

Displaying air flow rate

Display values of air flow rate differ depending on the state of the air. Pneumatic components must be selected upon checking the condition for displayed flow rate.

There are two main methods for displaying the air flow rate.

(1) Flow rate unit expressing volume in reference state: ℓ/min (normal) (Nℓ/min.)

(2) Flow rate unit expressing volume in standard condition: ℓ/min (ANR)

The reference state refers to: Absolute pressure: 101.3 KPa
Temperature: 0°C
Relative humidity: 0%

This state is usually used for the flow rate meter.

The standard condition refers to: Absolute pressure: 101.3 KPa
Temperature: 20°C
Relative humidity: 65%

This is the standard condition (refer to Japan Fluid Power Association Standards JPAS008) in which people are active.

The approximation formula is usually used to convert both conditions.

1 ℓ/min(normal)(1 Nℓ/min)≈1.08 ℓ/min(ANR)

Even if the air flow rate is the same, smaller values are displayed for N ℓ/min. Under the Japan Fluid Power Association Standards, the air flow rate unit is ANR (Note). Therefore, all flow rates in catalogs are displayed in ANR. (Excluding flow rate sensor)

Other than the above, some flow rates are displayed with the manufacturer's original reference values. In these cases, make sure to convert values to ANR when selecting the model.

(Note) ANR is the abbreviation of a French term:
Conditions de l'atmosphére normale de référence (Standard reference atmospheric conditions).

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Cost of air and energy saving

1 Cost of air

The cost of compressed air is calculated as the total sum of all expenses required to compress 1 m^3 of air to a specified pressure with atmospheric pressure conversion.

$$\text{Cost of compressed air} = \frac{\text{Electricity cost (compressor/auxiliary components such as dryer, pump, etc.) + facility depreciation cost + running cost + maintenance cost (yen/year)}}{\text{Amount of discharged compressed air (m}^3\text{/year)}}$$

When simply calculated from equipment performance, it differs due to contracted basic power rates. However, it is generally set to 2.5 yen/m^3.
Practically, the used flow rate (air discharge rate) differs with the daily operation time zone, such as daytime, nighttime, weekday, or month. When the flow rate and pressure change, power consumption also changes. To calculate the actual cost of air, the average annual cost must be found by measuring the total amount of power and amount of used air flow rate through the year.
When assuming the general operation state, some calculation examples provide 3.0 yen/m^3 for the cost of air.

The cost of air must be understood to promote energy conservation of the pneumatic system, and to illustrate the improvement effect. This is also important for increasing awareness in making improvements.

2 Points of energy saving

(1) Suppressing wasted air consumption
- ·Reduction of air leakage
- ·Review and reduction of air blow consumption
- ·Optimization of pneumatic component sizing, etc.

(2) Selecting devices and components with low power consumption

(3) Lowering pneumatic pressure
Driving the compressor shaft, which consumes the most energy, is reduced by lowering discharge pressure. (Example: If using a screw, savings of 8% or more are achieved by lowering discharge from 0.7 to 0.6 MPa). Thus, the working pressure at the end must be reduced and pneumatic components with small pressure loss must be selected.

3 Efforts by CKD

·High efficiency is pursued in every aspect of CKD products.
By enhancing efficiency, high processing performance is realized with small power consumption.
·By reducing pressure loss of components, low pressure air sources can be used, reducing compressor shaft force (power consumption).