

BCAS Factsheet FCT600-1

Specific power



What is specific power?

Air compressor specific power is a key performance metric that explains how efficiently a compressor converts electrical power into compressed air. It is especially important when comparing compressors or evaluating energy costs.

It is one of two measures of compressor performance. The other is isentropic efficiency, see BCAS Factsheet FCT601-1 (Isentropic efficiency). To understand the differences between isentropic efficiency and specific power see BCAS Factsheet FCT602-1 (Difference between isentropic efficiency and specific power).

Definition

$$\text{Specific Power} = \frac{\text{Input Power (kW)}}{\text{Free Air Delivered (FAD, m}^3\text{/min)}}$$

- **Input power (kW):** Electrical power consumed by the compressor (motor + losses)
- **FAD (m³/min):** The volume of air delivered at standard conditions

Units: Specific power = kW / m³ / min

Example calculation

A compressor consumes 75 kW and delivers 10.5 m³/min of compressed air (FAD)

$$\text{Specific Power} = \frac{75}{10.5} = 7.14 \text{ kW/m}^3\text{/min}$$

How is specific power used?

It is a measure of how much energy is required to generate usable compressed air:

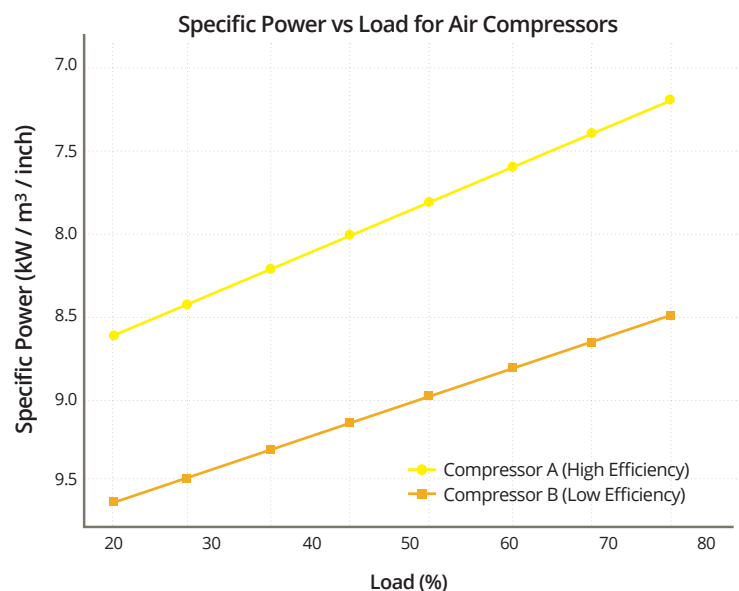
- Lower specific power = a more efficient compressor
- It reflects not just the isentropic process but also mechanical, electrical, and system losses
- Allows a comparison of compressors of the same size/rating
- Enables an evaluation of energy cost per unit of air

Typical specific power values

Compressor Type	Specific power (kW/m ³ /min)
Rotary screw	6.5 - 8.5
Rotary vane	7.5 - 10
Scroll	6.0 - 8.0
Reciprocating (small)	6.0 - 9.0
Centrifugal	5.0 - 7.5

Illustration

Graph comparing specific power vs. load for two compressors:



- **Compressor A:** Lower specific power across the load range, especially at high loads, indicating better energy efficiency.
- **Compressor B:** Higher specific power, less efficient, especially at partial loads