

# CAPACITY CONTROL SO PRECISE, IT'S NOTHING SHORT OF BRILLIANT

SMART UNLOADING COMPRESSORS  
AND ACCESSORIES



 Carlyle<sup>®</sup>

# SAY HELLO TO THE SMART FAMILY OF COMPRESSORS AND ACCESSORIES.

The latest in reliable and efficient compressor technology, our **SMART Unloading Compressors and Accessories** deliver precise, tighter control to reduce start-stop cycling. A simplified design provides increased reliability, safety and efficiency in every facet of the air conditioning applications, making these devices a truly intelligent addition to the compressor industry, and just the latest reason to count on Carlyle.

## SMART Unloading Compressors

At Carlyle, we understand the demand for efficiency and precision, and we design compressors with these objectives in mind. In refrigeration applications, especially those with multiple compressor applications, thermal load may vary over a wide range. To achieve the highest levels of efficiency and system performance across this range, Carlyle's SMART Compressors allow for precise capacity control and suction pressure by modulating the compressor's unloader valve.

The change in the compressor capacity output precisely meets the load demand and can be configured for low-, medium- and high-temperature applications. The results are cutting-edge performance in compressor cycling reduction, compressor life extension and refrigeration system energy use.

## SMART Accessories

To further enhance our line of compressors and help customers get the most from their system, Carlyle created a line of SMART Accessories. The SMART Controller and PWM Valve allow for optimum system performance through controlled settings, and efficient and advanced technology.

## SMART Controller

Acting as the brains of the refrigeration operation, the SMART Controller receives an analog output signal from the system rack controller, which creates an equivalent linear change in compressor capacity output, concisely and efficiently meeting the load demand.

With the SMART Controller, maximum efficiency is achieved through Pulse Width Modulation (PWM), which cycles the compressor unloader between the loaded and

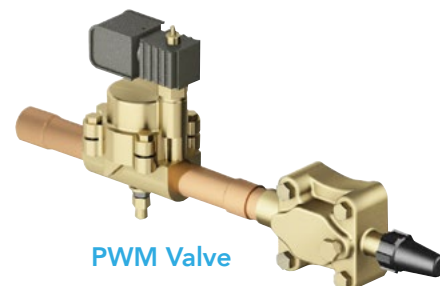
unloaded position every 30 seconds, generating a time average flow rate from the compressor and allowing linear capacity modulation from 50 to 100 percent (4 cylinder). The device also provides compressor discharge temperature control and protection, as well as control outputs for controlling the cylinder head fan and liquid injection valve.



SMART Controller

## PWM Valve

Designed to operate the compressor unloaders, the PWM Valve is controlled by the SMART Controller on a 30-second PWM signal. The valve is qualified to modulate compressor capacity from 20 to 100 percent. The PWM Valve is qualified to work with all low-, medium- and high-temperature applications, as well as single and parallel configurations. The valve also features a manual life stem that can be front set to force the valve open.



PWM Valve



06M  
Compressor



06CC  
Compressor



06D  
Compressor



06E  
Compressor

## The Benefits of Being SMART

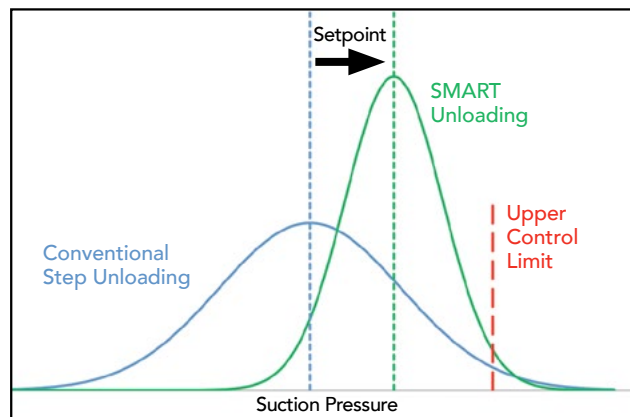
**Capacity Range:** Compressors can modulate compressor capacity from 20 to 100 percent with the PWM unloading. The result is a more efficient rack and energy savings. A large-capacity range also reduces compressor cycling for the fixed compressors.

**Two-Stage Qualified:** The PWM technology now adds unloading capability to our two-stage family of compressors.

**Precise System Control:** Tighter suction control allows the OEM to float the suction pressure 1-2 psig above set point, significantly reducing energy consumption. The tighter refrigeration control leads to more consistent product temperature while improving food quality.

**Reliability:** At Carlyle, reliability is everything to us. Each of our products has been tested to over 10 million cycles.

**Cost Savings:** Our compressor systems provide VFD-type control for single or parallel compressor applications at significantly lower hardware and installation costs.



Decreased deviation from setpoint with SMART Unloading enables those setpoints to be "floated" up, resulting in more efficient operating conditions and reduced system operating costs.

## INGENUITY RUNS IN THE FAMILY

Carlyle's family of SMART products provides greater control, efficiency and reliability over a range of applications. Together, they have the capabilities to help make the entire system, well, smarter.



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## COUNT ON CARLYLE.

Carlyle is a world leader in compressor technology. Our products can be found around the world — from the first nuclear submarine to your grocer's freezer. That's because when it comes to refrigeration and air conditioning, Carlyle builds the world's most reliable compressors.

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