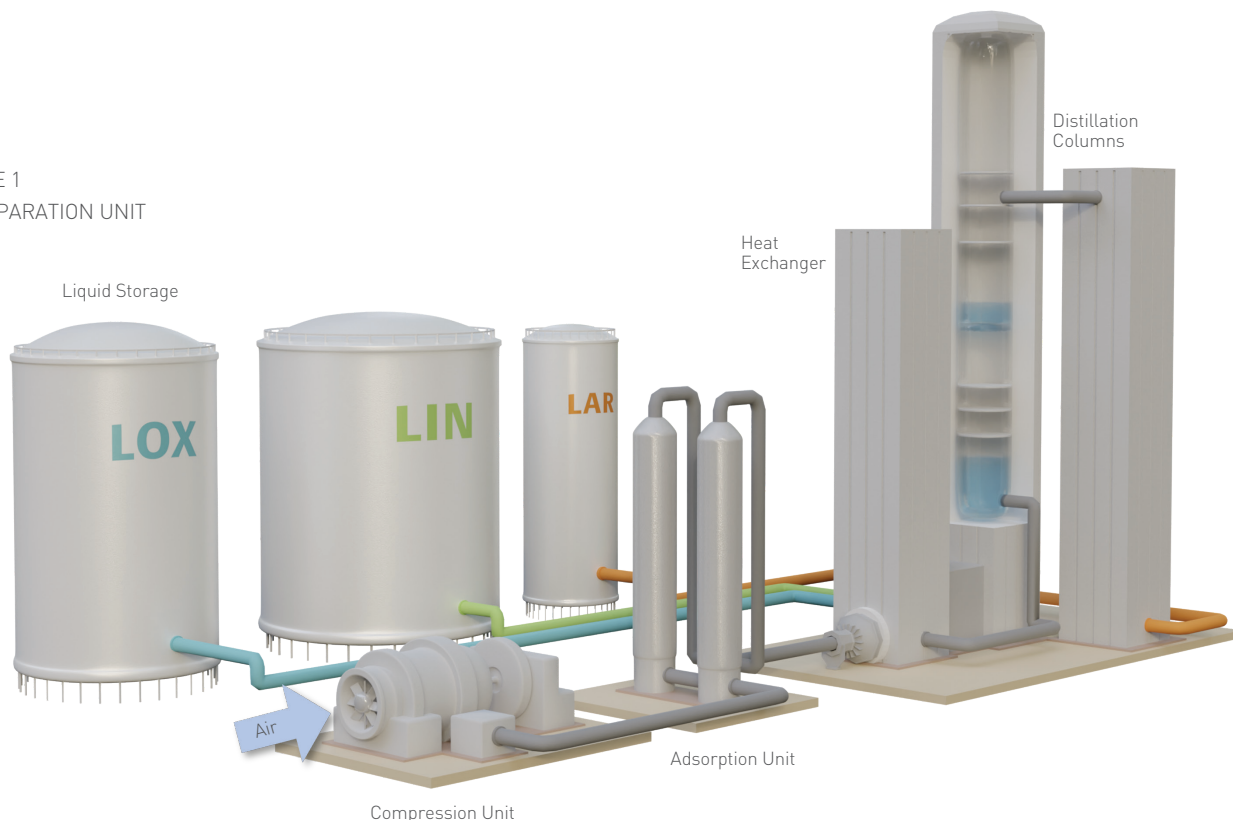


**A VANESSA TRIPLE OFFSET VALVE SOLUTION**  
 FOR HANDLING ISOLATION AND PROCESS CONTROL SAFELY AND RELIABLY WITHIN HIGHLY  
 OXIDIZING ENVIRONMENTS

Handling liquid and gaseous oxygen is challenging due to the risk of fire ignition. The industry needs solutions that deliver high level of performance, reliability and long service life while meeting stringent cleanliness requirements.

FIGURE 1  
 AIR SEPARATION UNIT



In and around an Air Separation Unit (ASU), Liquid Oxygen (LOX), a direct product of the cryogenic distillation process, is handled prior to conversion into Gaseous Oxygen (GOX). This occurs in a heat exchanger, following which gaseous oxygen is distributed and used in blast furnace, chemical reactors and many other industrial applications. Often, these services face important reliability issues that impact plant productivity and, more critically, safety: a defective valve can result in a significant accident.

Reliable oxygen service valves must combine suitable material selection with the fulfilment of stringent cleanliness requirements to deliver outstanding isolation and control functions at cryogenic temperatures in LOX and high pressures in GOX. Rising stems and body cavities in traditional valve designs create risk of external particulate ingress and oxygen phase change with consequent potential for ignition.

Traditional ball and high-performance butterfly designs have gained presence in LOX but still experience mechanical friction during sealing which is another possible source of ignition. Ball valves also represent the legacy technology in GOX but generate high total installed cost (due to their large footprint, heavy weight and high torque actuation required) and significant maintenance cost as well.

# VANESSA SERIES 30,000 TRIPLE OFFSET VALVE

## PRODUCT INFORMATION

### WHAT IS A TRIPLE OFFSET VALVE (TOV)?

As the concept of triple offset technology has evolved, so has the Vanessa Series 30,000. From meeting the need to eliminate leakage, triple offset valves have become the ultimate process valve - one that's even better positioned to deliver metal-to-metal torque seating, quarter turn non-rubbing rotation and withstand the harshest service conditions.

#### Triple Offset Design

The Vanessa Series 30,000 TOV shares the same cone-to-cone principle with a globe valve, but sealing is performed by quarter turn rotation. A TOV uses a sealing system consisting of a stationary seat and a rotating sealing surface sharing an identical shape: an inclined conic section. When these cones overlap, closed position is reached and sealing occurs. Such 'quarter turn globe' concept is made possible by the use of three 'offsets' meant to completely eliminate rubbing. Optimized seating angles and rotational characteristics guarantee superior tightness via an ingenious combination of the triple offset design and a flexible metal seal ring across all basic, cryogenic and high temperature configurations.

\* All standard Vanessa Series 30,000 TOV in basic configuration are seat leakage-tested with water and air in both directions according to our standard procedure, which meets the requirements of API 598, EN 12266-1 and ISO 5208. If not otherwise specified by the customer, the acceptance criterion for on/off service is "no visible leakage" throughout the duration of the seat test, that is the same as "Resilient Seated" of API 598 or "Leakage Rate A" of EN 12266-1 and ISO 5208.

#### Offset 1

The shaft is placed behind the plane of the sealing surface to provide a continuous seat path.

#### Offset 2

The shaft is placed to one side of the pipe/valve centerline to allow the displacement of the seal from the seat during the 90° opening.

#### Offset 3

The seat and seal cone centerlines are inclined in respect to the pipe/valve centerline. This third offset completely eliminates rubbing.

#### Seal Ring

The elasticity and radial compression of the Vanessa Series 30,000's seal ring enable the contact pressure to be uniformly distributed around the seating surface - guaranteeing zero leakage\*.

#### Seat Stellite® grade 21

The Vanessa Series 30,000 TOV features overlays made from Stellite® grade 21 - an incredibly robust material that is specifically designed to withstand flow generated wear and guarantee a robust surface to withstand the radial compression of the seal ring.

FIGURE 2

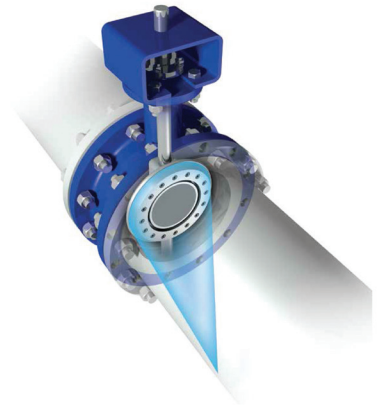
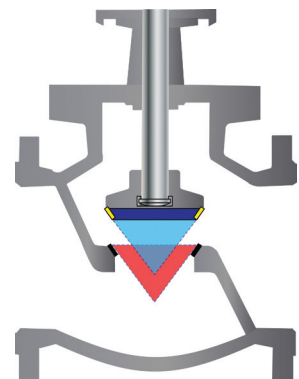
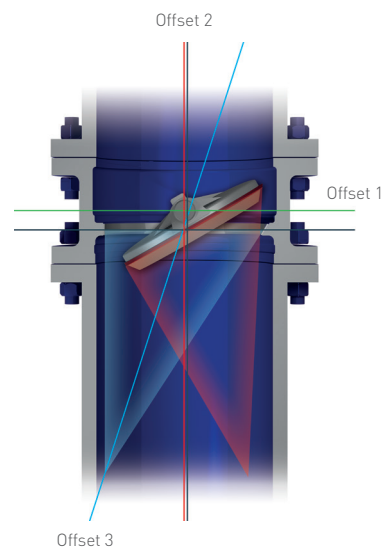


FIGURE 3



Cone-to-cone sealing principle in a TOV (rotational movement) and in a globe valve (linear movement)

FIGURE 4



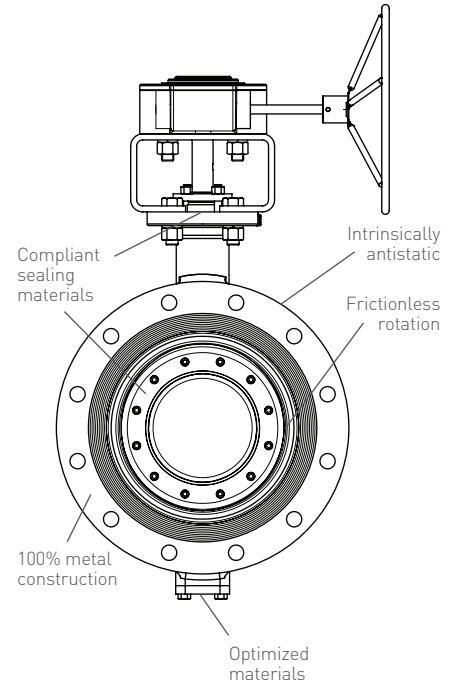
# VANESSA SERIES 30,000 TRIPLE OFFSET VALVE

## BENEFITS

A Triple Offset Valve solution can address liquid/gaseous oxygen challenges by eliminating friction and guaranteeing optimal suitability to the service requirements.

CHALLENGE	BENEFITS
Improving personnel safety	<ul style="list-style-type: none"> <li>• A full metal construction (fire safe by design) eliminates the risk of oxygen kindling chain across non-metallic sealing components.</li> <li>• The design principle based on triple offset frictionless quarter turn rotation and metal to metal torque seating eliminates the risk related to combining high speed/high load with rubbing surfaces as the contact between sealing components occurs only at 0° closed position.</li> <li>• A round solid seal ring provides a twofold contribution: it optimizes the seating profile, ensuring the best possible contact with the seat. With a reduced contact surface it inhibits the risk of ignition.</li> <li>• Optimized material selection contributes against the danger of thermal ignition.</li> <li>• The expanded graphite for gaskets and valve packing has been tested and certified for oxygen compatibility by world class laboratories.</li> <li>• Electrical continuity across all components makes Vanessa valves intrinsically antistatic by excluding localized accumulation of electric charge which can be suddenly discharged in a spark.</li> <li>• The cleaning, inspecting, assembly, testing, protection and labelling of Vanessa TOV for oxygen service are executed in compliance with the relevant product specifications in a designated manufacturing location. All the operations are carried out by expert personnel, specifically trained and equipped.</li> <li>• Vanessa TOV solutions for oxygen enriched atmospheres, namely the LOX and GOX configurations, are subject to a pneumatic seat tightness test as per API 598 at 6 bar (up to ASME class 600) and to a high pressure gas test (for ASME class 900).</li> </ul>
Extending plant uptime	Minimal planned maintenance required.
Reducing CAPEX & OPEX	<p>Vanessa TOV is lighter, smaller and more efficient product compared to traditional ball and gate valves which have a larger footprint by design.</p> <p>Vanessa TOV requires low and stable torque which can be provided by smaller actuators.</p>

FIGURE 5



# VANESSA SERIES 30,000 TRIPLE OFFSET VALVE

## LOX AND GOX CONFIGURATIONS

### Non-Cold Box and Cold Box in Air Separation Unit

Application: Cryogenic gas distillation (see figure 6)

<b>Process Medium</b>	Liquid oxygen (LOX)
<b>Range</b>	<p><b>NON-COLD BOX</b></p> <p>NPS 3 to 36 - ASME Class 150 and 300            DN 80 to 600 - EN PN 10/16/25/40            NPS 6 to 36 - ASME Class 600            DN 150 to 350 - EN PN 63/100</p> <p><b>COLD BOX</b></p> <p>NPS 3 to 12 - ASME Class 150 and 300            DN 80 to 300 - EN PN 10/16/25/40            NPS 6 to 12 - ASME Class 600            DN 150 to 300 - EN PN 63/100</p>
<b>Material Selection</b>	<p>Stainless Steel (ASTM A351 CF3M/CF8M or EN 10213 1.4408)</p> <p><b>BOM:</b>  <b>BEZ15 (ASTM A351 CF3M/CF8M)</b>  <b>BMZ15 (EN 10213 1.4408)</b></p>
<b>Valve Configuration</b>	Cryogenic
<b>Body Style</b>	Double flanged, lug, wafer

CONFIGURATION	TECHNICAL SOLUTIONS
LIQUID OXYGEN (LOX)	<ul style="list-style-type: none"> <li>Nitronic® 50 round solid seal ring with molybdenum disulfide dry antifriction coating tested for oxygen compatibility by WHA.</li> <li>Graphite packing and spiral wound gasket tested for oxygen compatibility by BAM.</li> <li>Stellite® 21 tested by WHA using the guidance of ASTM G124 test method to evaluate flammability levels.</li> </ul>

### Processed Gas Distribution

Application: Isolation and control (see figure 7)

<b>Process Medium</b>	Gaseous oxygen (GOX)
<b>Range</b>	<p>NPS 6 to 24 - ASME Class 300            DN 150 to 600 - EN PN 40</p>
<b>Material Selection</b>	<p>Stainless Steel (ASTM A351 CF3M/CF8M or EN 10213 1.4408)</p> <p><b>BOM:</b>  <b>AEZ27 (ASTM A351 CF3M/CF8M)</b>  <b>AMZ27 (EN 10213 1.4408)</b></p>
<b>Valve Configuration</b>	Basic
<b>Body Style</b>	Double flanged, lug, wafer

<b>Process Medium</b>	Gaseous oxygen (GOX)
<b>Range</b>	NPS 6 to 24 - ASME Class 600 and 900
<b>Material Selection</b>	<p>Monel (ASTM A494 M35-1)</p> <p><b>BOM: AZZ122</b></p>
<b>Valve Configuration</b>	Basic
<b>Body Style</b>	Double flanged, lug, wafer

CONFIGURATION	TECHNICAL SOLUTIONS
GASEOUS OXYGEN (GOX)	<ul style="list-style-type: none"> <li>Copper beryllium alloy round solid seal ring (in case of Monel valve body) with molybdenum disulfide dry antifriction coating tested for oxygen compatibility by WHA (see figure 8).</li> <li>Graphite packing and spiral wound gasket tested for oxygen compatibility by BAM.</li> <li>Stellite® 21 tested by WHA using the guidance of ASTM G124 test method to evaluate flammability levels.</li> </ul>

**NOTE**

WHA: WHA International, Inc.

BAM: Bundesanstalt für Materialforschung und -prüfung

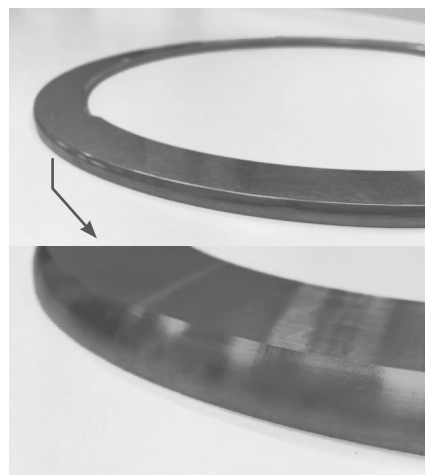
FIGURE 6



FIGURE 7



FIGURE 8



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