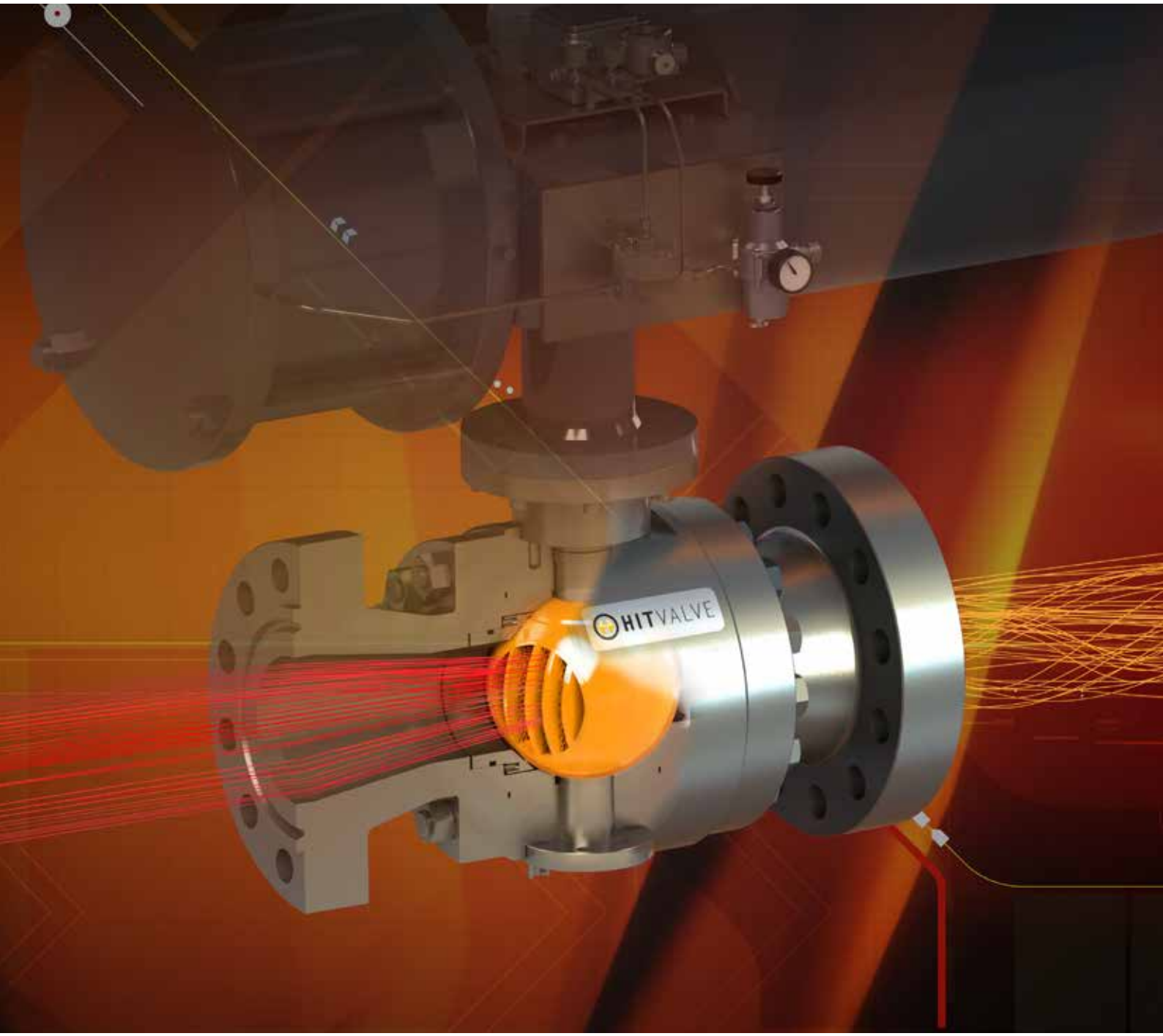
HITVALVE



CONTROL BALL VALVES

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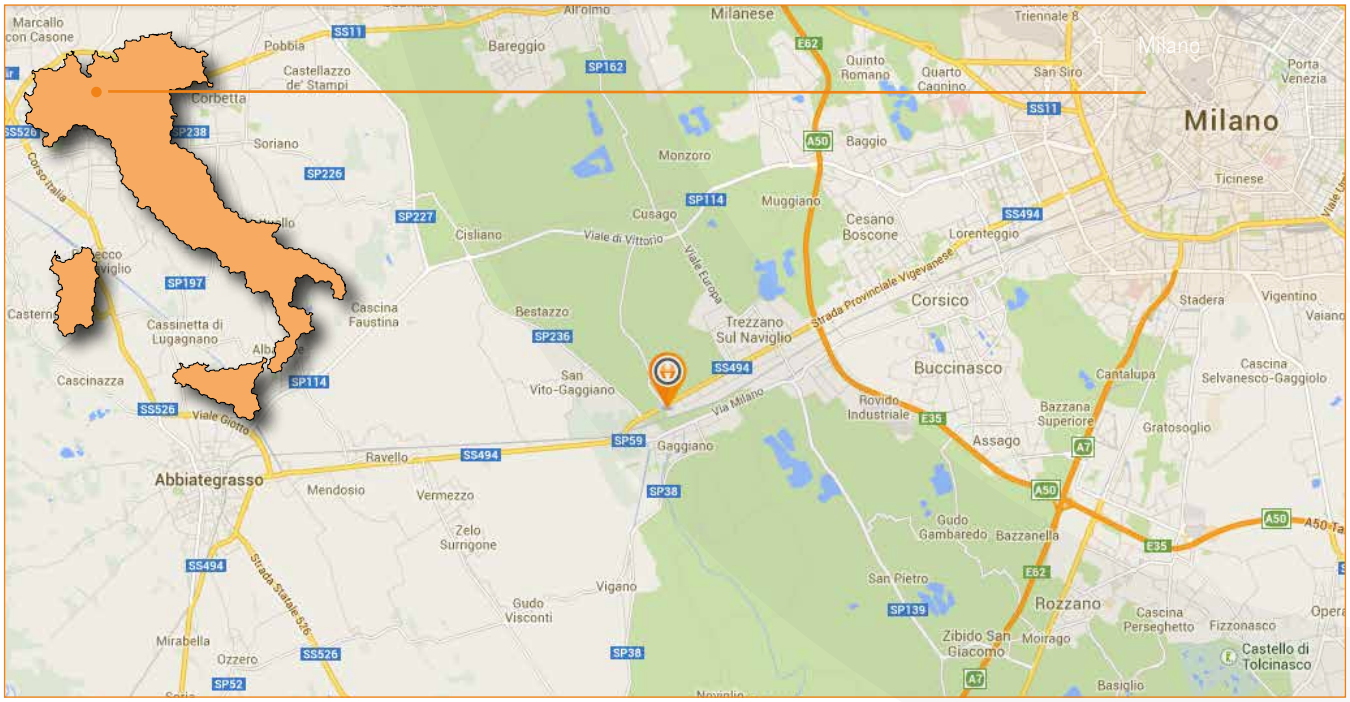
for further information about HIT VALVE's products and for sales enquiries, contact our Sales department at sales@hitvalve.com



COMPANY PROFILE

HIT VALVE is a privately owned Italian supplier of engineered valve solutions for a wide spectrum of industrial applications.

Our **range of products** includes:

- CONTROL BALL VALVES
- TRUNNION MOUNTED BALL VALVES

  side-entry, top-entry and fully-welded design
- THROUGH-CONDUIT SLAB GATE VALVES

  fabricated, forged or cast body
- DOUBLE EXPANDING GATE VALVES

For details about Ball and Gate Valves, check our dedicated catalogue.

INDUSTRIES

Oil & Gas
Exploration & Production
Pipelines & Processing Plants
Refining & Petrochemical
LNG
Power
FPSO & Shipbuilding

MAIN APPLICATIONS

platform water systems
flare systems
ballast systems
subsea umbilical riser and flowlines
gas compression/treatment systems
production separation systems
metering skids
storage/manifold
pig launch
bypass
mainline pipeline
line break detection systems
pig traps
pump/compression stations
HIPPS
slurry services
FPSO turret

WHY HIT VALVE

INNOVATION

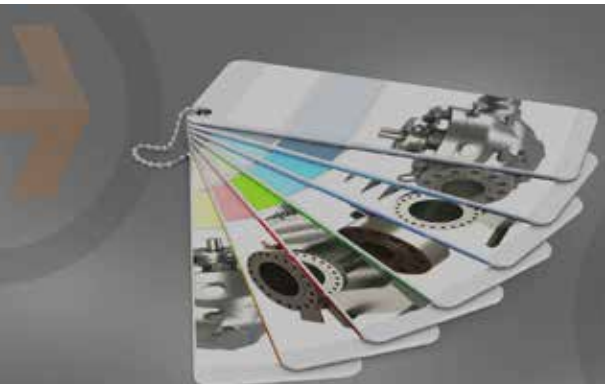
ALWAYS LOOKING AHEAD, BACKED BY EXPERIENCE

Driven by the evolving needs of the Oil & Gas demanding industry in terms of performance and reliability, we are committed to **develop the best technical solutions** for our Customers.
In this continuous challenge forward, we are backed by the **long experience and extensive know-how** of our management and engineering teams.

ITALIAN KNOW-HOW

100 % made in Italy

Our products are **100 % designed, engineered, assembled and tested in our Gaggiano (Milan) premises**. We can rely on a team of local managers and engineers with strong background in product design and manufacturing, and count on a nearby **network of qualified** raw materials and components **suppliers and subcontractors**.



FLEXIBILITY

CUSTOMIZED SOLUTIONS FOR ANY APPLICATIONS

Our design can be engineered to meet the most stringent requirements and provide our Customers with the most effective solution at the best value.
We have the expertise and skill sets to offer **tailor-made solutions** to suit any Projects' specifications, including critical and severe services.

ISO 9001

CE-PED

CE-ATEX

ISO 14001

OHSAS 18001

RELIABILITY

CERTIFIED QUALITY, FIELD PROVEN PERFORMANCE

Throughout our history since 2006 we have built a strong track record by successfully delivering thousands of valves now installed in a large scope of onshore, offshore and subsea applications. Our valves, our quality system and our facility meet the highest international quality and product standards: **ISO 9001, API 6D/6DSS/6A/17D, CE-PED, CE-ATEX, ISO 14001, OHSAS 18001, EN 14141, IEC 61508**. In order to grant performance and dependability to our supplies, HIT VALVE's products undergo a **stringent and extensive sequence of tests and inspections**.

SERVICE

CUSTOMER FOCUSED, SHORT LEAD TIME

HIT VALVE is a **privately owned company**, which favors a **partnering approach** with Customers and grants flexibility and quick response times for all inquiries, clarification and support.
We have gained a reputation for achieving exceptional Customer service by combining experience, proven technology, high- end engineered solutions at competitive prices.

GLOBAL PRESENCE

SERVING OUR CUSTOMERS AROUND THE WORLD

We offer our products through a widespread network of distributors/partners providing valuable consulting and support services all over the world. This **wide geographical presence** enables us to provide our Customers with global availability and deep local knowledge.

API 6D

API 6DSS

API 6A

API 17D

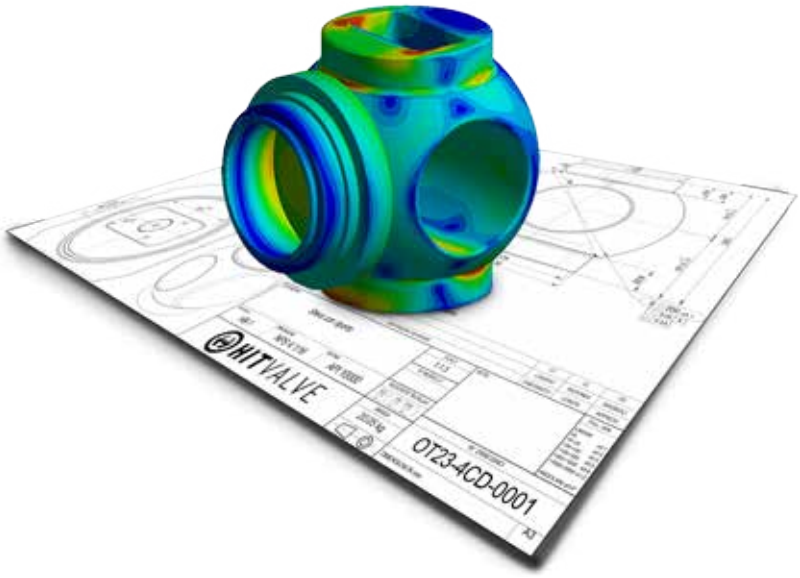
- FPAL
- ACHILLES JQS
- EAC
  (formerly GOST)

OUR CAPABILITIES

IN-HOUSE ENGINEERING AND R&D

Our design department comprises highly trained and experienced engineers who operate the most advanced engineering technologies and tools to ensure proper product performance since the earlier stages of design:
solid modeling
finite element analyses
fluid dynamic analyses
stress analyses

Research & Development resources are also dedicated to study, test and develop new products, materials and solutions in order to meet and exceed industry standards and Customer's needs.



MANUFACTURING

Our modern facility is equipped with the latest assembly and testing equipment to ensure complete control over the manufacturing process.

The strong technical hands-on experience of our shopfloor personnel ensures the state-of-the-art fabrication of reliable and durable valves.

HIT VALVE relies on a large network of qualified and reputable Italian suppliers for :

- *raw materials*
- *machining*
- *welding*
- *hard-facing*
- *painting*

All vendors are assessed and selected through an appropriate qualification process. Timeliness and quality of their deliveries are constantly monitored through expediting.

QUALITY CONTROL AND TESTING

Rigorous control over the whole manufacturing process is crucial in our business. At HIT VALVE we run a Quality Management System aimed at achieving zero defect performance.

Highly trained and certified technicians test and control 100 % of our production by using advanced equipment and instruments.

PRODUCT STANDARDS AND CUSTOMER SPECIFIC TESTS

STANDARD

- Stem Backseat Test
- Hydrostatic Shell Test
- Hydrostatic Seat Test
- Low Pressure Gas Test
- Cavity Relief Test
- Functional Test
- Anti-static Test

OPTIONAL

- Torque Test
- Endurance Test (cycling)
- Drift Tool Test
- Double Isolation and Bleed Test (DIB-1, DIB-2)
- DB&B Test
- High Pressure Gas Test
- Drive Train Strength Test
- Fugitive Emission Test
- Low Temperature/Cryogenic Test
- High Temperature Test
- TAT to MESC 77/300A
- Firesafe Test
- Hyperbaric Test
- Others

PRODUCT RANGE

SOLUTIONS DESIGNED TO SATISFY INDUSTRY DEMANDS

An **accurate and reliable control** is essential in the process industry to boost efficiency, guarantee safety of workers and protect the environment. Every application has its own requirements and poses challenges that must be faced.

HIT VALVE control valves meet these challenges with their solid design, based on an extensive campaign of **experimental tests** and numerical analyses, which allows to fulfill a **wide range** of **operating conditions**.

HC Series

The trim is the heart of a control valve. Its design defines valve performances in terms of capacity, flow characteristic, **rangeability**, noise and cavitation reduction.
Choosing the best trim for each application provides the optimal control in order to guarantee process efficiency. HC control ball valves can be configured with **seven different trim geometries**, which can be engineered to meet Customer's specific requirements.

HC-1	Full port
HC-2	V-port
HC-3	Mono stage
HC-4	Multi stage
HC-5	High performance stage
HC-6	Drilled ball
HC-7	Limiball

TECHNICAL SPECIFICATIONS

SIZE RANGES & PRESSURE RATINGS

	ASME 150 to 600	ASME 900	ASME 1500	ASME 2500
HC-1	2" to 60"	2" to 48"	2" to 36"	2" to 18"
HC-2	2" to 60"	2" to 48"	2" to 36"	2" to 18"
HC-3	2" to 60"	2" to 48"	2" to 36"	2" to 18"
HC-4	6" to 60"	6" to 48"	6" to 20"	6" to 18"
HC-5	6" to 60"	6" to 48"	6" to 36"	6" to 18"
HC-6	2" to 6"	2" to 6"	2" to 6"	2" to 6"
HC-7	2" to 24"	2" to 24"	2" to 20"	2" to 18"

Other sizes, reduced bore sizes and pressure classes are available upon request

TEMPERATURE RANGE

- Low temperature down to – 125°C
- High temperature + 400°C

In case of requirement for temperature ranges different from the ones here indicated, please contact your HIT VALVE sales rapresentative at sales@hitvalve.com.

MATERIAL SELECTION

Material selection is crucial to define the quality of the product and the suitability of the valve for a particular application. A variety of material combinations is available for any specified service conditions and order specifications. HIT VALVE uses only high-quality materials sourced from West European (mainly Italian) suppliers, inspected and tested to international standards.

BODY	BALL/SEATS	STEM	SEATING/SEALS	BOLTING
CARBON STEEL › A105 › WCB › LCC › LF2 › LF3 › F60/F65 STAINLESS STEEL › 316 › 321 › 347 › 6Mo DUPLEX SS SUPERDUPLEX SS NICKEL ALLOYS › Inconel › Monel TITANIUM	CARBON STEEL › A105 › LF2 › LF3 › F60/F65 STAINLESS STEEL › 316 › 321 › 347 › 13Cr › 13Cr4Ni › 17-4PH › 6Mo › Nitronic DUPLEX SS SUPERDUPLEX SS NICKEL ALLOYS › Inconel › Incoloy › Monel › Stellite TITANIUM OTHERS	CARBON STEEL › 4140 › LF3 › F60/F65 STAINLESS STEEL › 316 › 13Cr › 13Cr4Ni › 17-4PH › 6Mo › Nitronic DUPLEX SS SUPERDUPLEX SS NICKEL ALLOYS › Inconel › Monel TITANIUM OTHERS	SOFT SEATING › RPTFE › NYLON › PEEK › FKM › HNBR › FFKM › PCTFE METAL SEATING › TCC › ENP › CCC › Ni-SiC › Graphite	CARBON STEEL › B7/2H › L7/7 › B7M/2HM › L7M/7M › L43 STAINLESS STEEL › B8/8 › B8M/8M › 660 SUPERDUPLEX SS NICKEL ALLOYS › Inconel TITANIUM OTHERS

SEALING SELECTION

O-Rings	Lip-Seals	Metal/Graphoil Gasket & Stem Extension
-46°C /+200°C	-196°C /+220°C	Over +220°C

HC-1 *Full port*

Building on the extensive experience developed over the years with on-off valves, HC-1 offers all pro's of **trunnion mounted** ball valves (excellent structural strength, versatility of configuration, tight shut off) complemented with specific design features able to ensure **reliability** and **precision of flow control**.
Thanks to the full port trim configuration, HC-1 is suitable to control processes where very **high capacities** and low pressure drops are required.

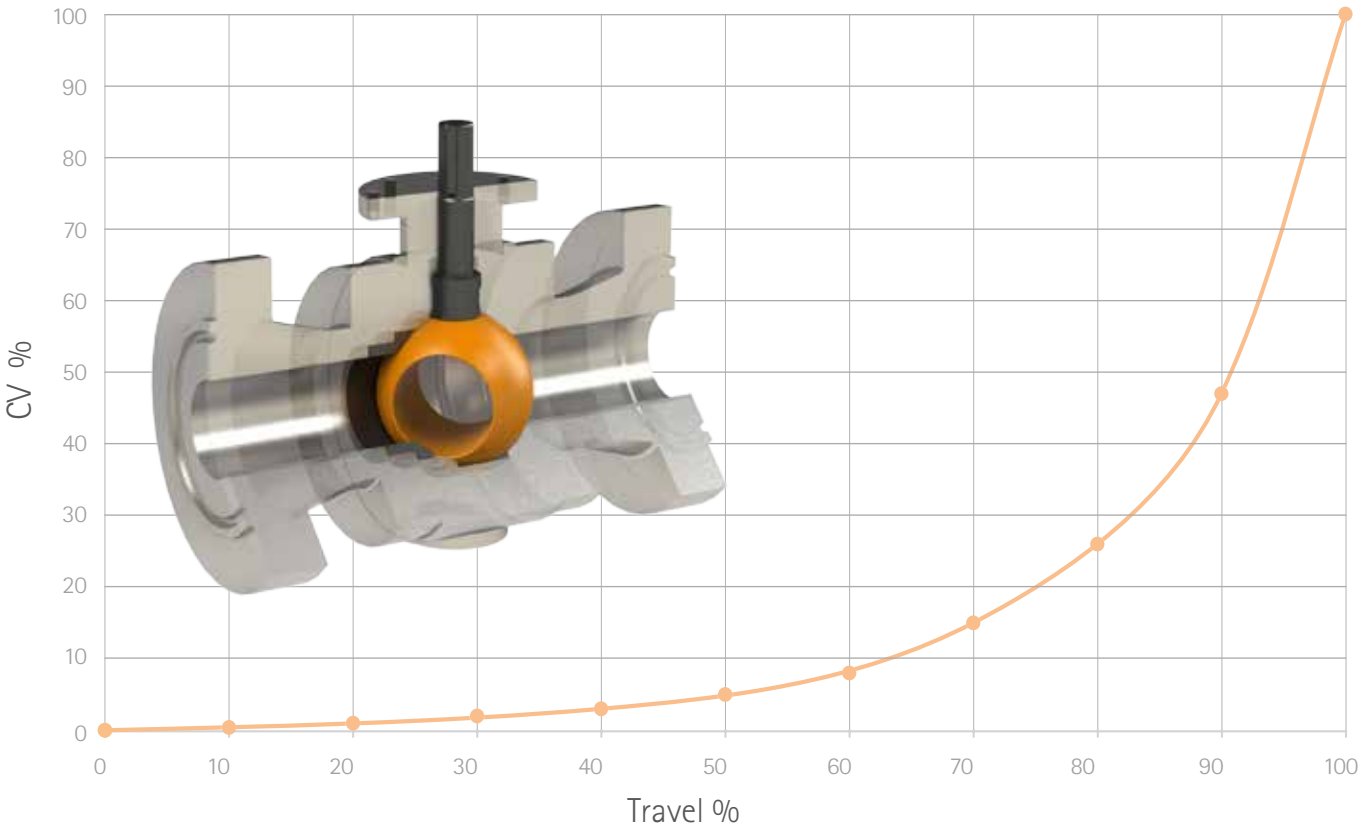
Hard coated internal wetted surfaces can withstand **dirty fluids** (with particles, slurries, slugs) without compromising the fluid-dynamics performances and its structural integrity.
The inherent characteristic curve is equal percentage.

Other HC-series product models are upgraded versions of HC-1: they encompass its standard construction features with enhanced characterized trim configurations aimed at improving performances in terms of anti-cavitation, noise reduction and control precision.

Coatings

HIT VALVE can offer engineered coating technologies based on application and specific operating conditions. Each solution is optimized to reduce erosion, corrosion, pitting, wear or friction.

- ENP (Electroless Nickel Plating)
- NiSiC (Nickel-SIlicon Carbide Plating)
- TCC (Tungsten Carbide Coating)
- CCC (Chromium Carbide Coating)
- Stellite weld overlay
- Kolsterizing



Rated CV [gpm]	2"	3"	4"	6"	8"	10"	12"	16"	20"	24"
Class 150 ÷ 600	490	1230	2160	5150	9420	15500	22700	38200	60540	87200
Class 900	490	1230	2160	5150	9420	15500	22700	35850	56620	81660
Class 1500	490	1230	2160	4740	8590	13940	20360	33400	52610	74930
Class 2500	360	860	1630	3920	7470	12130	17360	28570	44800	65120

Other sizes and pressure classes available upon request

BODY

HC series valves feature a side entry **split body geometry** in 2 or 3 pieces. The **trunnion mounted** design allows to transfer the pressure load from the trim directly on the valve body. In this way, stresses on the stem are minimized, service lifetime of the seals is extended, leakage towards environment prevented and torque requirements reduced.

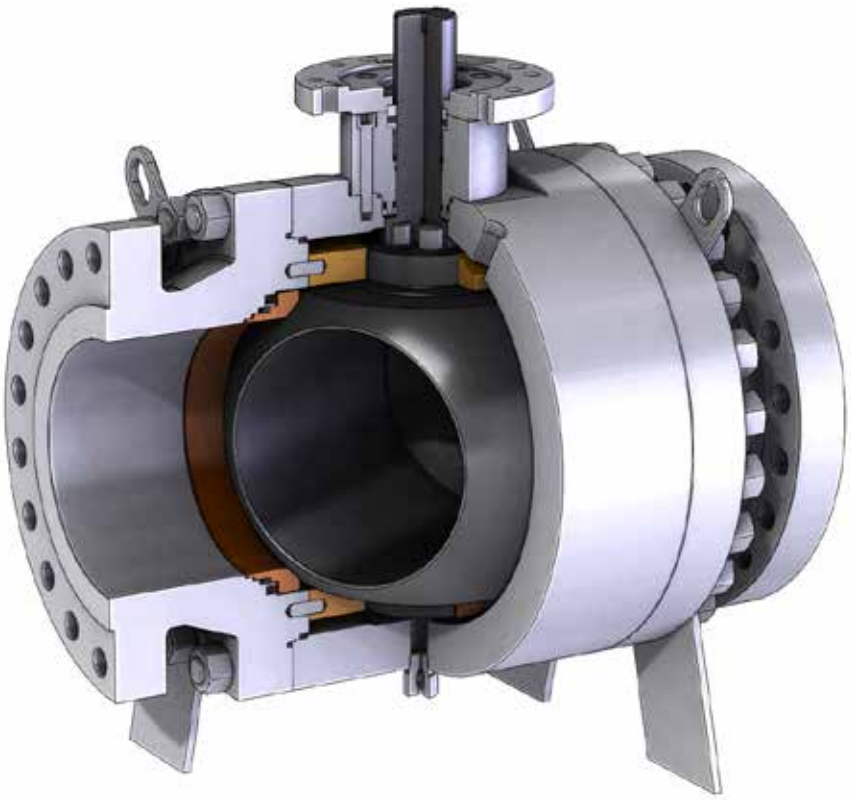
The body internal geometry is engineered to **minimize** the **secondary flow-streams** improving the fluid dynamic performances and minimizing erosion.

DRIVE TRAIN

In order to guarantee the required precision in control action, the connection between stem and ball is obtained by **dowel pins** to minimize backlashes and hysteresis.

Accurate material selection and thorough design allow the drive train to withstand the most severe operating conditions when dynamic torques, induced by flow passing through the valve, can be very high.

A stem **anti blow-out design** prevents accidental ejection.



SEATING & TIGHTNESS

Different seat configurations are available. As a standard, valves are provided with a **single upstream seat** (uni-directional shut-off).

Metal to metal sealing is recommended to minimize wear and erosion of inlet flow. IEC 60534-4 tightness class V can be achieved.

Polymeric soft seats fit for non critical processes with **IEC 60534-4 tightness class VI.**

STEM PACKING

To ensure better fugitive emission performances and an increased service life, HC series valves are provided with a **rPTFE redundant barrier** energized with Elgiloy springs (V-pack). This solution is suitable for the most different process fluids, as well as for a wide range temperatures and pressures.

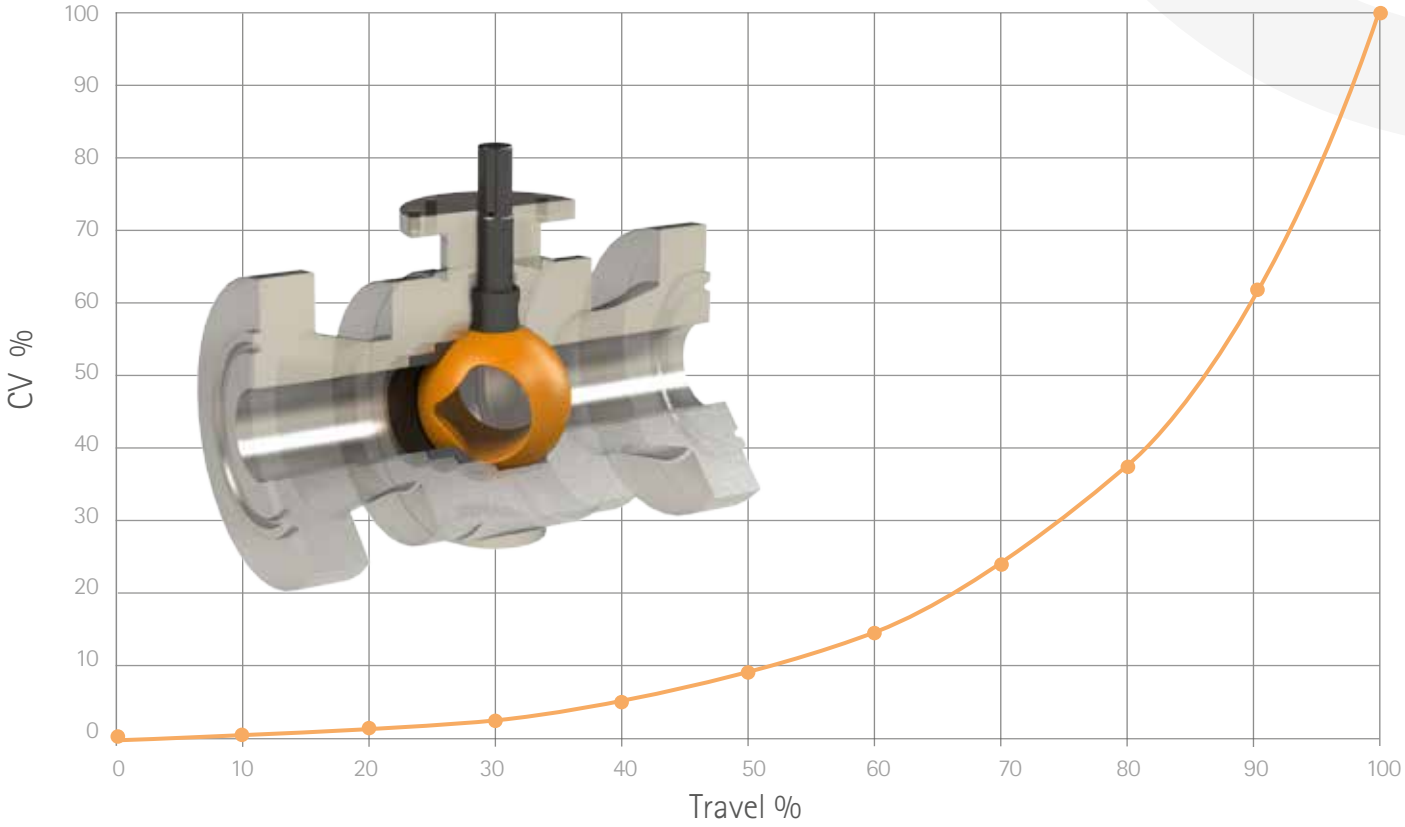
Alternative solutions are adjustable polymeric packing, with live-load (Chevron type), recommended for high cycling processes, or adjustable graphite packing for high temperatures.

Grease injection fitting may also be available upon request.

HC-2 V-port

HC-2 is used for non critical processes whenever small flow rates need to be controlled. The characterized frontal stage chokes flow capacity at small openings, thus achieving a smoother growth of the CV.

This way the required opening position can be reached with a **better precision**. The rated capacity, compared to HC-1, is reduced up to 30 %.



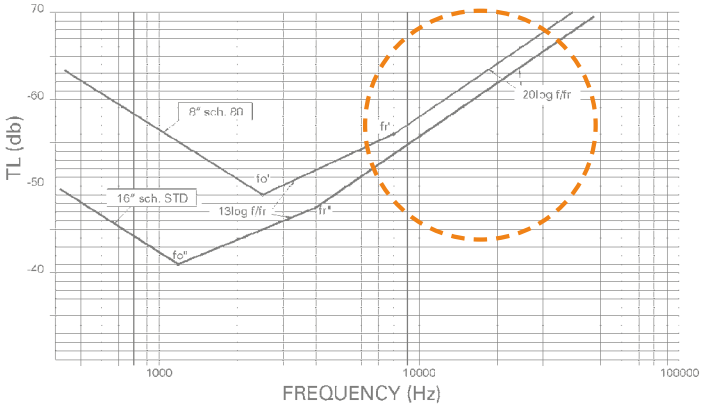
HC-3 Mono stage

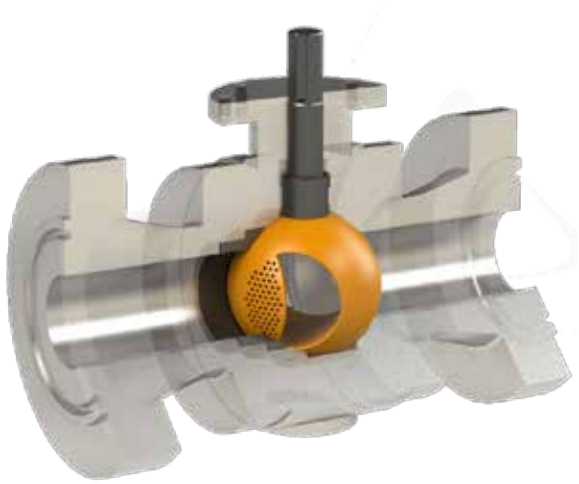
HC-3 mono stage **multi path** valve is recommended everytime an **accurate control** is required together with not so severe anti-noise/anti-cavitation requirements.

The size of the stage and the drilling map are optimized to process conditions. Extensive CFD analyses are performed to identify the best customized solution.

Multi path

- increased recovery factor **FL**
- **higher transmission loss** due to the flow division that shift sound power peak frequency to higher values



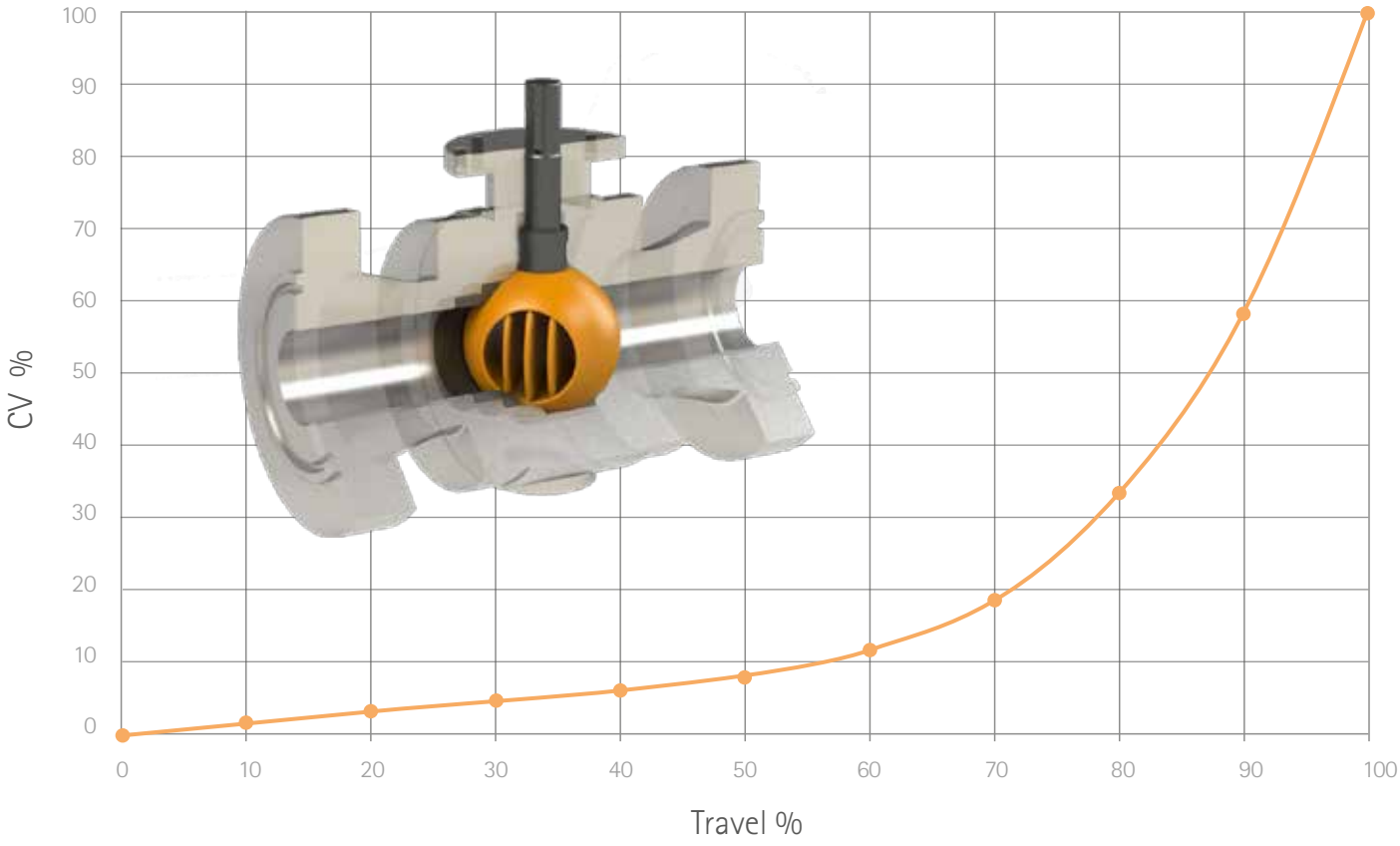


HC-4 Multi stage

HC-4 is recommended for all those applications characterized by higher pressure drop and large flow rate.
This solution combines **multi stage** with **multi path** technologies.
At intermediate opening positions the pressure drop is split into several stages and the flow into smaller streams by perforated plates.
The **risk of cavitation** with liquid is **limited** and the **aerodynamic** noise in presence of gas flow is **reduced**.
When the valve is fully open, the plates are aligned with the pipe axis to minimize pressure loss and achieve high capacity and **rangeability**.
A unique feature of HC-4 is the **self-cleaning** effect that avoids clogging of the flow paths in presence of fluids with suspended solid particles.

Multi stage - Multi path

- **higher** recovery factor **FL** due to pressure drop split
- **lower acoustic efficiency** (lower portion of stream power converted into sound power) due to the increased recovery factor
- **higher transmission loss** due to higher sound power peak frequency



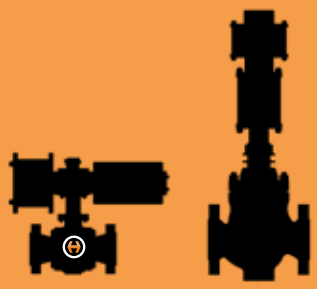
Rated CV [gpm]	6"	8"	10"	12"	14"	16"	18"	20"	24"
Class 150÷600	1130	2010	3300	5000	6450	8900	10570	13750	19580
Class 900	1130	2010	3300	5000	5990	8350	9940	12860	18330
Class 1500	1040	1830	2960	4480	5730	7780	9160	11950	16820
Class 2500	860	1590	2580	3820	4930	6650	7770	10170	14620

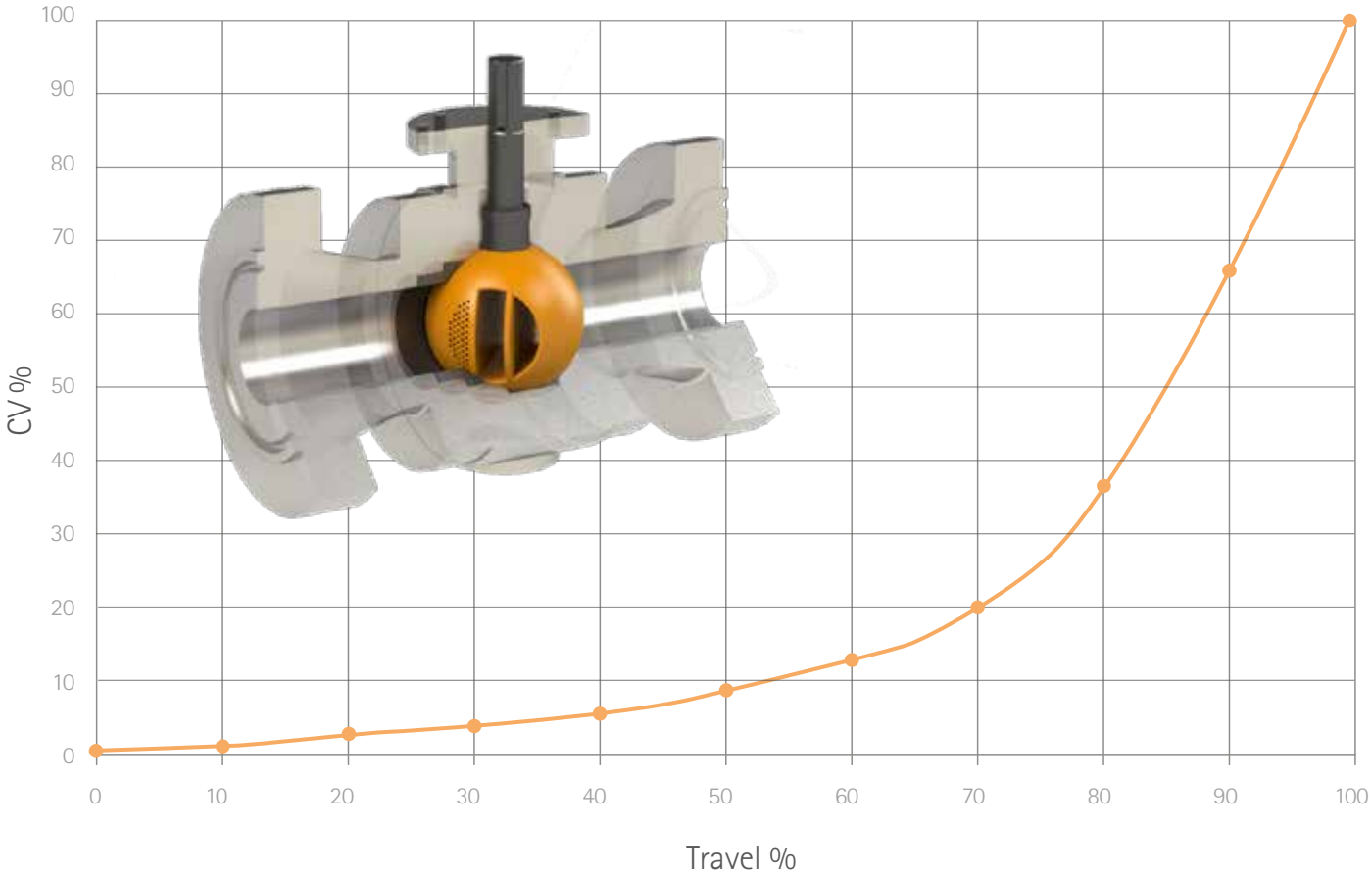
HC-5 High performance stage

HC-5 is an enhanced multi-stage trim, designed to achieve an **accurate control at small openings**, where it can manage high pressure drop with small flow rate thanks to the additional frontal stage.
The maximum capacity, compared to HC-4, is only partially decreased so HC-5 provides a **higher rangeability** maintaining optimal performances in a wider range of openings.
Aerodynamic noise reduction is heightened by an accurate velocity control obtained through a **calibrated expansion factor**, which can be increased thanks to an enlarged port at ball outlet. The frontal grid is properly hardened to prevent damage caused by wear.

Higher rangeability

- valve is effective over a **wide range of working conditions**
- smaller dimension of valve and actuator, **cost saving**
- extra capacity for additional noise attenuation devices





Rated CV [gpm]	6"	8"	10"	12"	14"	16"	18"	20"	24"
Class 150÷600	750	1300	2200	3100	4300	5900	7400	9600	13700
Class 900	750	1300	2200	2700	4000	5600	6960	8970	12850
Class 1500	700	1200	2000	2700	3800	5100	6400	8350	11750
Class 2500	600	1000	1700	2300	3300	4400	5400	7100	10200

HC-6 Drilled ball

HC-6 trim design is unique because of its **robust construction** that maintains the seat always in contact with the ball. Thanks to this feature, the vibrations between the pressure controlling members are limited, ensuring tightness performance even after frequent crack opening strokes.

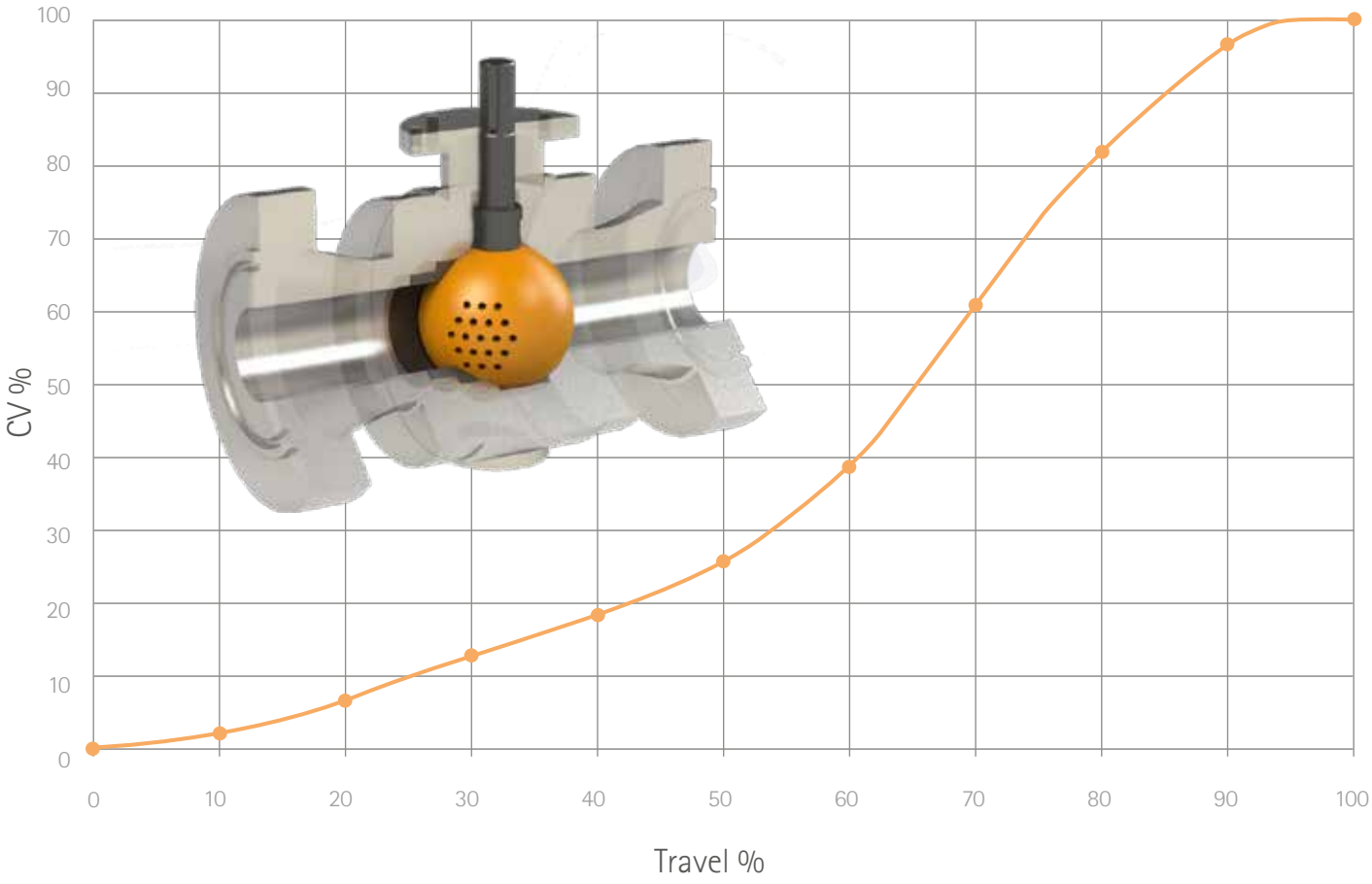
At intermediate positions the flow is forced to pass through a **tortuous path** designed to dissipate energy. When the valve is fully open, the main channels are aligned to the mean flow increasing as much as possible the capacity and the **rangeability**.

Thanks to the **optimal anti-cavitation performances**, ensured from very small to intermediate openings, HC-6 is particularly suitable for pressure equalizing processes and blow-down. The **symmetric path** fits bi-directional flow applications but in case the fluid is gas, the valve can deal only with intermediate pressure ratios.

Optimized Path

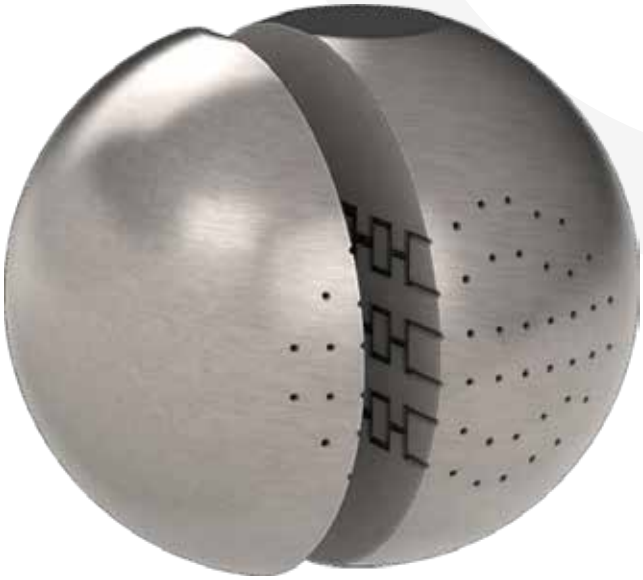
higher recovery factor FL from the first opening positions to the 60 % of the full opening.

CONTOUR OF FLUID PRESSURE



Rated CV [gpm]	2"	3"	4"	6"
Class 150 ÷ 2500	30	94	178	382
Class 2500	30	60	131	279

HC-7 Limiball



HC-7 is our top-of-the-range control ball valve which embodies our registered Limiball technology trim.

Its advanced features enhance and exalt the superior flow-stream control and high flexibility benefits of traditional control ball valves thus allowing Limiball to be the best solution for very severe regulating services.

HC-7 is the result of HIT VALVE continuous product development and is backed up by extensive numerical analyses and experimental test carried out in-house and at external laboratories.

Flow-stream control

The flow is split into several streams and forced into a set of **labyrinths** that dissipate energy in a controlled manner.
Very high pressure drops can be managed with both liquid and gas flows. Cavitation is avoided by a customized stages layout that **controls the velocity** in the vena contracta and increases the recovery factor up to **FL = 0.999**.
With gas the aerodynamic noise is reduced to that produced by the same flow inside the pipe and possible erosion is prevented by an optimized **passageway growth along the labyrinth.**
The robust construction together with an accurate material and coating selection preserve the trim from wear and increase the valve service lifetime.

Flexibility

The trim construction can be customized by varying the number of openings and stages, the expansion factor and the percentage of the filled bore.
Such highly engineered design allows the valve to suit severe specific requirements in terms of:

- flow capacity characterization
- rangeability
- modulating precision
- fluid dynamics performances

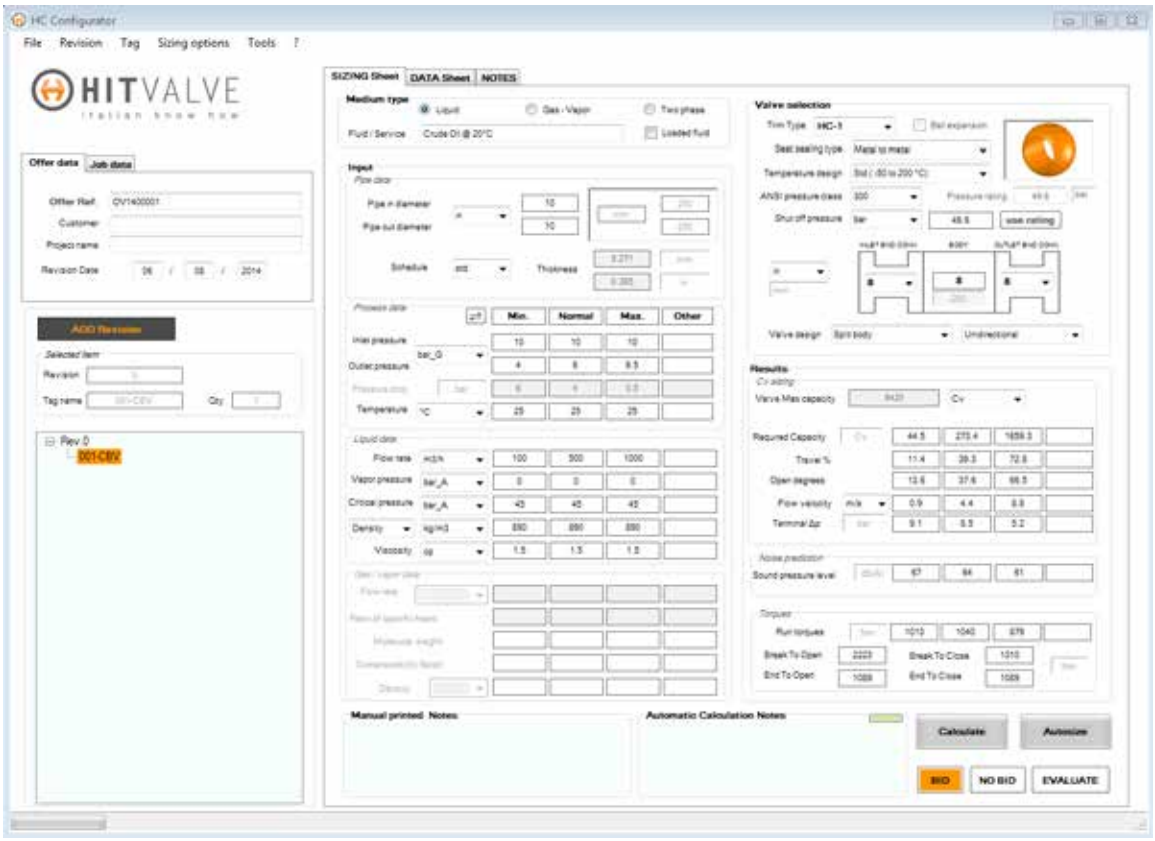
All these choices are finalized by combining dedicated CFD analyses with the extensive experience developed at our Engineering Department.

VELOCITY AND PRESSURE PROFILE ACROSS A TRIM LABYRINTH

FRONTAL VIEW OF HC-7 BALL TRIM

VALVE SIZING

Valve sizing selection is performed through an in-house software program developed on the basis of IEC 60534 standard.
Required capacity, valve opening, sound pressure level and dynamic torques are calculated. All key factors involved in the sizing process come from extensive experimental campaigns combined with CFD analyses and analytical calculations.
Thanks to the program's user friendly interface and to the auto-size function, it is possible to select the valve that better fits the given process conditions very quickly . Valve configuration (design, material and sealings) is also completed by the same software.



MAIN PERFORMANCES COMPARISON

	HC-1	HC-2	HC-3	HC-4	HC-5	HC-6
Rated capacity	••••	•••	••	•••	••	••
Rangeability	•	••	•••	•••	••••	••
Anti-Cavitation	no	no	•	•••	•••	••
Noise reduction	no	no	•	••	•••	••
Compability with dirty fluids	••••	••••	••	•••	••	••

•••• Very high, ••• High, •• Intermediate, • Low

ACTUATION

Actuator and positioner are as fundamental as the valve in defining control performances, so HIT VALVE pays great attention in their selection. Internal tests, combined with a close collaboration with main actuator suppliers, are the bases to identify the most suitable technical solution.

Pneumatic, **electric** and **hydraulic** actuators can be provided according to Customer requirements.

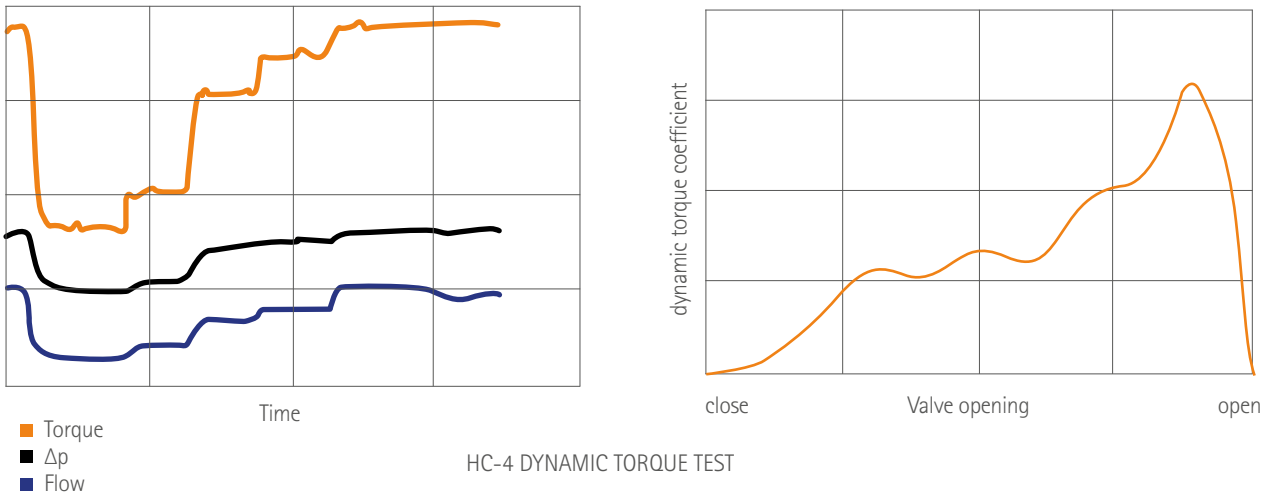
Actuator selection is focused on:

- accurate torques prediction (static and dynamic) to **optimize performances and costs**;
- actuator output torque curve (pneumatic, hydraulic models) to **fit the valve torque requirements**;
- engineering the most effective valve-actuator integration to **minimize hysteresis and dead band**;
- positioner to **ensure** adequate **precision**;
- instrumentation and accessories to **optimize dynamic response** and to provide the required fail action.

DYNAMIC TORQUE PREDICTION

A reliable actuator's choice depends on torques prediction and for a control ball valve dynamic torques play a key role. Dynamic torques are created by the asymmetrical pressure distribution on the obturator at intermediate opening positions. Each trim geometry is characterized by a different dynamic torque coefficient curve, which identifies the required torque at various positions.

All HC-series valves have been **tested for dynamic torques** and CFD analyses are performed on each geometry.

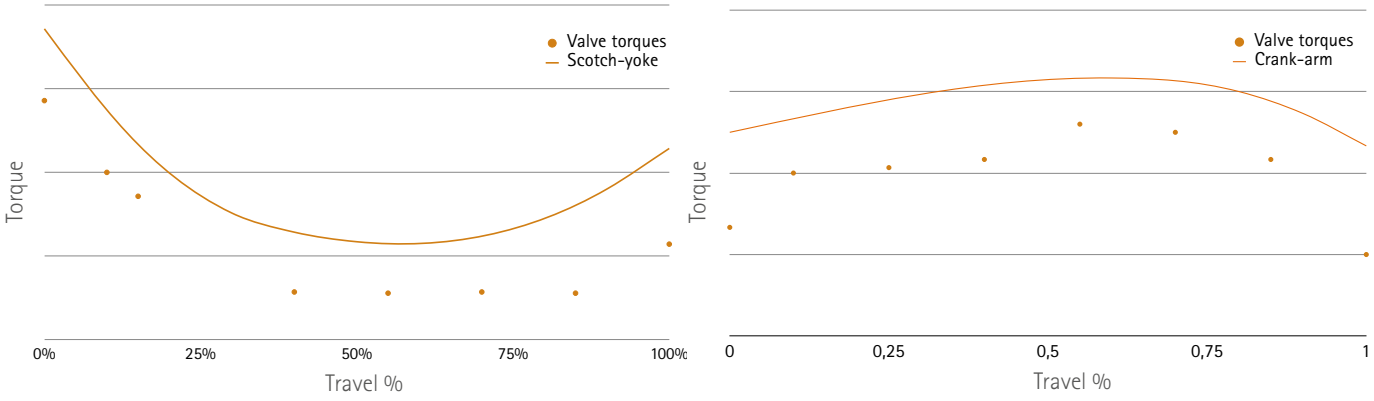


HC-4 DYNAMIC TORQUE TEST

ACTUATOR TORQUE CURVE

A good match between actuator and valve torques is essential for optimal control and cost saving. For pneumatic and hydraulic actuators HIT VALVE can provide both **scotch-yoke** and **crank-arm** mechanisms. The scotch-yoke is suggested whenever static torques prevail on dynamics or for all those applications where higher pressure drops occur only at small opening positions.

The crank-arm ensures more precision and higher torques at intermediate openings, so it is the best solution every time high pressure drops must be controlled at higher valve openings.

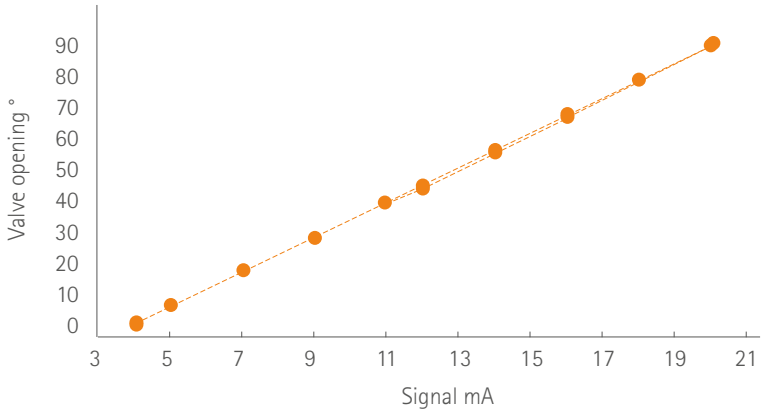


SCOTCH-YOKE VS CRANK-ARM TORQUE CURVES

VALVE – ACTUATOR CONNECTION

As well as for stem-ball connection, designed with dowel pins to avoid backlash, also the connection between valve and actuator is engineered to increase precision in control.

Suggested coupling is with **multiple keyways**. Whenever more precision, higher torques or frequent cycling are required, a **splined driveshaft** is used.



Hysteresis + dead band of HC-4 valve, 6" Class 600, with pneumatic spring return actuator and digital-smart postioner. Max value lower than 0.1.

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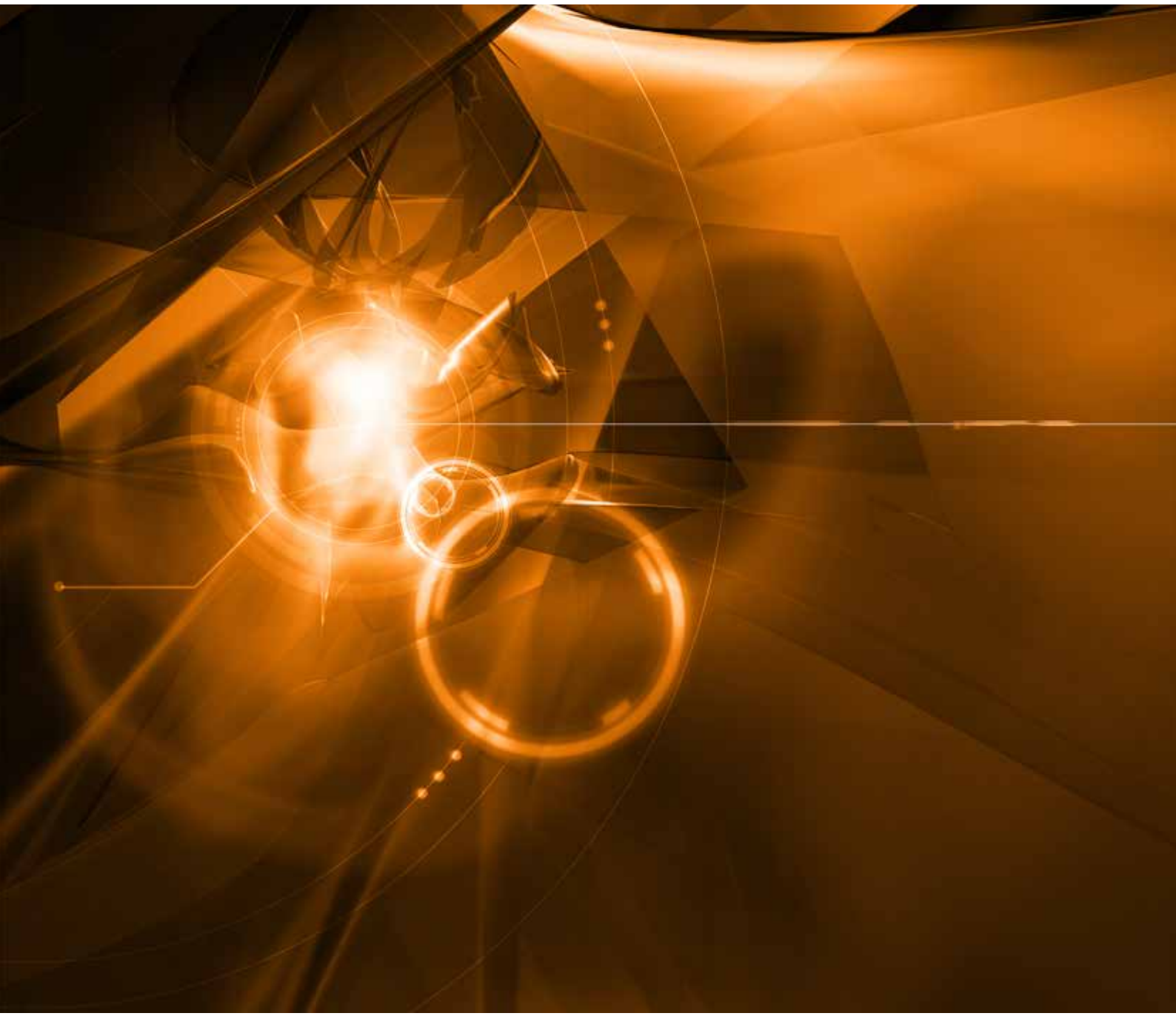

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