



FLOW CONTROL BALL VALVES



DAFRAM flow control ball valves

A complete ball valve range to cover all flow control applications and critical services



COMPANY PROFILE

DAFRAM S.p.A., founded in 1956, was the first company to manufacture floating ball valves in Italy. The long experience gathered during more than 60 years of activity ensures that DAFRAM is one of the most famous and competitive ball valve companies in the world.

DAFRAM's factory is located in Urbisaglia (Macerata), in the centre of Italy, on an industrial complex covering 32000 square meters, 12000 of which are covered workshops. The factory consists of commercial, technical and engineering offices and of two extremely modern workshops. The latest one, completed in February 2008, has a floor space of 4200 square meters and 10 meters high. These extensive facilities provide production, assembling, testing, painting and welding of ball valves up to large sizes and weights under one roof.

DAFRAM adopted the "lean" methodology for all our in-house processes to eliminate all the activities that are non value added by identifying waste in all its forms. The widespread use of visual management allows fast and effective control of the transactional and manufacturing processes from project to production scheduling and from technical development to the management phase of

the order. Each process has been defined in terms of the DAFRAM standard and is measured regularly. The main benefit realised is the speed of reaction time the company is able to achieve every time one of these processes deviates from the standard conditions. The current value stream organization has made possible a reduction of non value added processes and therefore a reduced lead time to the market.

In today's competitive market, Dafram is an excellent example of how to integrate the principles of continuous improvement through an extensive and widespread application of lean principles at all levels.



PRODUCTS and SERVICE

The control valves range consists exclusively of top quality trunnion mounted ball valves for high performance and critical applications with special configurations, size ¼" to 36", 150 lbs to 4500 lbs, PN10 to PN450, 2000 psi to 15000 psi, side entry, top-entry, full and reduced bore, in Carbon Steel, Stainless Steel, Nickel and exotic alloys, for the following services:

- ABRASIVE FLOWS
- HIGH TEMPERATURE
- CRYOGENIC (special STEM EXTENSION)
- LOW EMISSION ball valves, TA-LUFT certified and HELIUM tested to VACUUM, FLUSHING and SNIFFING methods
- AGGRESSIVE CHEMICAL SERVICE and FIRE SAFE executions



MAIN FEATURES

Due to a very large flow passage Dafram control ball valves can grant high flow coefficients compared to other valve types. Thanks to their operating principle, quarter-turn ball valves are able to control fluid flow at very small openings and to open at high differential pressure. They are also able to maintain low fluid velocity thus lower noise and vibration to the pipeline. In addition, control ball valves allow tight and fast shut-off in case of emergency.

Dafram control ball valves assure excellent flow characteristic and provide accurate, reliable control in a wide range of applications, such as chemical, power and oil, both on gas and liquid service.


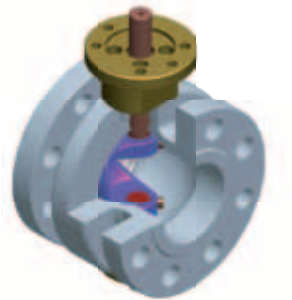

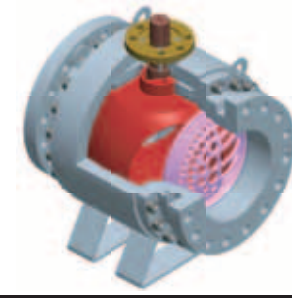

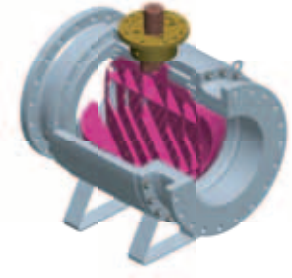
MAIN STANDARD FEATURES

<ul style="list-style-type: none">• High capacity (C_v)	The unrestricted flow passage in fully open position provides high C_v combined with relatively small overall dimensions and light weight compared to the same size globe valves: a given size ball valve can grant a C_v coefficient even three times greater than a same size globe valve. This ensures a smaller and lighter valve, a smaller and lighter actuator, smaller pipeline supports and overall a money-saving application compared to standard linear valve solutions.
<ul style="list-style-type: none">• High rangeability	High rangeability, characterization and precise modulation are granted thanks to trim special design. The DAFRAM valves inherent rangeability is kept between the acceptance limits stated in IEC 60534 specification by means of CFD calculation and lab testing based on customers specification and flow conditions.
<ul style="list-style-type: none">• Tight shut-off	When required, tight shut-off is obtained thanks to the well experienced on-off design (spring-loaded, pressure assisted floating seats with trunnion mounted ball) against any differential pressures, from very low to extremely high levels. Outstanding tightness capability is granted also when metal seats are required. For trunnion mounted valves the double block and bleed features is a DAFRAM standard, allowing cavity draining and basic maintenance operations. On request seats double sealing configuration is available.
<ul style="list-style-type: none">• Special design for sensitive control	Spring loaded seats design assures scraping action and continuous contact between seat and ball: dirty fluids do not stick and jam on the ball surface. Trunnion construction and special low-friction bearings assure low operating torque. So a smooth fluid control is assured for the whole valve service life.
<ul style="list-style-type: none">• Compact design	Body construction, special design for stem and actuator connections eliminate free-play (backlash) and assure great resistance even against piping forces.
<ul style="list-style-type: none">• Low emission stem packing	Special design of stem sealing assures low emission performance to meet Fugitive Emission and "TA-Luft" requirements. Advanced solution have also been developed when very low emission levels are required (i.e. ISO 15848 rate A)
<ul style="list-style-type: none">• Fast operating time	Quarter turn design allows to use fast actuating devices which can perform emergency operation in a few second to improve the safety of the plant.
<ul style="list-style-type: none">• Fire-safe design	Dafram control ball valves can be supplied with API6FA, API 607 and BS 6755 part 2. Fire safe test certificates are available on request.

OPTIONAL FEATURES

<ul style="list-style-type: none">• Adjustable stem packing	In order to improve the life time of stem sealings Dafram can provide adjustable packing to meet the most stringent requirements during the whole valve service time. Stem packings are available in PTFE, RPTFE and expanded graphite.
<ul style="list-style-type: none">• Customized seal arrangements	Dafram can provide different sealing systems both for static and dynamic application according to customer's specifications.
<ul style="list-style-type: none">• Grease injection fittings	If necessary ball, seats and stem sealing can be equipped with grease injections systems to reach the maximum service life. The same system may be used for emergency sealant injection to restore proper tightness and avoid emissions to the environment if damage occurs on the sealing surfaces.

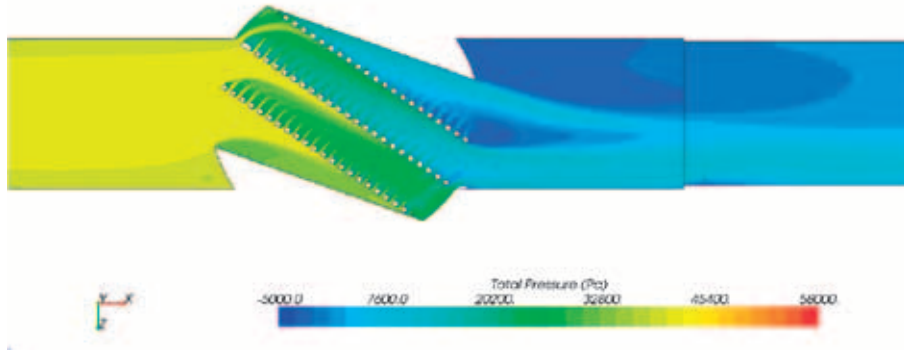
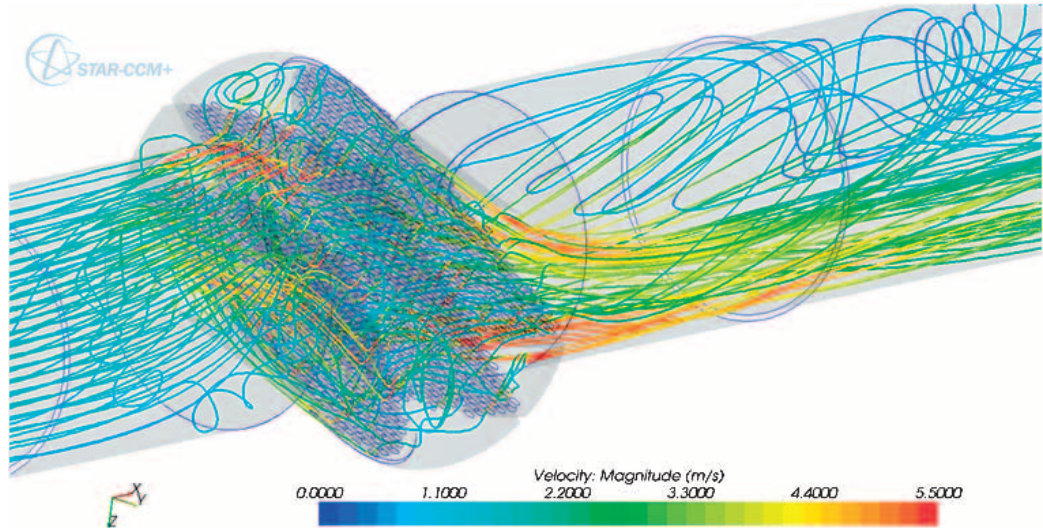
MODELS OVERVIEW

		MODEL	DESIGN	SIZES	RATINGS	APPLICATION & DESIGN
LIGHT SERVICE	Reduced Flow Ball (RFB)		Trunnion mounted, reduced bore	Up to 48"	ANSI 150 to 4500 API 2000 to 15000	<ul style="list-style-type: none">• Basic control capability• Tight shut-off• Suitable for low differential pressures
	Hemisphere-molded Ball (HMB)		Segmented ball, trunnion mounted	Up to 20"	ANSI 150 to 2500 API 2000 to 10000	<ul style="list-style-type: none">• Light control capability• Tight shut-off• Suitable for low differential pressures• Unidirectional
MEDIUM SERVICE	V-Shaper Ball (VSB)		V-port seat, trunnion mounted	Up to 48"	ANSI 150 to 4500 API 2000 to 15000	<ul style="list-style-type: none">• Good control capability (V shape designed to meet process conditions)• Tight shut-off• Fair cavitation resistance• Unidirectional
	Disk Controller Ball (DCB)		Trunnion mounted with drilled disk	Up to 48"	ANSI 150 to 4500 API 2000 to 15000	<ul style="list-style-type: none">• Good control capability (Drilled disk designed to meet process conditions)• Tight shut-off• Moderate cavitation resistance• Light noise reduction• Unidirectional• Vibration control• Suitable for gas application
SEVERE SERVICE	Stream Tuner Ball (STB)		Multistage ball, trunnion mounted	Up to 48"	ANSI 150 to 2500 API 2000 to 15000	<ul style="list-style-type: none">• Multistage ball (stage number, hole configuration and general trim design are chosen to meet process conditions; the design is carried out by means of CFD analysis and validated by laboratory measurement)• Tight shut-off• Good control capability• Vibration control• Good cavitation resistance• High differential pressure for gas service• Noise reduction
	Noiseless Ball (NLB)		Special multistage ball, trunnion mounted	Up to 48"	ANSI 150 to 2500 API 2000 to 10000	<ul style="list-style-type: none">• Multistage ball (stage number, hole configuration and general trim design are chosen to meet process conditions; the design is carried out by means of CFD analysis and validated by laboratory measurement)• Tight shut-off• Good control capability• Vibration control• Excellent cavitation resistance• High differential pressure for gas service• Noise reduction

MULTI-STAGE BALL VALVES

DAFRAM multi-stage ball valves are equipped with an internal cage that splits the pressure drop into several stages. Each stage is made up of a drilled plate placed in the ball hole. The number and configuration of internal stages are defined to meet the working conditions specified by the customer, in order to ensure the best flow control capability.

Multi-stage ball valves are designed to operate against high pressure drops providing excellent control capability and noise attenuation during a long service life. Furthermore, thanks to DAFRAM proven experience, tight shut-off and zero external leakage are a fixed point.



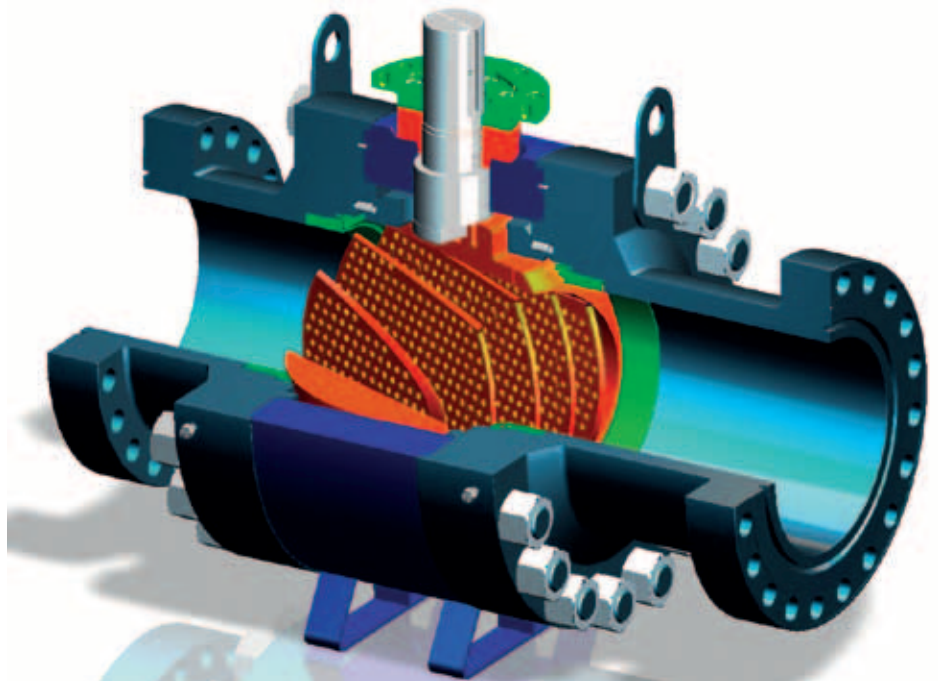
Compared to a standard ball valve, which is actually a two-stage valve, the multi-stage solutions ensures a very low pressure recovery factor, hence reducing flow velocity, ice formation and the risk of cavitation. The pressure energy is smoothly dissipated through the stages.

TECHNICAL DATA

- Design standards: DAFRAM control ball valves are in compliance with IEC 60534; other international standards or customer specifications are available on request.
- Materials: it is possible to choose over a wide range of materials to meet the process conditions.
- Hard facing: to ensure a long service life many different coatings are available to prevent ball and seats from damage due to erosive flow and continuous operation.
- Actuating: customer can choose between pneumatic (double acting or spring return), electric or hydraulic actuators; main actuators manufacturers are in collaboration with DAFRAM to ensure the best service.
- Positioning: many manufacturers can provide pneumatic & digital positioners to meet customers request.

MAIN ADVANTAGES

- Less expensive than a same Cv globe valve: for a given Cv a rotary valve is much smaller than a globe valve, thus ensuring less weight, smaller actuators and piping stress minimization.
- Cavitation control: dividing the pressure drop into several stages reduces the pressure recovery factor, so the vena contracta pressure is maintained over the vapour pressure limit.
- Noise control: a low recovery factor reduces also the maximum speed inside the valve, ensuring a lower sound pressure level and vibration reduction related to the stages configuration.
- High flow coefficient: in the fully open position the plates offer a minimum resistance to the flow so the Cv is very high compared to other control valve types.
- Bi-directional valve and symmetric trim: the valve design allows to control flow in both directions; moreover, the ball is symmetric so there are no limitations for plant installation.

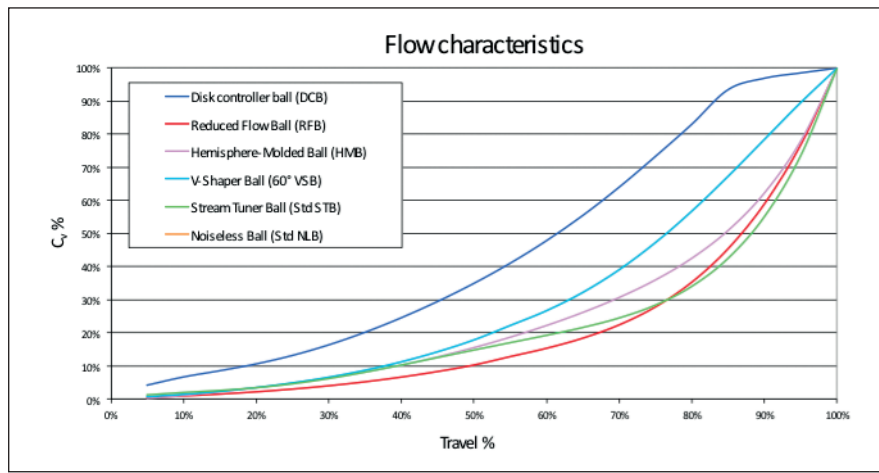
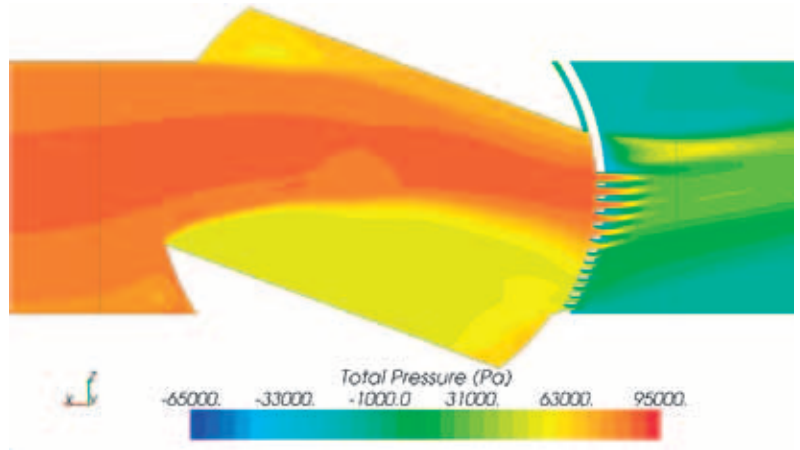


CFD ANALYSIS, FLOW CALCULATION & TESTING FACILITIES

Both design and testing are performed by Dafram qualified engineers using dedicated software and hardware tools. Finite Element Analysis and Computational Fluid Dynamics for both structural and fluid dynamic design validation. Advanced calculation software and hardware allow to predict the valves flow characteristics in terms of pressure drop, flow velocity and risk of cavitation.

CFD analysis is the primary instrument for the design optimization: pressure and velocity fields are clearly defined at every opening angle, allowing cavitation and noise level numerical prediction.

Once known the working conditions, the single valve can be designed to perfectly meet the plant requests.



DAFRAM developed a proprietary calculation software for valve sizing and valve behaviour prediction; this special tool is based on DAFRAM CFD calculation data and on the mathematical model validation obtained through intensive bench testing sessions that allowed a refined setting of the virtual model for each trim configuration.

DAFRAM calculation software is the primary instrument for sales dept. engineers to evaluate a preliminary solution before the fine tuning activity carried out during engineering phase.

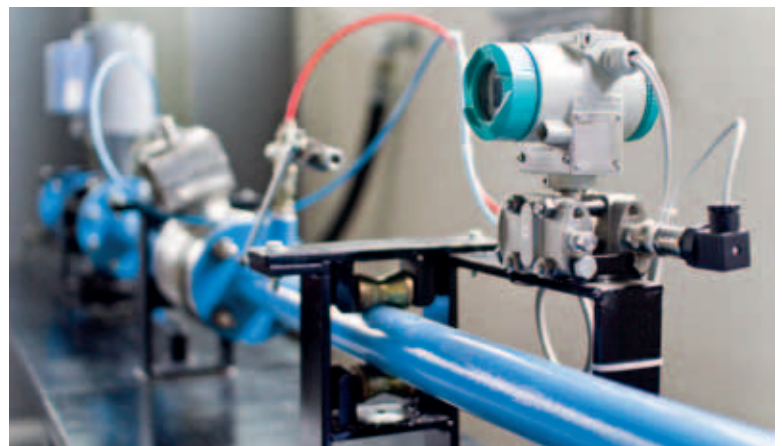
Cavitation/Flashing	-		Cavitation	no	no
Cv calculation					
Flow Conditions	-		Normal Flow	Normal Flow	Normal Flow
Calculated flow coefficient	[gpm]	$C_{v,c}$	13,44	51,18	129,25
CV CALCULATION					
CV Calculated	[gpm]	$C_{v,c}$	13,44	51,18	129,25
Cv Selected	[gpm]	$C_{v,s}$	165,00	165,00	165,00
Body size	[inch]	DN	2"	2"	2"
Seat Size	[mm]	D_s	54	54	54
Oversizing %	%	$C_{v,c}\%$	8,1%	31,0%	78,3%
Valve flow characteristic	-	Chr	Equal%	Equal%	Equal%
Valve position (angle)	[°]		23,9	49,9	79,8



In order to better set the mathematical model, DAFRAM, in collaboration with 3P Engineering, has provided advanced testing equipment to test valve prototypes. A completely dedicated testing facility allows experimental characterization of control valves.

A first bench was specifically designed to work with water, therefore the valve C_v can be measured as per main international standards (i.e. IEC 60534). Moreover on the water bench valves are tested to set CFD parameters useful to predict the risk of cavitation in operation at every opening angle and working condition.

A second bench was developed to test valves with a gaseous flow in order to evaluate sound pressure level generated in operation.

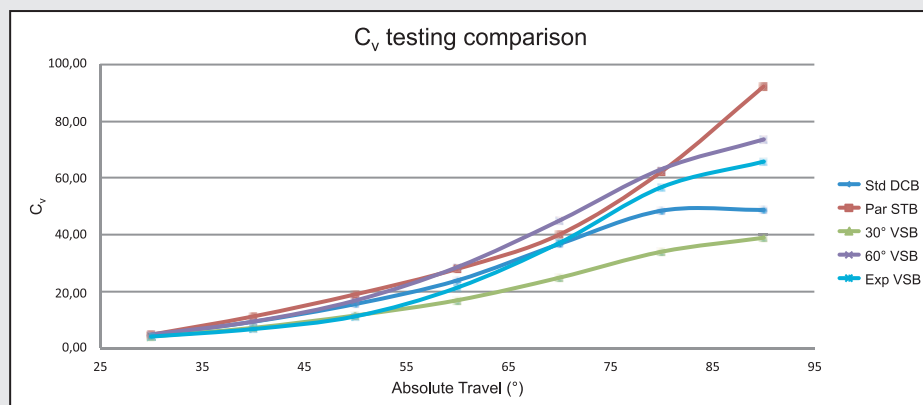




FLOW COEFFICIENT EVALUATION

High quality measurement equipment allows DAFRAM to collect reliable test data, providing us with a predictable behaviour of the valve in every working condition. Upon the receipt of the customers' specification in terms of fluid characteristic, flow temperatures, pressure levels and mass flow rates, DAFRAM can develop a control valve that perfectly matches the process configuration.

Both sets of information allow DAFRAM to complete a design validation profile for the control valves with an extremely accurate relationship between the test data and calculations.



WORKSHOP

DAFRAM S.p.A. is a specialized manufacturer of high quality ball valves for Chemical, Petrochemical, Oil&Gas, Power Generation, and for ON-OFF and PRESSURE & FLOW CONTROL applications.



As a consequence of continuous product development, DAFRAM's workshop has constantly being upgraded. It utilizes the most advanced manufacturing technologies in valve components machining and testing.

In addition to our methodology (design verification process) designed to evaluate the valves control capabilities, DAFRAM's vertical and horizontal testing machines allow our production valves to be 100% tested, controlled and certified before leaving our plant.

Standard control testing is performed according to IEC 60534. ON-OFF testing meets the requirements of BS 6755, API 6D, API 6DSS, API 6A and API 598. Other testing specifications or procedures can be followed upon customer request.



DAFRAM quality control assures the most reliable control valves: a rigorous series of checks is carried out during the whole design and manufacturing process, from customers' specifications to final drawings, from raw materials to completion of the machining processes.

DAFRAM design and production processes are covered by the following certificates:

- API 6D, license N. 0265
- API 6DSS, license N. 0029
- API 6A, license N. 1175
- PED 97/23/EC by Bureau Veritas, cert. N. CE-PED-H-DAF001-01-ITA
- TRD 100 / HP 0 by TÜV, cert. N. 112309
- TA-Luft by TÜV, cert. N. 922-960157
- DIRECTIVE 94/9/EC (ATEX)
- SIL3 for functional safety



DAFRAM quality system is covered by the following certificates:

- ISO 9001:2000 by RINA, cert. N. 4/89
- ISO 14001:2004
- BS0H-SAS18001:2007
- API spec. Q1

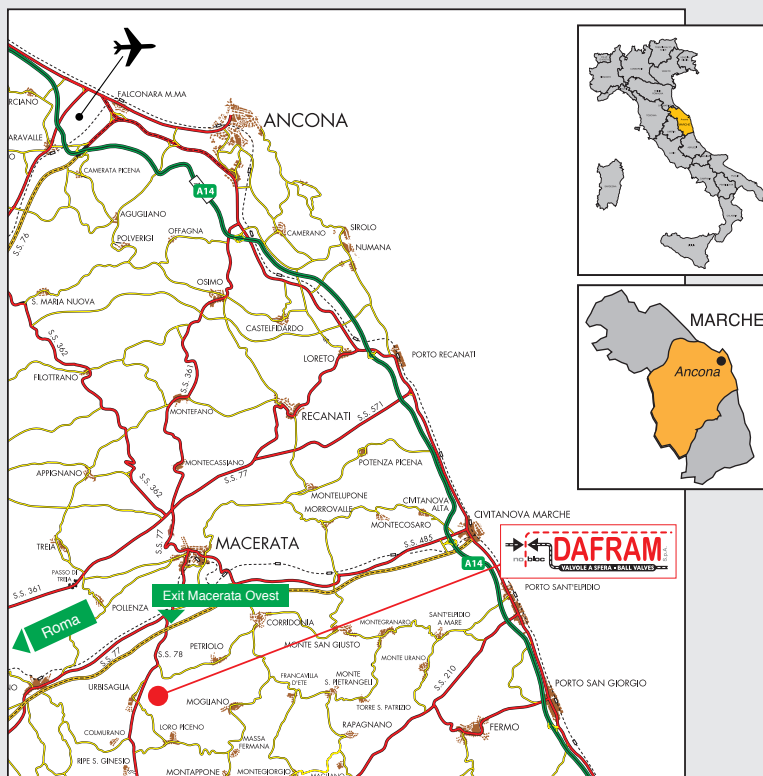
DAFRAM valves are tested according to:

- API 6D, API 6DSS, API 598, API 6A
- BS 6755 part I
- EN 12266-1
- IEC 60534

and Fire Safe tested and certified according to:

- API 607 5th Edition, API 6FA
- BS 6755 Part 2
- ISO 10497

DAFRAM S.p.A. is member of the Italian Valve Association and qualified to its standard Q AVR rules.



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