

# GENERAL PRESENTATION

LEGEND

GENERAL

VALVES

PIPING

SUBSEA & SPECIAL PIECES

SERVICES

GENERAL

VALVES

PIPING

SUBSEA & SPECIAL PIECES

SERVICES

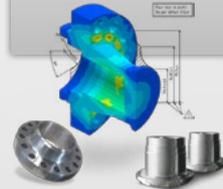
ACTIVITIES  
PRODUCT RANGE  
CERTIFICATIONS  
ORGANISATION  
...



.ICARUS  
PIPING



.ICARUS  
ENGINEERING



TEST RANGE  
QUALITY ASSURANCE  
PACKAGE  
PROJECT MANAGEMENT  
...

# 4 PARTNERS & 1 SERVICE



a European origin



a global presence

## Employees

Sales:	51	
Engineers:	23	
Workshop:	151	
Quality:	25	
Logistics:	16	
Admin. & Fin.:	20	
<b>Total:</b>	<b>286</b>	

Turnover (x 1,000,000€)	2014:	64.7	
	2015:	60.4	

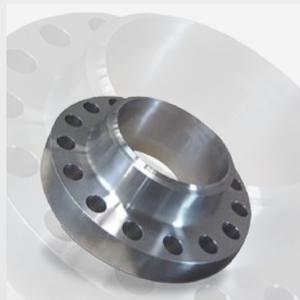
■ ICARUS ■ SACCAP □ COYARD □ SMFO

## Activities

- Production of valves, flanges, and forged parts
- Supply of complete packages of piping and fittings



Valves



Compact and subsea flanges



Forged parts for subsea applications



Piping and fittings

## Markets



▶ Oil & Gas



▶ Marine



▶ Petrochemical industry



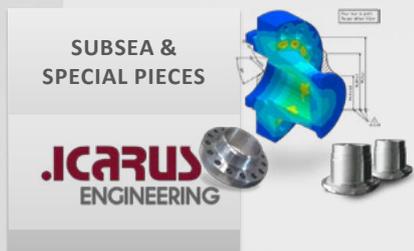
▶ Energy

▶ ...

## Clients

- ▶ End-users  
(oil & gas companies, (petro-)chemical industry, ...)
- ▶ Engineering companies
- ▶ Equipment manufacturers  
(industrial piping, boilerwork, industrial furnaces, ...)
- ▶ ...

## Commercial position



### Product range

VALVES		Ø : 1/4" to 24"
Ball valves	Floating Trunion-mounted Double block & bleed Top entry	
Gate & globe valves	Gate valves, globe valves, Parallel slide gate, through conduit gate	
Double block & bleed	Ball x Ball (floating or T-M), Gate x Gate, Globe x Globe Various according to requirements	
Check valves	Wafer assembly, swing, piston, ball	
Plug valves	Plug	

PIPING & FITTINGS		Ø : 1/4" to 102"
Pipes	Welded or seamless, all thicknesses	
Flanges	Compact, WN/SW/slip on & Blind standards, Long welding neck, orifice, anchor, swivel	
Forged fittings	Elbows, tees, caps, couplings, plugs, nipples, o-lets	
BW fittings	Elbows, tees, lateral & barred tees, reducers, caps	
Flexibles	Flexible or metallic, hydraulic fittings	
Bolting	Bolts, nuts, washers, screws, studs	
Gaskets	API ring joints, anti-vibration, elastomer seals, engineering plastics, expansion joints, o-rings, hydraulic seals, spiral wound gasket	
Clamps & hubs	Clamps connectors, hubs, API clamps	

SUBSEA & SPECIAL PIECES		Ø : 1/4" to 36"
Offshore & subsea products	Compact flanges, buckle arrestors, anchor pipes, hanger flanges, tees et barred tees, wyes, API6A/B – ASME B16.5 flanges, ... API 5L gr.X60-X65 linepipe end bends (incl. cladded/uncladded)	

### Range of services

ENGINEERING	
Calculation	Structural resistance, sealing
Design	3D modelling & 2D drawings design

QUALITY	
Non-destructive tests	High pressure, magnetic, dye penetrant, PMI, ferrite, hardness, ultrasonic, pig test, fugitive emission, cryogenic
Destructive tests	Sub-contracted according to requirements

## Approved supplier

We are approved by our clients, such as:

- Total E&P
- Petronas
- DCNS
- Gazprom
- Alstom
- Total Raffinage
- Gaz de France
- Air Liquide
- Lukoil
- Chevron
- Exxon Mobil
- EDF
- Navantia
- KNPC
- AREVA
- Shell
- BP
- Fluxys
- Statoil
- ...

## Certifications

Details of certifications by site available on demand



# 4 PARTNERS & 1 INTEGRATED GROUP



## COLLABORATIVE PRODUCTION GROUPS EXTENDED MEANS OF PRODUCTION

IMPROVED MACHINING FACILITIES

## POOLED TECHNICAL CAPABILITIES

COLLABORATIVE DRAWING-OFFICES AND POOLED TECHNICAL SKILLS

## SYNERGY

SHARED AND GROUPED WORK

## FLEXIBILITY & RESPONSIVENESS

INFRASTRUCTURE

POOLING OF SPECIALISMS

## COMPLEMENTARY PRODUCT RANGES

JOINT-VENTURES ALREADY UNDERTAKEN ACROSS A RANGE OF MARKETS

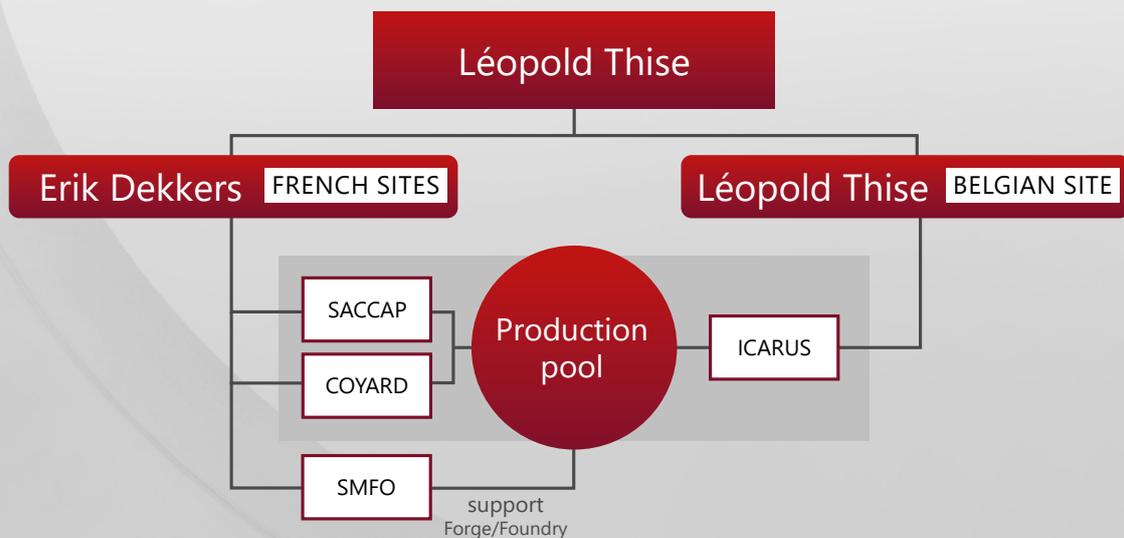
A STRONGER BRAND AWARENESS

## STRENGTHENED COMMERCIAL POSITION

IMPROVED MARKET REPRESENTATION

SUPPLY OF FULL PACKAGES

## Organization chart



## Infrastructure & production

- ▶ **Extended project development capabilities**  
Engineers dedicated to your projects, custom development



ENGINEERING EMPLOYEES	
ICARUS:	8
SACCAP:	9
COYARD:	6

- ▶ **Forge and foundry integrated within the group (SMFO)**  
Forging, die-forging, or casting



SMFO EMPLOYEES	
ADMIN.:	2
PROD.:	22
QUALITY:	4

- ▶ **Three machining workshops**  
Specialised and complementary machining facilities, about 130 production technicians



PRODUCTION EMPLOYEES	
ICARUS:	19
SACCAP:	71
COYARD:	39

- ▶ **Three complete testing infrastructures**  
Non-destructive tests, metrology, mechanical testing, etc.



QUALITY EMPLOYEES	
ICARUS:	9
SACCAP:	8
COYARD:	4

- ▶ **A logistical platform**  
12,000m<sup>2</sup> for deliveries, dispatches, and storage



LOGISTICS EMPLOYEES	
ICARUS:	10
SACCAP:	2
COYARD:	4

## GROUP COMPANIES

# ICARUS

Parc industriel des Hauts Sarts, Zone 3  
Rue des Alouettes, 100  
4040 Herstal  
Belgique

TEL : +32 (0)4 240 01 01  
FAX : +32 (0)4 240 06 40  
info@icarus-be.com  
www.icarus-be.com



**Turnover:**  
(x 1,000,000€)

2011: 38.2  
2012: 46.9  
2013: 44.9  
2014: 34.8  
2015: 32.9



**Activities:**

- Pipe & fitting supplier (full package)
- Valve manufacturer
- Subsea & special pieces manufacturer

**Head office:** Herstal - Belgium 

**Established in:** 1985

**Employees:**

Sales:	30
Engineers:	8
Workshop:	19
Quality:	9
Logistics:	10
Admin & Fin:	10

**Infrastructure:**

**Main building**

Offices:	1000 m <sup>2</sup>
Production site:	1200 m <sup>2</sup>
Warehousing:	1200 m <sup>2</sup>

**Depot & QC**

Offices:	960 m <sup>2</sup>
Warehouse:	4000 m <sup>2</sup>
Outdoor storage:	4000 m <sup>2</sup>

# SACCAP

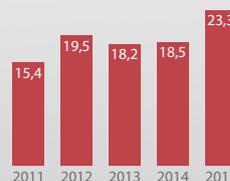
112, Avenue de Vendôme  
41034 Blois  
France

TEL : +33 (0)2 54 52 33 20  
FAX : +33 (0)2 54 52 33 33  
info@saccap-coyard.com  
www.saccap-coyard.com



**Turnover:**  
(x 1,000,000€)

2011: 15.4  
2012: 19.5  
2013: 18.2  
2014: 18.5  
2015: 23.3



**Activities:** Valve manufacturer dedicated mainly to the oil & gas sector

**Head office:** Blois - France 

**Established in:** 1947

**Employees:**

Sales:	12
Engineers:	9
Workshop:	71
Quality:	8
Logistics:	2
Admin & Fin:	4

**Infrastructure:**

40,000 m<sup>2</sup> site including a covered surface area of roughly 9,000 m<sup>2</sup>

Offices:	1000 m <sup>2</sup>
Warehousing:	1000 m <sup>2</sup>
Mechanical workshop:	5000 m <sup>2</sup>
Assembly / testing:	1000 m <sup>2</sup>
Marking / shipping:	1000 m <sup>2</sup>



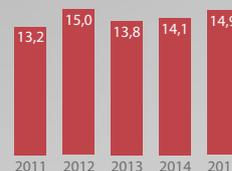
Zone industrielle Angers-Beaucouzé  
1, Rue de la Nouette  
49072 Beaucouzé Cedex  
France

TEL : +33 (0)2 41 72 10 20  
FAX : +33 (0)2 41 72 10 21  
info@saccap-coyard.com  
www.saccap-coyard.com



**Turnover:**  
(x 1,000,000€)

2011: 13.2  
2012: 15.0  
2013: 13.8  
2014: 14.1  
2015: 14.9



**Activities:** Valve manufacturer specialised in the marine & energy sectors

**Head office:** Angers - France

**Established in:** 1926

**Employees:**

Sales:	9
Engineers:	6
Workshop:	39
Quality:	4
Logistics:	4
Admin & Fin:	4

**Infrastructure:** 10,800 m<sup>2</sup> site including a covered surface area of roughly 5,300 m<sup>2</sup>

**Offices:** 950 m<sup>2</sup>

**Production:** 4350 m<sup>2</sup>

Machining facilities: 1200 m<sup>2</sup>

Assembly/testing: 1870 m<sup>2</sup>



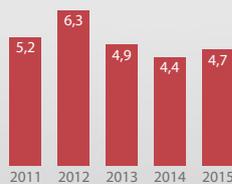
Zone d'Activités de la Ronde  
74 rue du meurier  
49650 Allonnes  
France

TEL : +33 (0)2 41 38 53 85  
FAX : +33 (0)2 41 38 53 80  
info@smfo.fr  
www.smfo.fr



**Turnover:**  
(x 1,000,000€)

2011: 5.2  
2012: 6.3  
2013: 4.9  
2014: 4.4  
2015: 4.7



**Activities:** Forge & Foundry

**Head office:** Allonnes - France

**Established in:** 1932

**Employees:**

Workshop :	22
Quality :	4
Admin & Fin :	2

**Infrastructure:** 16,500 m<sup>2</sup> site including a covered surface area of roughly 9,000 m<sup>2</sup>

**Offices** : 200 m<sup>2</sup>

**Production** : 8800 m<sup>2</sup>

Tool shop : 1020 m<sup>2</sup>  
(tooling, dies and models)

Testing area : 80 m<sup>2</sup>

# VALVES

# PRODUCT SPECIFICATIONS

## Product range

	150lbs	300lbs	600lbs	900lbs	1500lbs	2500lbs
<b>ON/OFF BALL VALVES</b>						
Floating Ball	2" - 10"	1/2" - 8"	1/2" - 6"	1/2" - 6"	1/2" - 2"	1/2" - 1"
Trunnion Ball	1/2" - 24"	1/2" - 24"	1/2" - 24"	1/2" - 24"	1/2" - 16"	1/2" - 12"
Double block & Bleed ball						
<b>THROUGH CONDUIT GATE</b>						
Slab gate	2" - 24"	2" - 24"	2" - 24"	2" - 24"	1" - 24"	1" - 24"
<b>DUO CHECK</b>						
Dual plated Wafer Check	2" - 24"	2" - 24"	2" - 24"	2" - 20"	2" - 20"	2" - 18"
<b>CASTING</b>						
Gate	2" - 24"	2" - 18"	2" - 14"	2" - 10"	2" - 10"	2" - 8"
Globe		2" - 14"	2" - 10"	2" - 10"	2" - 10"	2" - 8"
Check (Swing, Piston and Ball)						
<b>FORGINGS</b>						
Gate						
Globe				1/2" - 2"		
Check (Swing, Piston and Ball)						



## APPLICATIONS & SPECIFIC FEATURES

Navy - Military - Nuclear - Cryogenic - Oxygen Service - 3-Way Ball - Welded Design - Wafer Swing Check - Bellow sealed - ...  
Actuated as per request

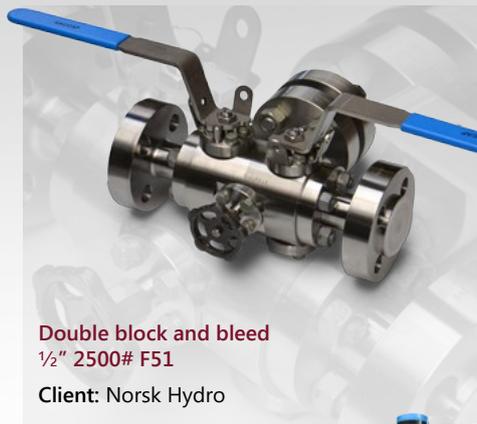
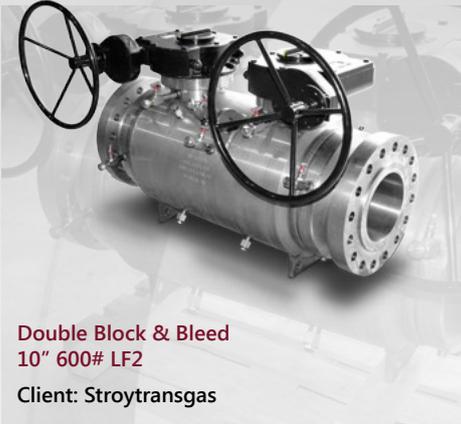
Sizes	from 1/2" to 24" ( > 24" upon request)
Pressure Ratings	CL-150 to 2500 – PN 16 to PN 400 – API 6A : 3,000 / 5,000 / 10,000
Material	Main: Carbon Steel ( with cladding ) / Stainless Steel / Duplex / Nickel Alloys Others: Cupro Aluminium / Titanium / ...

EUROPEAN ORIGIN  
TOP QUALITY MATERIAL SOURCING  
ASTM – PED – NORSOK M630 – CUSTOMER SPECIFICATION

## Our Strengths

- **Deadline flexibility & responsiveness**
- **Valves for use under extreme conditions:**
  - Low and high temperatures
  - Corrosive and abrasive products
  - High pressures
- **Custom solutions**

- Standards-compliant valve production
- Non-standard valve production
- Machined from bars, castings or forgings
- Specific and particular grades
- Engineering department allows management of specific requirements (Size constraint, pressure, corrosion, temperature, etc.)



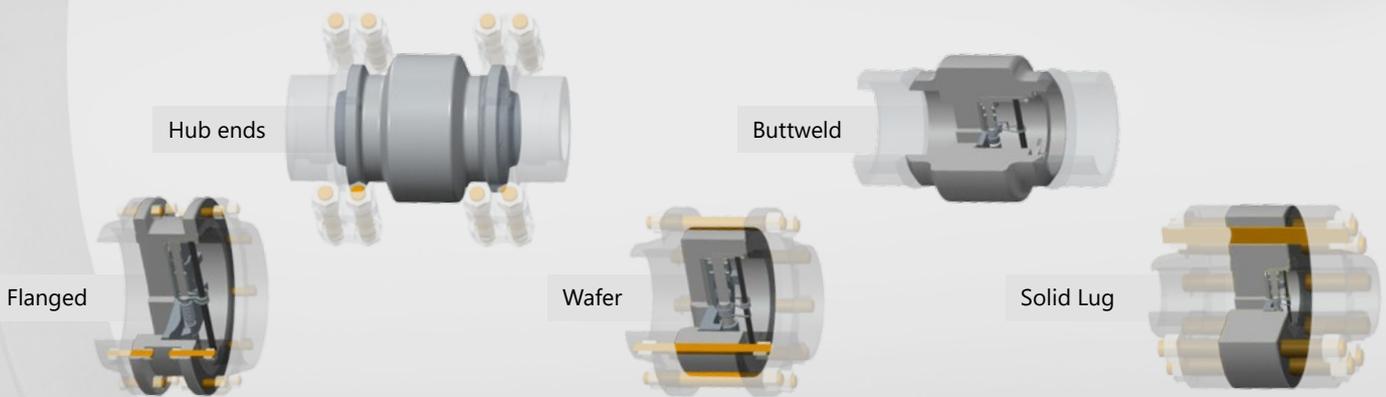
# VALVES

# DUO CHECK

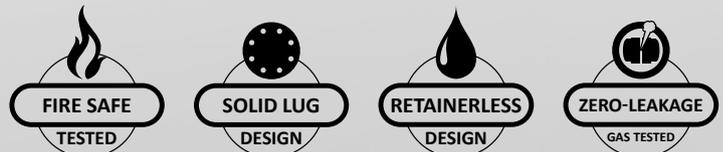
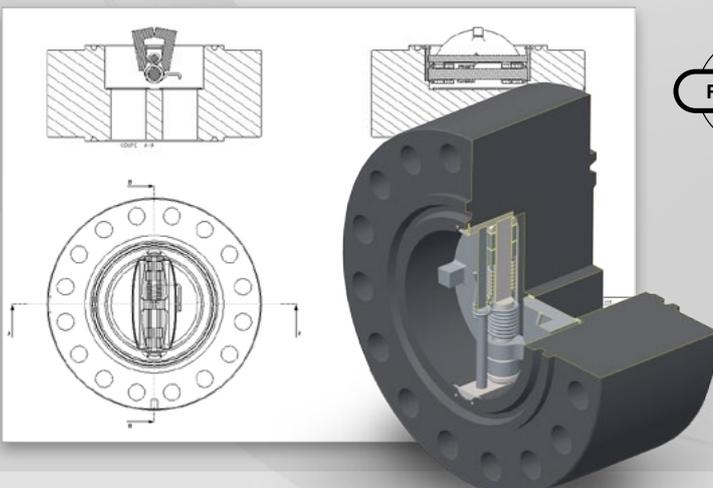
## Dual plated wafer check



Sizes	from 2" to 24"
Pressure Ratings	ANSI : 150 to 2500 – API : 2,000 to 10,000
Material	Carbon Steel / Stainless Steel / Duplex Steel / Aluminum Bronze / High Nickel Alloys / Titanium ... Forged or cast construction
Seats	Metal to metal (BARE, STELLITE®, ULTIMET®, HVOF TCC) / Soft seat (PTFE, RPTFE, HNBR, VITON®, ...)
End Connections	Wafer / Solid lug / Flanged / Buttweld / Hub ends



## Design



According to:

- API 594     ■ API 6D     ■ API 6 FD
- Customer specifications
- API & ISO Fire Safe certifications

## FEA Analysis

BODY STRENGTH APPRAISAL

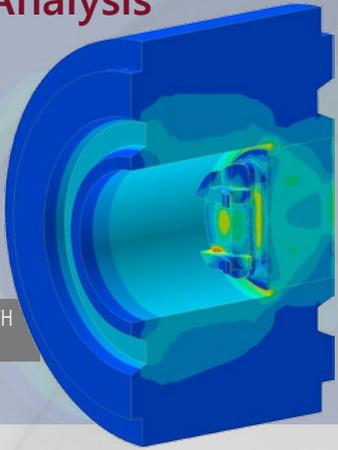
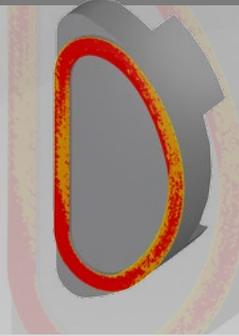
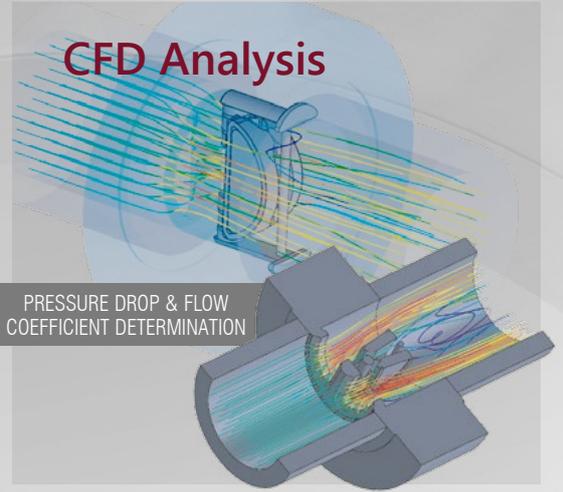


PLATE TO BODY SEATING AREA TIGHTNESS VERIFICATION



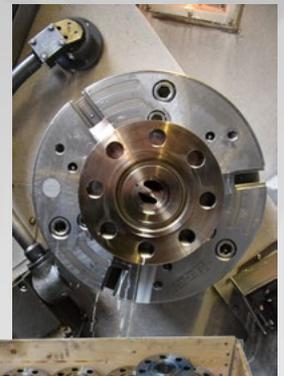
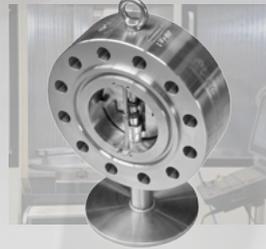
## CFD Analysis

PRESSURE DROP & FLOW COEFFICIENT DETERMINATION



## Inhouse production

- Castings and forgings coming from our own forge / foundry or from other top quality european suppliers
- Inhouse machinery, assembly & testing ( hydro / gas ... )
- Low/high pressure gas tested according to API598 & ISO5208
- Inhouse quality controls : MPE / DPE / Visual / Dimensional ...



## Some references

CUSTOMER	END USER	PROJECT	DESTINATION	DESCRIPTION
Remontowa	Total E&P	Martin Linge	Norway	2"-10" 150#-600# 316, Duplex (150+ pcs)
Yamgaz SNC	JSC Yamal LNG	Yamal LNG	Russia	3"-30" 150#-900# LF2, 316 (140+ pcs)
Eni Saipem	Petrobras	Golfinho	Brazil	12" 2500# F55 with small std LF2, 316
Total ABK	Total E&P	Pre-Khuff	U.A.E.	2"-6" 2500# Inconel 625 Hub ends
ENTREPOSE-TMSI	JSC Yamal LNG	Yamal	Russia	16" 150# CF8M
Solberg & Andersen	Statoil	Statfjord B Platform	North Sea	6" 150# F55
Nigerdock	Total E&P	Ofon 2	Nigeria	2"-6" 150# LF2
Total E&P Congo	Total E&P	Libondo	Congo	2"-8" 150#/2500# Alu Bronze, LF2, F316 several orders
Polymetal Trading Ltd	Polymetal LTD.	Amursk POX HUB Plant	Russia	2"-6" 150#-300# F53, Inconel 625 for Oxygen service
Subsea 7	Exxon Mobil	Erha North Phase 2	Nigeria	2"-12" 1500#/2500# LF2
Denholm Valve Care	Unknown	Unknown	UK	18" 150# F51
Akersolutions through SVS	Nexen Petroleum UK Ltd	Buzzard field development project	North Sea	3" 1500# F44
Saipem	Total E&P	GirRI Project	Angola	3" 2500# F316
Total E&P RUSSIA	Total E&P	Kharyaga Phase 3 Project	Russia	2"-6" 150#/2500# LF2
MMHE	Exxon Mobil CO	Telok A/B	Malaysia	2" 900#/2500# F51

# VALVES

# OIL & GAS

## Gate / Globe / Check

A complete range of gate valves, globe valves, parallel slide gate valves, needle valves and check valves, is available in all the normalized pressure classes and every grades of steel / alloy material from 1/2" to 24" according API, AISI, BS, DIN, NF... standards.

The available "custom-made" valves for specific applications include :

- Welded bonnet
- Extended body and/or stem
- Actuation
- Cryogeny and high temperature
- Normalized fugitive emission
- Limit switches
- Interlocks
- Tightness performed with bellows sealed

All relevant specific applications can be studied, developed and completed according to specification sheets and end-users' requirements.



Bellows sealed gate valve



Aluminum-Bronze gate valve



Cryogenic gate valve



High temperature gate valve



Flanged gate valve



Pneumatic actuated gate valve



Pressure sealed bonnet valve



Through conduit gate valve

## Ball valves & Double block & bleed

Complete range of ball valves and double block and bleed

Available diameters: ½" to 24".

Pressure classes: series 150 to 2500 lbs, API 5000 and 10000.

Floating or trunnion-mounted, in all steel grades.

All types of end connections: BW, SW, NPT, flanges ISO/ASA/PN, Hub ends,...

Specific options:

- Metal to Metal seating (tungsten or chromium carbide coating)
- Double piston effect
- Double block and bleed
- Cryogenic
- Specific alloys
- Tungsten carbide coating
- Overlay - Stainless steel, inconel...

Our engineering department is able to work with you on all your other specific requirements or to combine these options to meet your most demanding specifications.



**Trunnion Mounted Ball Valve**  
12" 1500# Carbon Steel  
Client: Subsea 7



**Trunnion Mounted Ball Valve**  
20" 1500# Carbon Steel  
Client: Total Qatar



**Cryogenic**  
8" 2500# 316  
Project: Burlington Algeria



**Double Block & Bleed**  
10" 600# LF2  
Client: Sroytransgas



**Double block and bleed**  
½" 2500# F51  
Client: Norsk Hydro



**Double block & bleed**  
globe / needle / ball valve



**Double 3 ways**  
2" 2500# Carbon Steel  
Client: Hydro

# VALVES / SPECIAL PIECES

# MARINE

## Submarine valves

Wide range of valves and fittings specially designed for submarines and to meet the clients specifications.

- Ball valve
- Angle globe valve
- Check valve
- Gate valve
- Safety globe valve
- Self regulating valve

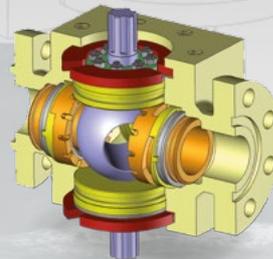
- Strainer
- Piston valve
- Air distributor
- Hydraulic actuator
- Gear box
- Switches box
- ...



Equipped ball valve



Forged angle globe valve



Top Entry ball valve



Parallel slide gate valve

## Warship valves

Wide range of moulded products for surface vessels.

- Gate valve
- Globe valve
- Ball valve
- Check valve
- Safety globe valve
- Self regulating valve
- Strainer

- High performance butterfly valve
- Fire hydrant globe valve
- Actuator
- Pressure dropping service
- Storm valve
- ...



Ball valve



Check valve



Gate valve



Safety globe valve

## Well-developed infrastructure

### Specific means

Our Marine department is equipped with integrated resources (3D design, finite element analysis, simulation, trials, mechanical workshop, clean room, test bench, three-dimensional verification equipment, ...), along with the qualifications required to meet our clients' most demanding requirements.



### Diversified materials

Our wide range of valves in corrosion-resistant alloys (copper-alloy, Monel, Hastelloy, Inconel, Titanium, Duplex and Super Duplex, ...) is intended for applications ranging from naval construction, offshore and inshore construction, energy, processing industry.



## Specific parts



Air distributor



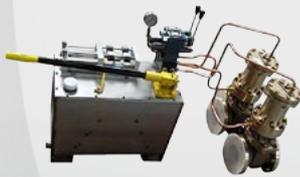
Air pannel



Drain manifold



Hydraulic actuator



Hydraulic actuated gate valve



Electric actuator



Safety globe valve



Security Valve



Discriminator



Ball valve



Self regulating valve



Y globe valve



Ball valve



Strainer



Gear box



Piston valves



# VALVES / SPECIAL PIECES

# ENERGY

## An efficient & integrated infrastructure

Machining centres, qualified welders, water and HP air test benches, clean room, cryogenic test facilities, fire test bench, x-ray examination, dye penetrant test equipment, US, PMI, etc.



Benefiting from the acquired experience and means of the group companies, and using modern production equipment in accordance with the requirements of the industrial markets, we are able to meet the high tech Energy market demand.

### SMFO: Integrated Forge-Foundry

We have our own forge-foundry able to produce:

- forged or stamped pieces, of all grades of steel (carbon steels, alloy steels, stainless and duplex), copper and nickel alloys.
- cast pieces of all grades of steel, copper and nickel alloys.

This French forge-foundry fulfills all the quality requirements expected by the industrial valve market and the European Union obligations.

It has been active for over 15 years in the production of pieces for Nuclear application matching the RCC-M and the RCC-MX requirements. It produces pieces with a high-quality finishing, thanks to its sanding, blasting and spraying glass ball capacities.

Quality Control team consists of qualified COFREND Level 2 (Ultrasonic tests , Magnetic particle examination, dye penetrant tests, Radiography) with all equipment necessary to carry out those controls. It also makes its own foundry and forge tooling.



### White room

Our Energy department has also built two clean rooms in compliance with cleanliness standards required by RCC-M and RCC-MX codes. This particular environment is equipped with its own means of production in deionised water grade A. One of those rooms is dedicated to stainless steel parts and the other one to copper alloys.



## A comprehensive product range

We offer a complete range of forged and cast valves from 1/4" to 24" in all pressure ratings on the following designs:

- Ball valve
- Double block and bleed
- Gate valve
- Parallel slides valve
- Globe valve
- Check Valve
- Steam piping
- Specific equipment
- ...

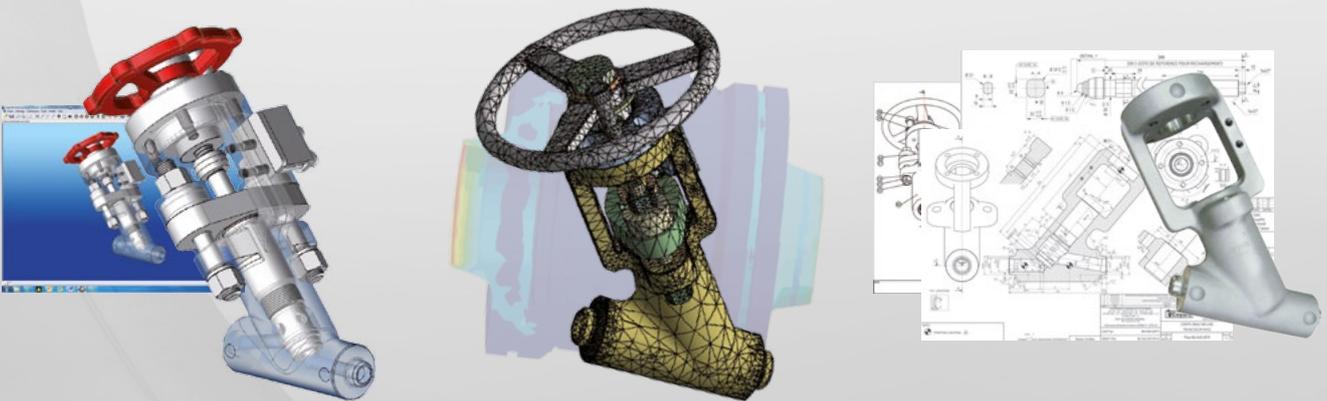
We are able to offer these designs in many grades with many variations (cryogenic design, high temperature, one-piece design, equipped with actuators, buried equipment, ...).



## A sophisticated approach

Our Energy engineering uses the 3D design software Top Solid. It is also equipped with the software ANSYS finite element calculation to match the different theoretical simulations required by its customers (fatigue, earthquake...).

Our Energy Department is expert in the development and design of valves in high level technical applications (like the Navy) wich enables it to match the requests and stipulations of its customers.



## Strong references

Our Energy department works with most major industrial actors :

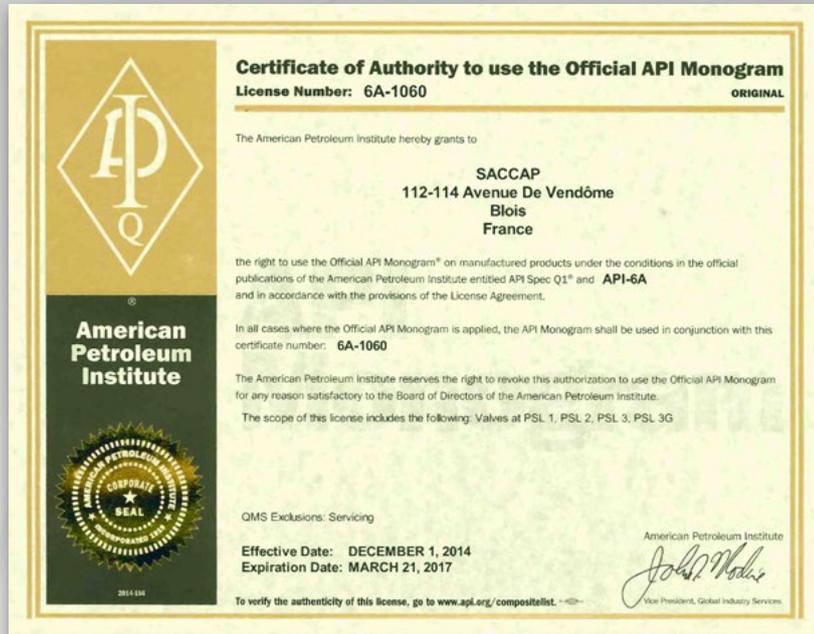
- in the Energy markets (EDF, Total, Shell, ...)
- in the Nuclear markets (AREVA, EDF, ...)
- in the Defense markets (DCNS, Navantia, DSSF, ...)



# VALVES

# BALL VALVE API 6A - UP TO 10 000 PSI

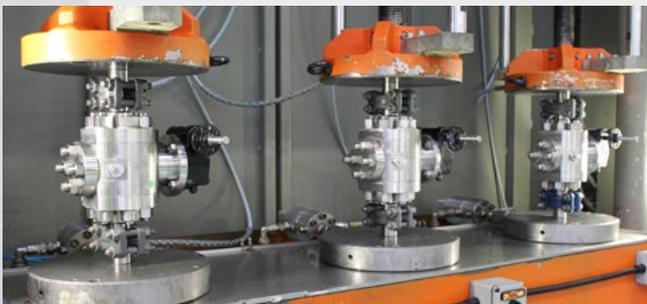
## Certification



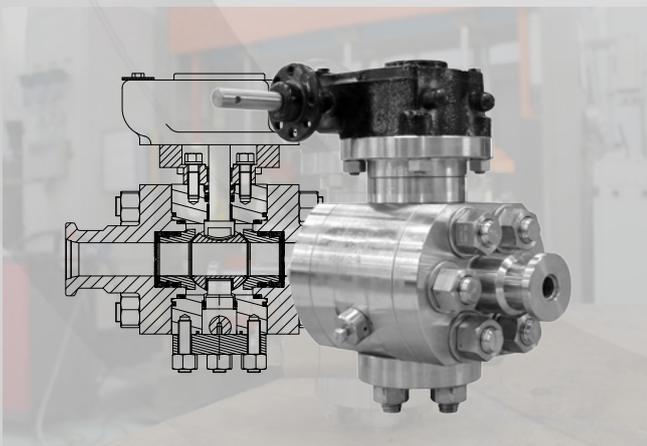
API 6A is met at every step:

- Raw material from European Origin and meeting all API 6A requirements
- Engineering:
  - Analytical calculation
  - FEA
    - Body : strength appraisal
    - Ball (seats) : tightness verification
- Inhouse NDT
- Pressure test according to API 6A, including high pressure gas test with immersion
- PSL-1, PSL-2, PSL-3 & PSL-3G

## References



MARTIN LINGE	
TYPE	Trunnion Mounted Ball Valves & DBB
CUSTOMER	Technip France
END USER	Total Norway E&P
DESCRIPTION	API 10,000 - A182 F55 - TCC Ball valves - 3/4" 15 pcs DBB - 2" x 2" 36 pcs



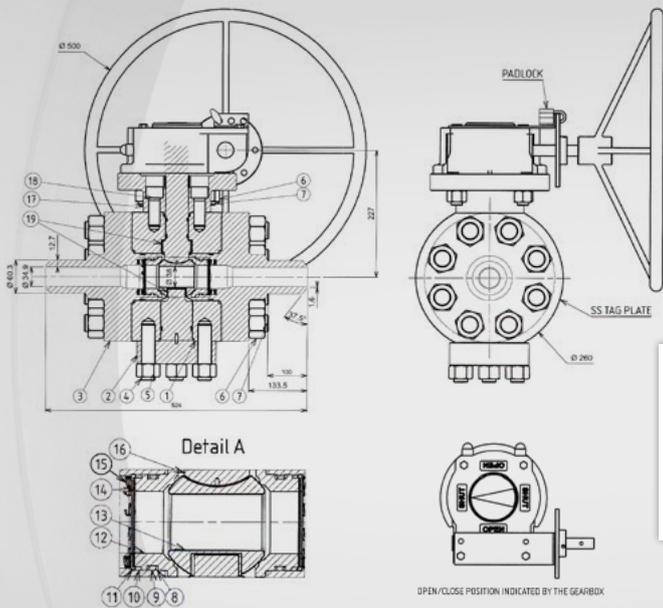


- **HYDROSTATIC TEST**  
SHELL : 518 BAR  
HIGH PRESSURE SEAT TEST : 380 BAR  
LOW PRESSURE SEAT TEST : 6 BAR
- **GAS TEST**  
SHELL : 518 BAR  
HIGH PRESSURE CLOSURE TEST : 380 BAR



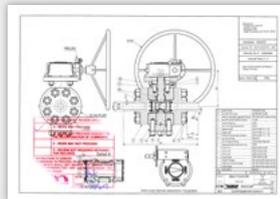
**BARZAN**

<b>TYPE</b>	Trunnion Mounted Ball Valves
<b>CUSTOMER</b>	HHI
<b>END USER</b>	RasGas
<b>DESCRIPTION</b>	<u>API 5,000 - Inconel 625</u>
	2" 1/16 Reduced bore 62 pcs
	3" 1/8 Reduced bore 16 pcs
	4" 1/16 Reduced bore 19 pcs
	3" 1/8 Full bore 2 pcs
	<u>API 5,000 - CS/SS</u>
2" 1/16 Reduced bore 45 pcs	
3" 1/8 Reduced bore 6 pcs	



**NGI MIXED CASE PROJECT**

<b>TYPE</b>	Trunnion Mounted Ball Valves
<b>END USER</b>	GASCO
<b>DESCRIPTION</b>	<u>API 10,000 - Gr60K</u>
	1" 13/16 Ball valve 4 pcs



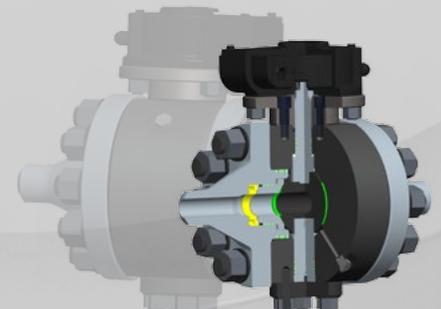
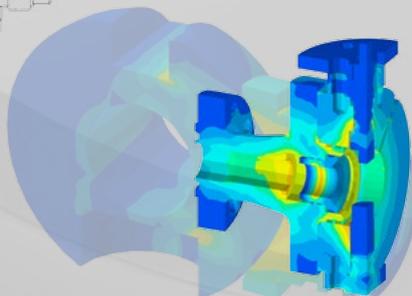
19	gasket/flush	TREATED STEEL
18	key OMC/OMC actuator	ASTM A304 Gr-B2
17	flange reducer/gasket/flange	API 50K (ASTM A304 Gr-F40)
16	size of trunnion/seat & trunion	19APH
15	resistant/lapping	KPSB
14	joint of sealer/seat spacer	PEEK
13	set screw/ball	ASTM A303 F51 + TFC
12	sealer/seat	ASTM A303 F51 + TFC
11	pressure/actuator/seat activator	ASTM A303 F51 + TFC
10	gasket/seal	GRAPHITE
9	split torque/OT ring	VTCS AED PRS3/99
8	baggage anti-extrusion/Ax ring	PEEK
7	bracket/seat	ASTM A304 Gr-B2
6	actuator/nut	ASTM A303 Gr-B
5	actuator/nut	ASTM A303 Gr-B
4	bracket/seat	ASTM A304 Gr-B2
3	bracket/flanges	API 50K (ASTM A304 Gr-F40)
2	ends of trunnion flange	API 50K (ASTM A304 Gr-F40)
1	corps/body	API 50K (ASTM A304 Gr-F40)
rep.	designation	ballface

<p><b>General notes :</b></p> <ul style="list-style-type: none"> <li>- Finishes acc. to API 6FA</li> <li>- Antistatic Design</li> <li>- Dimensional in mm</li> <li>- Design in accordance with API 6A - PSL36</li> </ul>
Customer : GASCO
Customer PO : AE/211/0111/PO...049
Internal Job n° : 20000684
Internal Item n° : 3
DATA SHEET (VB-009) APPENDIX-1 PROJECT N°5243
Approx. Mass (Kg) 144Kg

**SOUTH MAHAKAM PHASE 3**

<b>TYPE</b>	Trunnion Mounted Ball Valves
<b>END USER</b>	Total E&P Indonesia
<b>DESCRIPTION</b>	<u>API 10,000 - Gr60K</u>
	1" 13/16 Full bore 38,1mm 3 pcs
	2" 1/16 Reduced bore 3 pcs

- **HYDROSTATIC TEST**  
SHELL : 1034 BAR  
HIGH PRESSURE SEAT TEST : 690 BAR  
LOW PRESSURE SEAT TEST : 6 BAR
- **GAS TEST**  
HIGH PRESSURE CLOSURE TEST : 690 BAR



# VALVES

# MACHINING WORKSHOP & ENGINEERING SKILLS

## Machining workshop

Distribution of production space at the different sites:

- **Blois** (SACCAP headquarter): 5000 m<sup>2</sup>
- **Angers** (COYARD headquarter): 4350 m<sup>2</sup>
- **Herstal** (ICARUS headquarter): 1200 m<sup>2</sup>



### Blois site

Machines	Quantity
CNC multi-tasking machines	3
CNC Lathes	22
CNC Milling machines	2
Drilling machines	5

### Production capacity:

Gate/Globe/Check ≤2" : ~ 20 000 / year  
 Ball / DBB ≤6" : ~ 10 000 / year

### Angers site

Machines	Quantity
CNC multi-tasking machines	2
Lathes (conventional   CNC)	2   8
Milling machines (conventional   CNC)	2   2
Drilling machines	2

### Production capacity:

Gate/Globe/Check ≥2" : ~ 3500 / year  
 Ball / DBB ≥1" : ~ 2500 / year

### Herstal site

Machines	Quantity
CNC Milling machines up to 2600x1200x800 / 5 axis	4
CNC Lathes up to Ø 1100mm	7
EDM (Electrical Discharge Cutting Machine)	1
Saws	2

### Production capacity:

Ball ≥6" : ~ 250 / year  
 Duo Check - all sizes : ~ 1000 / year



Mazak Integrex e-500H



DMG DMF 260 linear



Mazak VTC 300C



Mazak Variaxis 630-5X II

# Engineering skills

- Experienced engineering team
- Efficient modelling and simulation software

- FEA:
  - Samcef field
  - PTC ProMechanica
  - Ansys
- CAD:
  - PTC Pro Engineer / Creo
  - Autodesk Autocad
  - TopSolid
- CAM:
  - Mastercam
- Calculation:
  - PTC Mathcad

SAMTECH

Autodesk

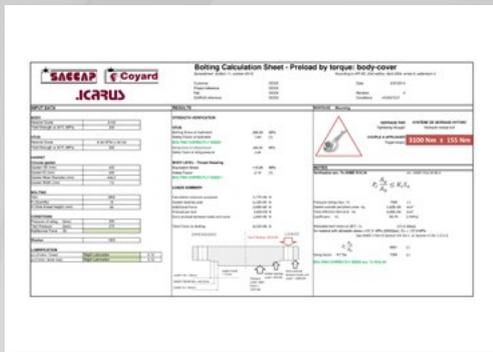
PTC

Mastercam

ANSYS

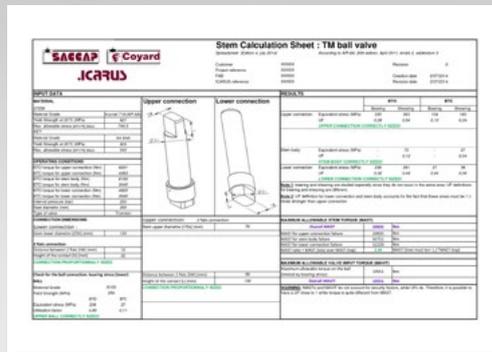
TopSolid

## Calculation notes based on standards / rules of good practice



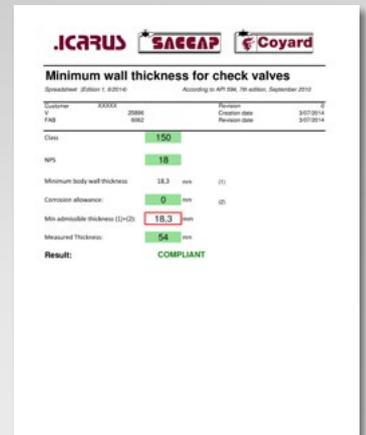
### Bolting calculation:

- Tightening torque
- Reaction forces between parts
- Working coefficient (safety)



### Stem dimensioning:

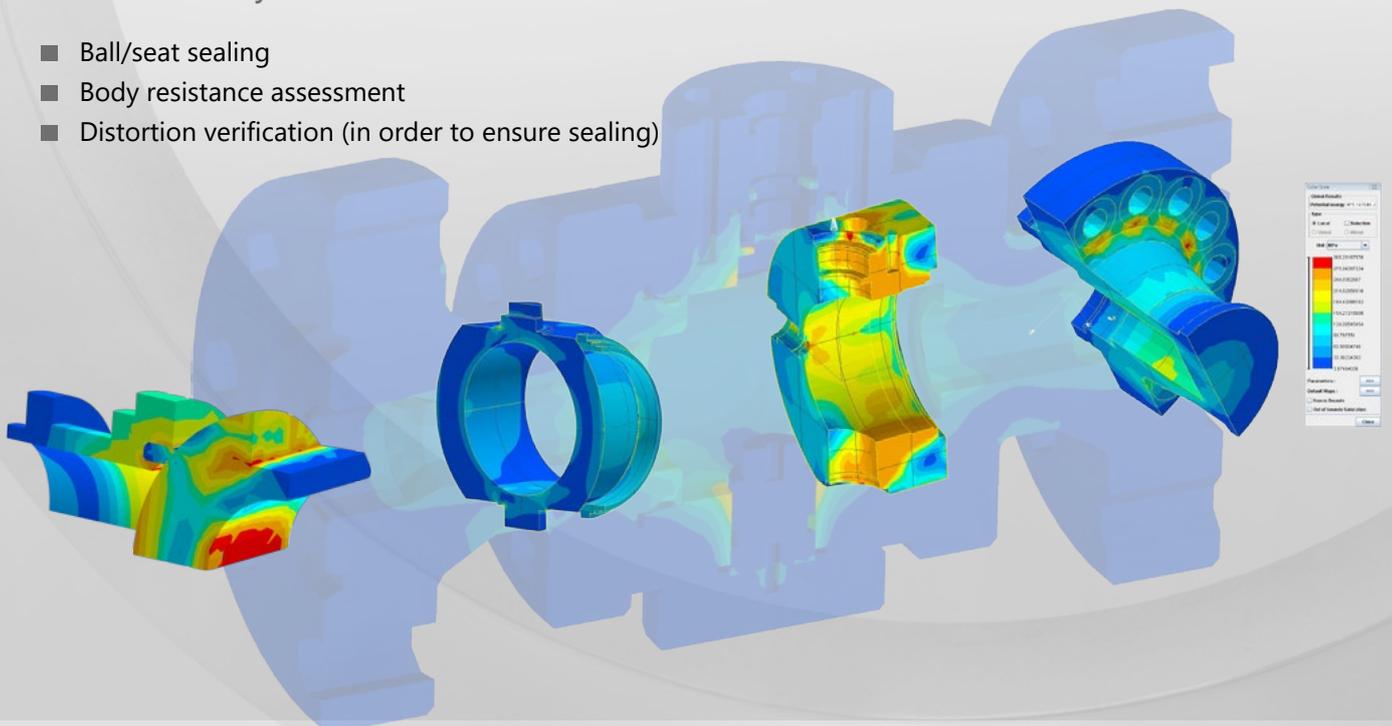
- Allowance for different shapes of stem-ends
- Working coefficient
- Maximum resistance of stem



### Wall thickness calculation for check valves

## Finite Element Analysis :

- Ball/seat sealing
- Body resistance assessment
- Distortion verification (in order to ensure sealing)



# VALVES

# SMFO : INTEGRATED FORGE & FOUNDRY

## SMFO

French Forge / Foundry, located in Allonnes

Located close to Saccap and Coyard.  
SMFO specialises in the production of:

- Forging from 0.1 kilo to 40 kilos
- Casting from 0.1 kilo to 500 kilos



## Our strength

- Single units to medium series
- Short deadlines
- Internal control of the entire process including documentary management, inspection and NDTs
- Experience in the use of a wide range of alloys:

High strength carbon steel, stainless steel including duplex and super duplex, nickel alloys, copper alloys



### Internal tooling production

- Die-forging
- Production of patterns



### Non-Destructive tests

- Dye Penetrant test
- Magnetic particle ex.
- X-ray
- Ultrasonic test
- Spectrometry



### Heat treatments

Electric furnace for:

- Normalisation
- Quenching
- Annealing, Tempering

### Certifications

- ISO 9001 version 2008
- DESP - 97/23/EC
- HAF604
- RCCM / RCCMX
- NORSOK (Gr4A / F51-F53-F55-F44)



### Approved supplier

- AREVA
- EDF

### Upcoming Certifications

- NORSOK (Gr5A-Gr6A-CK3MCuN)
- ISO 14001 version 2004



# PIPING

# PRODUCTS & SERVICES

## Scope of supply

### Pipes

Seamless & Welded  
Finned / Studed

All dimensions  
All wall thicknesses

### BW Fittings

- Elbows
- Tees
- Lateral & Barred Tees
- Reducers
- Caps

### Forged Fittings

- Elbows
- Tees
- Caps
- Couplings
- Plugs
- Union
- Crosses
- O-lets

### Clamps & Hubs

- Clamps connectors
- Hubs
- API Clamps

### Flanges

- Compact flanges
- Standard flanges
- Long welding neck
- Orifice
- Anchor
- Swivel
- Fully designed & calculated flanges

### Bolting

- Bolts
- Nuts
- Washers
- Screws
- Studs

### Gaskets

- API ring joints
- Anti vibration
- Elastomer seals
- Engineering plastics
- Expansion joints
- O-rings
- Hydraulic seals
- Spiral wound gaskets

## Material grades

### Stainless steel Corrosion resistance

- 316 Mo+
- 317L
- Alloy 28
- Alloy 20
- 904L
- 19.25 HMo
- 254 SMO®
- 310L

### Alloy and stainless steel

- P11
- P22
- P5
- P9, P91
- 316L
- 304L
- 304H
- 321H
- 347H
- 310S

### Austenitic-ferritic steel

Duplex : UNS S31803 / S32205  
Super Duplex :  
UNS S32750 / S32760

### Nickel and Nickel alloy

Alloy 600, 601, 625, 825,  
400, 200/201, C276, C22,  
800, 800H, 800HT

### Carbon steel

- A106 Gr B
- A105
- A234WPB
- P265 GH

### Low temperature :

- LF2, A333 Gr 6
- LF3, A333 Gr 3

### High yield strength :

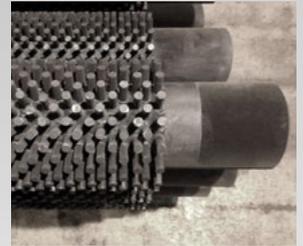
API 5L X52-60-65-80

... this is a non-exhaustive list, Do not hesitate to contact us for other needs.

MATERIAL COMPARISON	
Material	Properties
316L	200
304L	200
304	200
316	200
316H	200
316L	200
316	200
316H	200
316L	200
316	200
316H	200

PDF version available for download at [www.icarus-be.com](http://www.icarus-be.com)

## Piping material



**Extruded Manifolds**  
**Material :** Alloy 800 HT  
**Client :** Total Petrochemicals Gonfreville

**Extruded Manifolds**  
**Material :** Alloy 800 HT  
**Client :** Total Petrochemicals Gonfreville

## PIPING

## COUPLINGS & HOSES

### Our services and solutions: expertise, development, production

We supply since more than 20 years a complete range of flexible hoses assemblies and specific couplings: rubber hoses, hydraulic hoses, metallic hoses and many couplings, for using on air, water, steam, hydrocarbons, Onshore, Offshore, acids and chemicals... for low, medium, high and very high pressures.

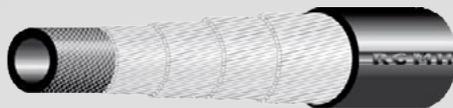
#### ■ Rubber Hoses for Air & Gas



#### ■ Rubber Hoses for Oil & Petroleum



#### ■ Rubber Hoses for Off-Shore



#### ■ Rubber Hoses for Chemical



#### ■ PTFE Hoses



#### ■ Metallic Hoses



#### ■ Half Couplings Guillemin Type



#### ■ Chicago / Express Couplings



#### ■ Quick Coupling, Camlock Type



#### ■ Victaulic type Couplings



#### ■ Dry Cam & Groove disconnect couplings



#### ■ TODO couplings

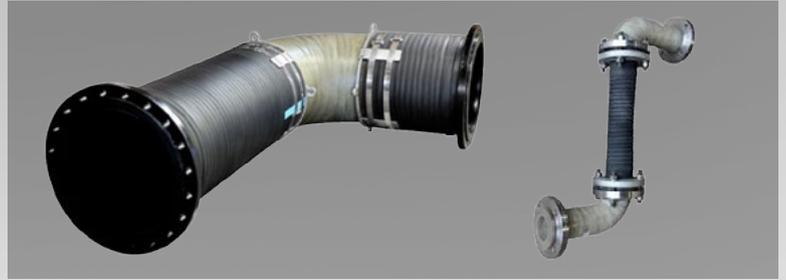


#### ■ Half flanges & joints



See our Reference List: SAIPEM O2 Pearl (TOTAL), TECHNIP TIFERT, SAIPEM SONATRACH (HASSI MESSAOUD), SNC LAVALIN : JIFCO JORDANIE, TECHNIP : PMP (QATARGAS), TECHNIP : IKRA (RUSVINYL), EIFFAGE : OFON 2 (TOTAL), SAIPEM MAFUMEIRA, TECHNIP PRELUDE FLNG (SHELL).

## Our projects



Flexibles hoses for phosphoric acids fitted 8" cam & groove couplings stainless steel 904L



# PIPING

# BENDS

## Induction Bends for topside application & riser systems

Icarus works alongside with world leading manufacturer of pipe bends to provide a wide range of bending solutions :

■ **High Flexibility**

- All types of material : starting from seamless or welded pipes in CS, Alloy Steel, SS, DSS, SDSS, Nickel Alloy and cladded pipes with weld overlay method.
- Wide range of bend radius, angle and bend plane
- Close tolerances (optimum ID tolerances...)

■ **Several applications : sour service, low temperature, topsides, ...**

■ **Optimum Heat Treatment Process to meet the strict mechanical requirements**

- Stress relieving
- Normalizing
- Quenching & Tempering
- Solution Annealing

■ **Full compliance to International Standards and Specifications :**

- DNV (DNV-OS-F101, ...)
- TOTAL specifications (PVVs, PLR 231, ...)
- Chevron's specifications (PPL-SU-U737-D, ...)

...



**22" 3D Bends**  
Material : API 5L GrB X65

**8" 3D Bends**  
Material : Duplex UNS S31803

**Contractor : HHI**  
**Client : BP**  
**Project : Clair Ridge**

**6" 3D Bends**

**Material : Duplex UNS S31803**  
**Contractor : Subsea7**  
**Client : Total**  
**Project : Pazflor**  
**Standards : DNV-OS-F101**





**42" 5D Bends**

**Dimension :** ID 1068,4 mm x 54,5 mm  
**Material :** API 5L X65 PSL2 (SAWL)  
**Contractor :** DSME  
**Client :** Chevron Australia  
**Project :** Wheatstone Upstream Project

**6" & 10" 5D Induction Riser Bends**

**Material :** API 5L X60 QS PSL2  
**Contractor :** DSME  
**Client :** Chevron  
**Project :** Mafumeira Sul Project



**6" 5D Bends Pressure test**

**Material :** API 5L X65 PSL2 (DNV 450)  
**Contractor :** Technip France  
**Client :** Tullow  
**Project :** TEN Project  
**Standards :** DNV-OS-F101

**6", 8" & 10" 5D Bends**

**Material :** API 5L X65 PSL2 (DNV 450)  
**Contractor :** Technip France  
**Client :** Tullow  
**Project :** TEN Project  
**Standards :** DNV-OS-F101



# SUBSEA & SPECIAL PIECES

# PRODUCTS & SERVICES

## Our technical support at your service

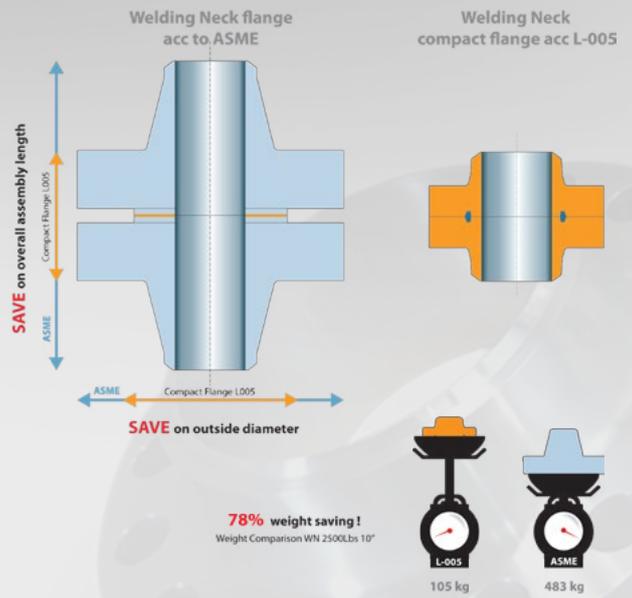
We are at your disposal for:

- Studies undertaken according to your requirements
- Flanges and forged pieces
- Special parts

## Compact flange vs. ASME flange

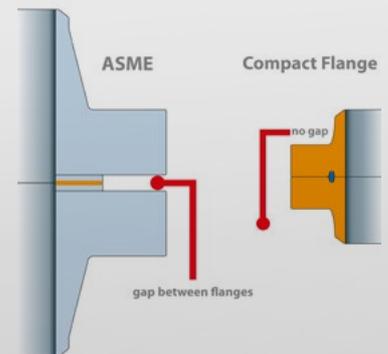
Main benefits of L-005 compact flange

- Much **lighter** (save up to 80% on weight)
- **Smaller dimensions** (in both overall length and diameter)
- **More reliable** sealing : seal ring instead of gaskets
- Multiple sealing areas
- No corrosion/erosion on flange faces (gapless)
- No need to re-tighten bolts on a regular time scale



The Raised Face (RF) on an ASME flange is a weak point

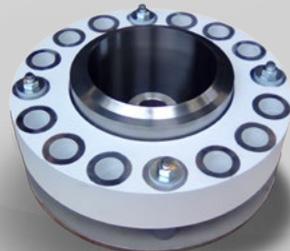
- 1) Bending forces on the piping system will relax bolting on ASME flanges after a while so that re-tightening of the bolts is required. Which is not the case for compact flanges.
- 2) Gap between 2 ASME flanges (due to RF) can cause crevice corrosion or erosion.



Inhouse machining of CF swivel ring  
Block 17 Phase 2 Total Angola



Hydrotest on CF assembly  
Block 17 phase 2 Total Angola



Swivel hub & ring with special coating and flange face protection



Welding Neck CF with proper protection on flange faces

## Special forgings

All sizes from ½" up to 24" (ext. Ø) and larger,  
up to 36" on request  
Maximum length up to 3500mm

High strength carbon steel, stainless steel forgings,  
including duplex and super stainless steel, nickel  
alloy, copper alloy and titanium alloy

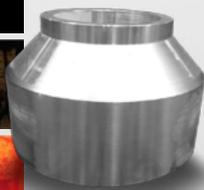
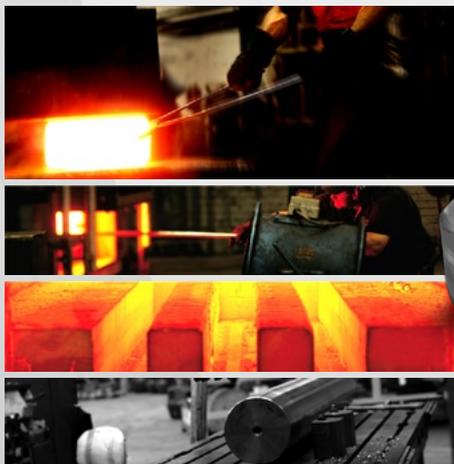
- Buckle Arrestors
- Pipe Anchors
- Hanger Flanges
- Tees and barred tees
- Wyes
- Flanges API6A/B – MSS SP44 – ASME B16.5
- Compact flanges Norsok L005

## Exemple of partnership

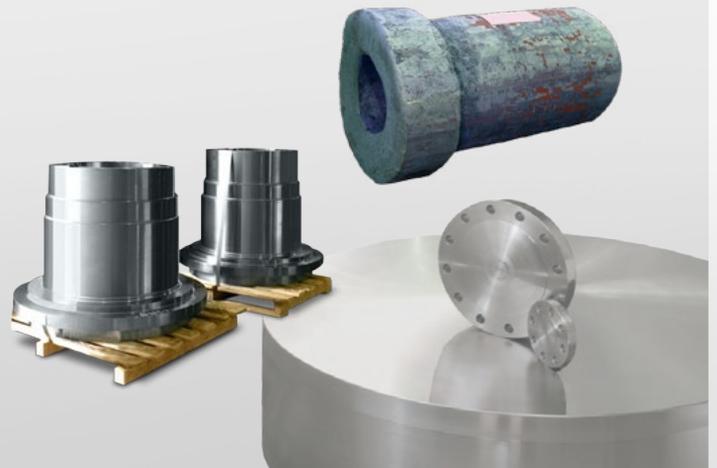
Partners forge masters working on our design and drawings :



- UK based forgemaster (Sheffield)
- Metal forgings from 1 kilo to 1200 kilos (maximum outside diameter: 1050mm)
- Ring-rolling up to 1500mm



- Spain based forgemaster (Zestoa near Bilbao)
- Three free forgings presses, with a maximum capacity of 5000 Tons
- Forgings and machining of parts up to 40 Tons
- Discs : maximum diameter is 3500 mm (40 000 kg)  
Rings : maximum diameter is 4500 mm (10 000 kg)



## SUBSEA & SPECIAL PIECES

## SPECIFIC MACHINING WORKSHOP

### Machinery list

#### Milling Machines

Brand	Model	Capacity (in mm)
<b>DMG</b>	DMF260	X 2600 / Y 1100 / Z 900 5th axis : Integrated table Ø1050 & Swivel head (axis B) - Power : 52 kW
<b>CME</b>	BF400	X 2500 / Y 1200 / Z 1500 4th axis Ø 600 Automatic head ( axis C and axis D indexable 1°) - Power : 23 KW
<b>MAZAK</b>	VTC-200B	X 900 / Y 500 / Z 500 Power : 11 KW
<b>MAXIMART</b>	Q-15	X 1520 / Y 800 / Z 700 Power : 20 KW



#### CNC Lathes

Brand	Model	Capacity (in mm)
<b>SCHIESS</b>	12 DS	Ø 1000 x 600 (Type : Vertical)
<b>DOOSAN</b>	PUMA VT900	Ø 900 x 850 (Type : Vertical)
<b>GEMINIS</b>	CNC 5 plus	Ø 800 x 3000
<b>DEAWOO</b>	PUMA 700M	Ø 800 x 2000
<b>URSUS</b>	plus 300	Ø 400 x 2000
<b>DEAWOO</b>	PUMA 400	Ø 400 x 1500
<b>DEAWOO</b>	PUMA 400L	Ø 400 x 2500



#### EDM ( Electrical Discharge Cutting Machine )

Brand	Model	Capacity (in mm)
<b>ONA</b>	RE 400	600 x 300 x 400

#### Saws

Brand	Model	Capacity (in mm)
<b>KASTO</b>	HBA	Horizontal Saw Max Height : 720mm
<b>PEHAKA</b>	HS 540	Horizontal Saw Max Height : 540mm



#### Welding Machines

Brand	Model	Capacity (in mm)
<b>TIG MIGATRONIC</b>	BDH 320	maximum 320 A DC



## Computer-assisted design and production

Creation of machining program for use with our CNC machines.

Our main tool for the implementation of virtual models and parameters:

**Mastercam**

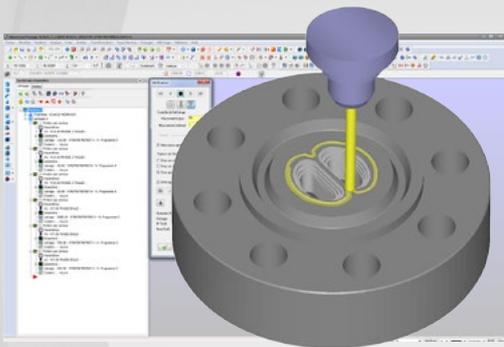


## Pass simulation

Integration of 3D model, definition of path, of cutting parameters, and of the type of tool.

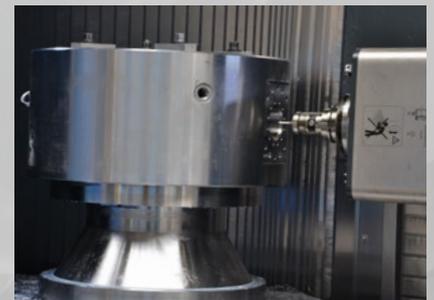
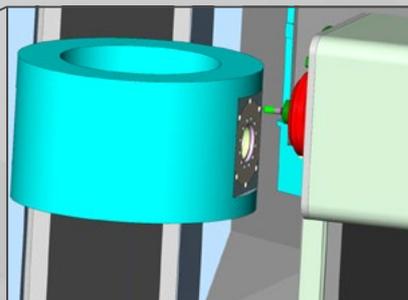
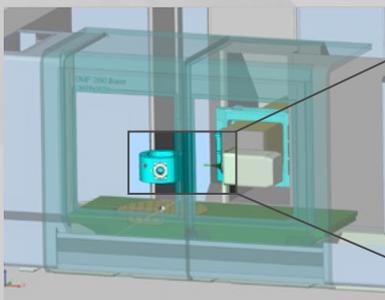
(tool path precision to 0,001mm)

Post-processing output of the NC file, tool list, machining range and transmission of the program to the machine by WiFi.



## Reproduction of machining conditions

Realistic simulation of machining with modelling of the machine, collision assessment, and precise forecasting of the machining time.



# SUBSEA & SPECIAL PIECES

# DESIGN OFFICE

## Custom products & solutions

- Experienced engineering team
- Most advanced modelling & simulation software

- FEA :
  - Samcef field
  - PTC ProMechanica
  - Ansys
- CAD :
  - PTC Pro Engineer / Creo
  - Autodesk Autocad
  - TopSolid
- CAM :
  - Mastercam
- Calculation:
  - PTC Mathcad

SAMTECH

Autodesk

PTC

Mastercam

ANSYS

TopSolid

## Our services

- Design and manufacture of custom products
- 3D modelling services
- FEA Analysis
- Calculations
- Reverse engineering services



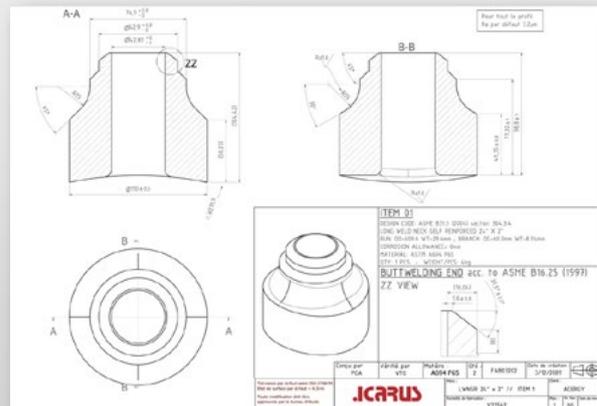
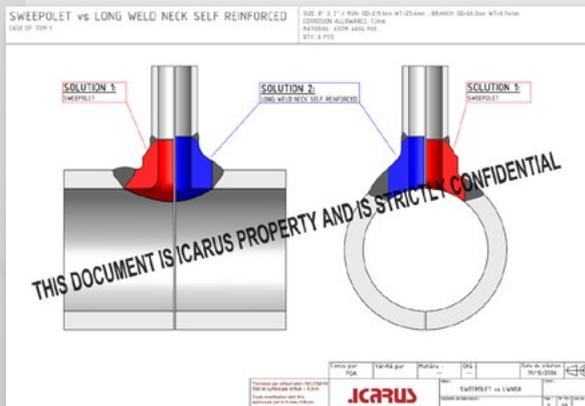
FEA ANALYSIS



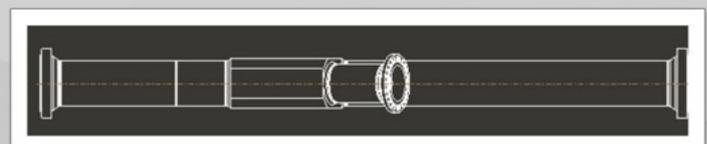
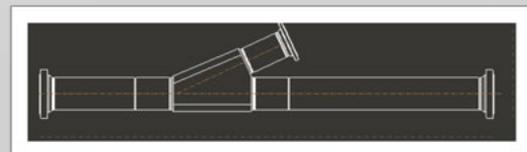
DETAILED CALCULATION NOTES

## Design

Long welding neck self reinforced



Wyes



# Calculation note

## Compact Flange



**Welding Neck CF 11"**  
Client : Saipem for Total Pazflor project

## Weldolet

**Weldolet 10" x 2"**  
Client : SBM - Cidade de Marica project

# Inhouse FEA calculation

# Examples of custom projects

- Special compact flanged joint design (based on NORSOK L-005) : including swivel ring flanges, out of standard welding neck flanges, development of special connections for cryogenic applications.
- Special flanged joint design (based on ASME B16.5 or API 6A / 17D) : swivel ring flanges.
- Calculation of branch outlet : "Common" solutions as weldolet, design of special branch outlet called the Long Weld Neck Self Reinforced.
- Development of all kind of pressure related equipment.

# SERVICES

# OVERVIEW

## Supply of complete package

We are able to provide you a complete package of products for your project

- Standard or special valves
- Piping & fittings
- Special parts from Engineering (flanges, forgings, etc.)

## Services provided

The entire range of supplied products is supported by an offer of complete services

- Quality assurance / Quality control
- Contract review
- Proven project management
- Following standards and specifications required by each project
- ITP management
- Third-party inspection
- Expediting
- Certificate management
- ...

## Quality assurance

Details of certifications by site available on demand



## Dimensional analysis

### Specific measurement tools

- FARO 3D measuring arm
- Wenzel 3D measuring table
- Someco Dynascan profile projector
- Coating thickness measurement tool
- Ultrasonic thickness measurement



## Test range

### Non-destructive tests

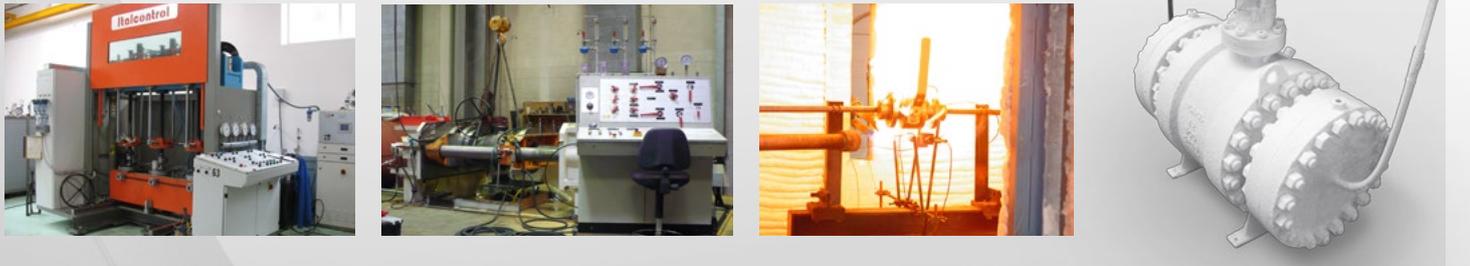
- Magnetic particle examination
- Dye Penetrant test
- PMI
- Feritscope®
- Hardness
- Ultrasonic test
- X-ray
- Pig gauge trial



## Simulation of extreme conditions

### Specific service or environment

- High pressure ( air / gas / water )
- Fugitive emission test (helium)
- Cryogenic test
- Fire test



## Pressure tests

### Test capacities:

- Hydraulic up to 1200 bars
- Pneumatic up to 6 bars
- High pressure gas up to 1000 bars
- Cryogenic down to -196°C
- Leak detection test (with helium)

### Test equipment:

- Presses
- Safety bunkers for pressure tests
- Cryogenic tanks

