PETROBRAS	**TECHNICAL SPECIFICATION**	Nº: I-ET-5000.00-2221-220-PEI-001	
	CLIENT: INDUSTRIAL		SHEET: 1 of 19
	JOB: BASIC DESIGN SPECIFICATIONS		CC: -
	AREA: FLUID CATALYTIC CRACKING UNIT		
SRGE	TITLE: **CATALYST VALVES**		NP-1
			SRGE/ERGE

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INDEX OF REVISIONS

REV.	DESCRIPTION AND/OR REVISED SHEETS
0	ORIGINAL ISSUE.
A	VALVE MATERIAL DATA SHEET INCLUDED IN ANNEX, PIPE SPEC M44 INCLUDED. SLIDE VALVES CHANGED TO BLOCK VALVE TYPE.
B	INCLUDED PIPE SPEC C1 AND ELSEWHERE INDICATED.

	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E	REV. F	REV. G	REV. H
DATE	15/FEB/18	02/OUT/20	27/JUN/21						
DESIGN	EETC/EBET	EQET	EQET						
EXECUTION	MEDEIROS	BR15	BR15						
CHECK	C.MENDONCA	HR77	UPSD						
APPROVAL	ARTUR	CSOY	CFT3						

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FORM OWNED TO PETROBRAS N-0381 REV. L

1 PURPOSES

This specification stablishes the technical requirements for valves to be used in catalyst piping in FCCU converters, supplementary to piping material specification for catalyst service.

The piping systems covered by this specification are:

- Catalyst withdrawal piping from regenerator, disengager, FCCU risers and standpipes to catalyst drums.
- Flue gas piping from regenerator, with catalyst content;
- Catalyst feed piping from catalyst drum to regenerator;
- Catalyst withdrawal piping from third stage separation cyclones system;
- Auxiliary branch piping for steam or air service connected to main catalyst piping or valves (up to the pipe spec break). Those branch piping are for purge or acceleration service.

2 REFERENCE DOCUMENTS

2.1 ABNT NBR 15827 – Válvulas industriais para instalações de exploração, produção, refino e transporte de produtos de petróleo – Requisitos de projeto e ensaio de protótipo;

2.2 API Std 599 – Metal Plug Valves – Flanged, Threaded and Welding Ends;

2.3 API Spec 6D – Specification for Pipeline and Piping Valves;

2.4 API Std 600 – Steel Gate Valves – Flanged and Butt-welding Ends, Bolted Bonnets;

2.5 ASME B16.34 – Valves - Flanged, Threaded, and Welding End;

2.6 MSS SP-45 – By-pass and drain connections.

3 GENERAL REQUIREMENTS

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3.1 The following Piping Material Specifications (piping specs) are covered by this Technical Specification: B1, C1, M20, M21, M28 and M44. The technical requirements supplement the descriptions on those piping specs.

3.2 The supplier shall give references of application of those valves in piping conducting catalyst in Fluid Catalytic Cracking Units in Petroleum Refineries or other solids with comparable service in the Petroleum or Petrochemical Industry. It should be demonstrated that those operate successfully for at least five years. PETROBRAS should evaluate this demonstration at Technical evaluation stage.

3.3 The supplier shall guarantee that the valve is free from fabrication defects, and that materials and mechanical design are adequate for service, for five years of operation.

3.4 Deviations and exceptions to these specifications shall be clearly identified in the supply proposal. If not, PETROBRAS will assume full acceptance to these Technical Specification.

3.5 The accordance to these Technical Specifications does not exempt the supplier responsibility to include components or requirements considered necessary from its point of view to specified service.

3.6 The supplier shall issue a spare parts list and a maintenance plan attached to the main supply proposal with separated prices.

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3.7 The hard coating shall be applied in inner parts in contact with catalyst, such as the body, seats, disk and stem, even that the exposure occurs eventually. Material: CoCr lining (Stellite 6), with 3 mm thickness or equivalent shall be used. The minimum hardness shall be 40 HRC.

3.8 Purge connections shall be, at least, NPS ¾ for valves up to NPS 8 and NPS 1 for valves NPS 10 and greater.

3.9 Block valves for catalyst service shall be preferably wedgeplug valves or metal seated ball valves. Slide valves may be eventually used for block valve function, but they are preferable as regulation or control valve.

4 BLOCK VALVES

4.1 GATE VALVES

4.1.1 Gate valves shall not be used as block valves for main lines of catalyst flow. However, they may be used as block valves for auxiliary lines connected to catalyst lines or main catalyst valves or lines submitted to eventual catalyst flow or low content of catalyst. Examples: air or steam purge systems of valves, aeration lines, drains, and vents.

4.1.2 Gate valves listed in the pipe specs under this Technical Specification scope (item 3.1) shall be used at the pipe spec break in the auxiliary piping connected to purge system of catalyst valves (See Figure 1).

4.1.3 Gate valves descriptions shall be according to the pipe specs listed on item 3.1.

4.1.4 Gate valves shall be provided with connections for purging with air or steam as per figure 1(a) of ASME B16.34, positions J, K and G.

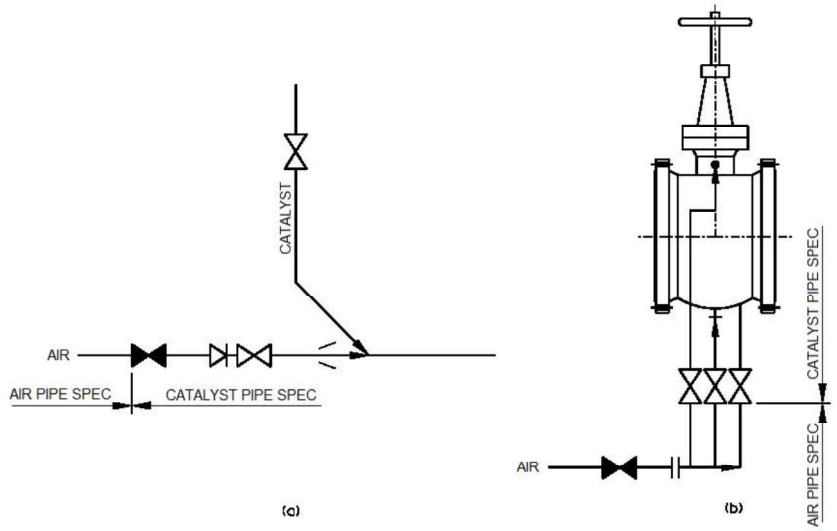


Figure 1 – Pipe spec break for catalyst service.

4.2 BALL VALVES

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4.2.1 Metal seated ball valves shall be according to the description on Piping Material Specification listed item 3.1 and valve data sheet on ANNEX I, ANNEX III, ANNEX V, ANNEX VII, ANNEX IX, ANNEX XI and ANNEX XI. Those valves shall be used as on-off valves at catalyst main line. Wedgeplug valves according to item 4.3 may be used as an alternative.

4.2.2 Ball and seats shall be hardcoated with 3 mm thick stellite 6 coating. Alternatives may be accepted by PETROBRAS if supplier give guarantees of similar or better erosion resistance.

4.2.3 Floating ball valves shall be provided with one metal seat energized by disc spring of high resistance and a rigid seat fixed to the valve body.

4.2.4 Trunnion type ball valve shall be provided with two spring loaded seats, of high resistance, at both ends of the ball.

4.2.5 Manufacturer shall define if purge injection is required and inform all the required data (capacity, pressure, temperature, and fluid). In such a case, the ball valves shall be provided with connections for air or steam purge, according to figure 1(c) of ASME B16.34, at the positions H and J. Tangent connections may be accepted if they are installed at opposite positions related to one another. In such a case, one shall be installed at the top of the valve body, while the other shall be installed at the lower portion of the valve body.

4.2.6 In the case manufacturer valve technology is purgeless, only drain connection (position G) is required.

4.3 PLUG VALVES

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4.3.1 Plug valves shall be according to the description on Piping Material Specification listed in item 3.1 and valve data sheet on ANNEX II, ANNEX VI, ANNEX VIII, ANNEX X, ANNEX XII and ANNEX XII. Those valves shall be used as on-off

valves at catalyst main line. Ball valves according to item 4.2 may be used as an alternative.

4.3.2 Plug and seats shall be hard coated with 3 mm thick Stellite 6 coating. Alternatives may be accepted by PETROBRAS if supplier give guarantees of similar or better erosion resistance.

4.3.3 Non-lubricating plug valves shall be used. The opening and closing of such valves are the combination of translation movement (upward or downward) and the 90º rotation movement of the plug. This minimizes the friction between the plug and the seats.

4.3.4 Those valves shall not be used for throttling or to regulate the catalyst flow.

4.3.5 Plug valves shall be supplied with auxiliary connections for purging according to figure 5 of MSS SP-45, at positions C, D and G. The purge system shall be defined by valve suppliers, including piping size, orifice plates, valves, and types, as well as other items considered necessary to the operation of the plug valves.

4.4 SLIDE VALVES

4.4.1 Slide valves may be used in main catalyst lines, with materials according to pipe specs listed in item 3.1.

4.4.2 The disc shall be provided with a sloped end of contact to the guide, in the flow direction, to avoid catalyst deposit to stuck the disk and to provide seating force between the dis and the seat guide, to improve tightness (see Figure 2)

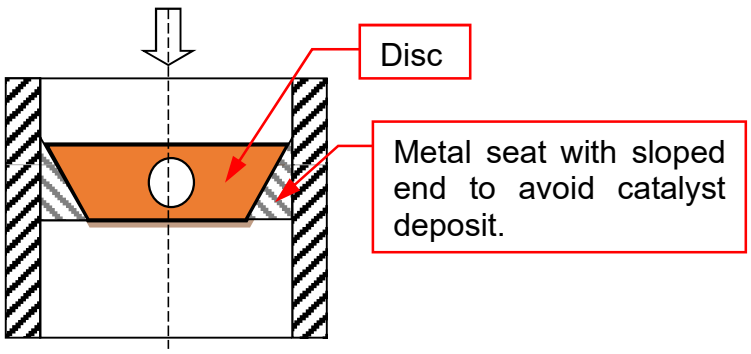


Figure 2 – Slide valve schematic drawing section, with sloped border of the disc.

4.5 ALTERNATIVE VALVE TECHNOLOGIES

4.5.1 Purgeless valves and/or alternative construction of valves not listed in this Specfication may be accepted in main catalyst lines, since the materials are compatible with the corresponding pipe specs listed in item 3.1.

4.5.2 The alternative construction valves shall be successfully in operation for at least five years and have been inspected after at least one UFCC turnaround with small repairs.

4.5.3 Valves shall be fast opening type, similar to quarter turn valves.

5 REGULATING VALVES (THROTTLING)

5.1 GLOBE VALVES

5.1.1 Globe valves shall not be used for throttling in main lines of catalyst flow. However, they may be used as regulating valves for auxiliary lines connected to catalyst lines or main catalyst valves or lines submitted to eventual catalyst flow or low content of catalyst. Examples: air or steam purge systems of valves, aeration lines, drains, and vents. Examples: air or steam purge systems of valves, aeration lines, drains, and vents.

5.1.2 Globe valves that are described at piping material specification under the scope of this Technical Specification (item 3.1), may be used as pipe spec break between auxiliary lines and main catalyst lines (see Figure 1).

5.1.3 For regulation in main catalyst lines, in regenerator or third stage cyclones, slide valves may be used. See item 5.2.

6 CHECK VALVE

6.1 Check valves shall not be used in in main lines of catalyst flow. However, they may be used for auxiliary lines connected to catalyst lines or main catalyst valves or lines submitted to eventual catalyst flow or low content of catalyst. Examples: air or steam purge systems of valves, aeration lines, drains, and vents.

6.2 Check valves that are described at piping material specification under the scope of this Technical Specification (item 3.1), may be used at the auxiliary lines (see Figure 1).

6.3 Check valves may be sized to keep opened at the normal operating conditions of the main catalyst lines where the auxiliary lines are connected. Special attention shall be given to sizing of piston, ball, or discs, to avoid misuse closing.

7 ANNEX

The Valve Description Sheet applicable to the block valves according to items 4.2 and 4.3 under the scope of this technical specification are listed in the annex.

ANNEX I – BALL VALVES – Pipe Spec B1;

ANNEX II – PLUG VALVES – Pipe Spec B1;

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ANNEX III – BALL VALVES – Pipe Spec C1

ANNEX IV – PLUG VALVES – Pipe Spec C1;

ANNEX V – BALL VALVES – Pipe Spec M20;

ANNEX VI – PLUG VALVES – Pipe Spec M20;

ANNEX VII – BALL VALVES – Pipe Spec M21;

ANNEX VIII – PLUG VALVES – Pipe Spec M21;

ANNEX IX – BALL VALVES – Pipe Spec M28;

ANNEX X – PLUG VALVES – Pipe Spec M28;

ANNEX XI - BALL VALVES – Pipe Spec M44;

ANNEX XII – PLUG VALVES – Pipe Spec M44.

ANNEX I – BALL VALVES – Pipe Spec B1

CHARACTERISTIC	DESCRIPTION	
1 – Type	Ball Valve	
2 - Operation	Manual	
3 - Standard	API 6D	
4 – Diameter Range	2 to 10	
5 – Ends	Flanged ends ASME B16.5 RF	
6 – Flange Facing	ASME B16.5	
7 – Pressure Class	150	
8 – Body Construction	Flanged body Parts	
9 – Body Material	ASTM A216 Gr. WCB	
10 – Port	Full Port	
11 – Trim Material	Stellite 6 seat and AISI 410 coated by Stellite 6	
12 – Type of actuation	2 to 4	Lever
	6 to 10	Gear operated
13 – Construction type	2 to 4	Floating Ball
	6 to 10	Trunion Mounted
14 – Supplementary requirements	ABNT NBR 15827 – Annex C I-ET-5000.00-2221-220-PEI-001	

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ANNEX II – PLUG VALVES – Pipe Spec B1

CHARACTERISTIC	DESCRIPTION	
1 – Type	Wedged Plug Valve	
2 - Operation	Manual	
3 - Standard	API Std 599	
4 – Diameter Range	2 to 10	
5 – Ends	Flanged ends ASME B16.5 RF	
6 – Flange Facing	ASME B16.5	
7 – Pressure Class	150	
8 – Construction	Wedge Plug	
9 – Body Material	ASTM A216 Gr. WCB	
10 – Port	Reduced Port	
11 – Trim Material	Stellite 6 seat and AISI 410 coated by Stellite 6	
12 – Type of actuation	2 to 4	Lever
	6 to 10	Gear operated
13 – Obturator assembly type	Ascending and Descending Plug	
14 – Supplementary requirements	I-ET-5000.00-2221-220-PEI-001	

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ANNEX III – BALL VALVES – Pipe Spec C1

CHARACTERISTIC	DESCRIPTION	
1 – Type	Ball Valve	
2 - Operation	Manual	
3 - Standard	API 6D	
4 – Diameter Range	2 to 10	
5 – Ends	Flanged ends ASME B16.5 RF	
6 – Flange Facing	ASME B16.5	
7 – Pressure Class	300	
8 – Body Construction	Flanged body Parts	
9 – Body Material	ASTM A216 Gr. WCB	
10 – Port	Full Port	
11 – Trim Material	Stellite 6 seat and AISI 410 coated by Stellite 6	
12 – Type of actuation	2 to 4	Lever
	6 to 10	Gear operated
13 – Construction type	2 to 4	Floating Ball
	6 to 10	Trunion Mounted
14 – Supplementary requirements	ABNT NBR 15827 – Annex C I-ET-5000.00-2221-220-PEI-001	

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ANNEX IV – PLUG VALVES – Pipe Spec C1

CHARACTERISTIC	DESCRIPTION	
1 – Type	Wedged Plug Valve	
2 - Operation	Manual	
3 - Standard	API Std 599	
4 – Diameter Range	2 to 10	
5 – Ends	Flanged ends ASME B16.5 RF	
6 – Flange Facing	ASME B16.5	
7 – Pressure Class	300	
8 – Construction	Wedge Plug	
9 – Body Material	ASTM A216 Gr. WCB	
10 – Port	Reduced Port	
11 – Trim Material	Stellite 6 seat and AISI 410 coated by Stellite 6	
12 – Type of actuation	2 to 4	Lever
	6 to 10	Gear operated
13 – Obturator assembly type	Ascending and Descending Plug	
14 – Supplementary requirements	I-ET-5000.00-2221-220-PEI-001	

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ANNEX V – BALL VALVES – Pipe Spec M20

CHARACTERISTIC	DESCRIPTION	
1 – Type	Ball Valve	
2 - Operation	Manual	
3 - Standard	API 6D	
4 – Diameter Range	2 to 14	
5 – Ends	Flanged ends ASME B16.5 RF	
6 – Flange Facing	ASME B16.5	
7 – Pressure Class	300	
8 – Body Construction	Flanged body Parts	
9 – Body Material	ASTM A351 Gr. CF10	
10 – Port	Full Port	
11 – Trim Material	Stellite 6 seat and AISI 347 coated by Stellite 6	
12 – Type of actuation	2 to 4	Lever
	6 to 14	Gear operated
13 – Construction type	2 to 4	Floating Ball
	6 to 10	Trunnion Mounted
14 – Supplementary requirements	ABNT NBR 15827 – Annex C I-ET-5000.00-2221-220-PEI-001	

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ANNEX VI – PLUG VALVES – Pipe Spec M20

CHARACTERISTIC	DESCRIPTION	
1 – Type	Wedged Plug Valve	
2 - Operation	Manual	
3 - Standard	API Std 599	
4 – Diameter Range	2 to 10	
5 – Ends	Flanged ends ASME B16.5 RF	
6 – Flange Facing	ASME B16.5	
7 – Pressure Class	300	
8 – Construction	Wedge Plug	
9 – Body Material	ASTM A351 Gr. CF10	
10 – Port	Reduced Port	
11 – Trim Material	Stellite 6 seat and AISI 347 coated by Stellite 6	
12 – Type of actuation	2 to 4	Lever
	6 to 14	Gear operated
13 – Obturator assembly type	Ascending and Descending Plug	
14 – Supplementary requirements	I-ET-5000.00-2221-220-PEI-001	

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ANNEX VII – BALL VALVES – Pipe Spec M21

CHARACTERISTIC	DESCRIPTION	
1 – Type	Ball Valve	
2 - Operation	Manual	
3 - Standard	API 6D	
4 – Diameter Range	2 to 10	
5 – Ends	Flanged ends ASME B16.5 RF	
6 – Flange Facing	ASME B16.5	
7 – Pressure Class	300	
8 – Body Construction	Flanged body Parts	
9 – Body Material	ASTM A217 Gr. C5	
10 – Port	Full Port	
11 – Trim Material	Stellite 6 seat and AISI 304 coated by Stellite 6	
12 – Type of actuation	2 to 4	Lever
	6 to 10	Gear operated
13 – Construction type	2 to 4	Floating Ball
	6 to 10	Trunnion Mounted
14 – Supplementary requirements	ABNT NBR 15827 – Annex C I-ET-5000.00-2221-220-PEI-001	

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ANNEX VIII – PLUG VALVES – Pipe Spec M21

CHARACTERISTIC	DESCRIPTION	
1 – Type	Wedged Plug Valve	
2 - Operation	Manual	
3 - Standard	API Std 599	
4 – Diameter Range	2 to 10	
5 – Ends	Flanged ends ASME B16.5 RF	
6 – Flange Facing	ASME B16.5	
7 – Pressure Class	300	
8 – Construction	Wedge Plug	
9 – Body Material	ASTM A217 Gr. C5	
10 – Port	Reduced Port	
11 – Trim Material	Stellite 6 seat and AISI 304 coated by Stellite 6	
12 – Type of actuation	2 to 4	Floating Ball
	6 to 10	Trunnion Mounted
13 – Obturator assembly type	Ascending and Descending Plug	
14 – Supplementary requirements	I-ET-5000.00-2221-220-PEI-001	

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ANNEX IX – BALL VALVES – Pipe Spec M28

CHARACTERISTIC	DESCRIPTION	
1 – Type	Ball Valve	
2 - Operation	Manual	
3 - Standard	API 6D	
4 – Diameter Range	2 to 14	
5 – Ends	Flanged ends ASME B16.5 RF	
6 – Flange Facing	ASME B16.5	
7 – Pressure Class	300	
8 – Body Construction	Flanged body Parts	
9 – Body Material	ASTM A351 Gr. CF8C	
10 – Port	Full Port	
11 – Trim Material	Stellite 6 seat and AISI 347 coated by Stellite 6	
12 – Type of actuation	2 to 4	Lever
	6 to 14	Gear operated
13 – Construction type	2 to 4	Floating Ball
	6 to 10	Trunnion Mounted
14 – Supplementary requirements	ABNT NBR 15827 – Annex C I-ET-5000.00-2221-220-PEI-001	

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ANNEX X – PLUG VALVES – Pipe Spec M28

CHARACTERISTIC	DESCRIPTION	
1 – Type	Wedged Plug Valve	
2 - Operation	Manual	
3 - Standard	API Std 599	
4 – Diameter Range	2 to 10	
5 – Ends	Flanged ends ASME B16.5 RF	
6 – Flange Facing	ASME B16.5	
7 – Pressure Class	300	
8 – Construction	Wedge Plug	
9 – Body Material	ASTM A351 Gr. CF8C	
10 – Port	Reduced Port	
11 – Trim Material	Stellite 6 seat and AISI 347 coated by Stellite 6	
12 – Type of actuation	2 to 4	Lever
	6 to 14	Gear operated
13 – Obturator assembly type	Ascending and Descending Plug	
14 – Supplementary requirements	I-ET-5000.00-2221-220-PEI-001	

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ANNEX XI - BALL VALVES – Pipe Spec M44

CHARACTERISTIC	DESCRIPTION	
1 – Type	Ball Valve	
2 - Operation	Manual	
3 - Standard	API 6D	
4 – Diameter Range	2 to 14	
5 – Ends	Flanged ends ASME B16.5 RF	
6 – Flange Facing	ASME B16.5	
7 – Pressure Class	300	
8 – Body Construction	Flanged body Parts	
9 – Body Material	ASTM A217 Gr. C12	
10 – Port	Full Port	
11 – Trim Material	Stellite 6 seat and AISI 347 coated by Stellite 6	
12 – Type of actuation	2 to 4	Lever
	6 to 10	Gear operated
13 – Construction type	2 to 4	Floating Ball
	6 to 10	Trunnion Mounted
14 – Supplementary requirements	ABNT NBR 15827 – Annex C I-ET-5000.00-2221-220-PEI-001	

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ANNEX XII – PLUG VALVES – Pipe Spec M44

CHARACTERISTIC	DESCRIPTION	
1 – Type	Wedged Plug Valve	
2 - Operation	Manual	
3 - Standard	API Std 599	
4 – Diameter Range	2 to 10	
5 – Ends	Flanged ends ASME B16.5 RF	
6 – Flange Facing	ASME B16.5	
7 – Pressure Class	300	
8 – Construction	Wedge Plug	
9 – Body Material	ASTM A217 Gr. C12	
10 – Port	Reduced Port	
11 – Trim Material	Stellite 6 seat and AISI 347 coated by Stellite 6	
12 – Type of actuation	2 to 4	Lever
	6 to 14	Gear operated
13 – Obturator assembly type	Ascending and Descending Plug	
14 – Supplementary requirements	I-ET-5000.00-2221-220-PEI-001	