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1 Subject of specification

This specification used in conjunction with standard technical specifications of LOTOS Group S.A. establishes the minimum requirements for the design, manufacture, erection, inspection and tests for different types of equipment, machines, apparatuses, pipelines and lists all norms/standards connected to them

2 Scope of validity

This specification applies to the preparation of tender documents, inquiries and contracts concerning new investments and modernization projects planned by LOTOS Group S.A.

It shall also be a basis for preparing both detailed specifications and inquiries for individual or package unit supplies.

2.1 Deviations

Any deviations from this specification and relevant specifications, standards and documents, including the bidder's proposals indicating a more economic design or solution, shall be submitted in writing for checking and approval by LOTOS Group S.A.
No deviation or modification shall be permitted unless confirmed by LOTOS.

The bidder shall present in written form any ambiguity or conflict between this standard any other LOTOS Group S.A standards or other quoted documents/standards, and shall receive LOTOS Group's written explanation.

2.2 Exclusions

This specification does not cover the design of vessels, equipment and utility media pipelines, it only defines the properties and parameters of available media.

3 Definitions

Pressure and temperature

The MINIMUM utility pressure and temperature denote the lowest values of pressure and temperature in the main area header during operation. These are the parameters which permit the determination of the minimum conditions at inlet and outlet of the specified equipment. Utility consuming equipment connected to the utility header should be as a rule specified for the minimum utility conditions, although it must operate properly within the full range of the utility parameters occurring in the header, between the minimum and the maximum.

The NORMAL utility pressure and temperature denote the parameters in the area header during normal operation and are the conditions upon which the utility consumption of equipment is determined and the mass and heat balances are made .

The MAXIMUM utility pressure and temperature denote the highest values of pressure and temperature that can occur in the header. Steam-generating equipment connected to the steam header should be as a rule specified for the maximum steam conditions, but it must also operate properly within the full range of header parameters between the minimum and the maximum.

The DESIGN pressure and temperature are the conditions specified for mechanical design of equipment and piping, unless there are other design guidelines or standards governing the equipment in question.

4 Description

The specification characterises utilities in the main headers within the battery limits of individual plants.

Utility media used in Lotos Group S.A.:

- Low-pressure steam
- Medium-pressure steam
- Medium-pressure superheated steam
- Condensate
- Instruments air
- Industrial air
- Low-pressure nitrogen
- High-pressure nitrogen
- Nitrogen for reworking of catalyst
- Raw water
- Fire water
- Industrial water
- Cooling water
- Decarbonized water
- Demineralized water
- Boiler water
- Potable water
- Fuel gas
- Fuel oil

4.1 General design requirements for utility flow measurements used for balance calculations

Utility consumption and production shall be balanced separately for each process plant. Pressure and temperature measuring devices as well as devices for flow measurement and balancing shall be installed on the main headers that convey utility supplied from the battery limits and utility sent to an external network. A measuring device shall permit the measurement of the flow to and from the plant in the case of a two-directional flow. Measuring devices shall be adjusted to the type of medium and its parameters and shall meet the requirements contained in LOTOS Group's Specifications for instruments.

The accuracy of balance measurements for fuel gas and fuel oil shall be max. 0.5%, and max.1% for other media.

Gas and steam flow measurements shall be compensated for temperature and pressure. For nitrogen, air and fuel gas flow shall be expressed in units of volume reduced to normal conditions (i.e. a pressure of P=101.325 kPa and temperature of T=273.15 K): Nm3/h. Steam flow shall be expressed in units of mass: kg/h.

For liquids, flow measurements shall be compensated for temperature and expressed in units of mass: kg/h.

4.2 Characteristics of utilities

4.2.1 Low-pressure steam, medium-pressure steam, medium-pressure superheated steam

Parameter		Low-pressure steam	Medium-pressure steam	Medium-pressure superheated steam
Pressure MPa (g)	min.	0.35	1.8	1.8
	norm.	0.45	1.9	1.9
	max.	0.60	2.2	2.2
	design	1.00	2.5	2.5
Temperature °C	min.	170	220	320
	norm.	200	250	340
	max.	240	275	360
	design	260	300	375

4.2.2 Condensate

	min.	norm.	max.	design
Pressure MPa g	0.05	0.1	0.4	1.0
Temperature °C	100	130	145	260

4.2.3 Instruments and industrial air

Parameter		Instruments air	Repair air
Pressure MPa g	min.	0,5	0,0
	norm.	0,6	0.7
	max.	0,7	0.8
	design	1,0	1.0
Temperature °C	min.	-25	
	norm.	ambient	ambient
Dew point °C		below -39 °C at 0,7 MPa g	+3

4.2.4 Low-pressure nitrogen, high-pressure nitrogen, nitrogen for reworking of catalyst at Plant 450

Parameter		Low-pressure nitrogen	High-pressure nitrogen	Nitrogen for reworking of catalyst
Pressure MPa g	min.	0.40	0.60	0.60
	norm.	0.50	3.30	0.72
	max.	0.55	3.50	0.90
	design	0.70	3.53	0.93
Temperature ^{o}C		ambient	ambient	ambient
Nitrogen cont. % vol.		99.9	99.9	99.9
CO_2 cont . ppm max.		20	20	20
CO cont. ppm max.		20	20	20
O_2 cont. ppm max.		10	10	10
HC cont. ppm max.		5	5	5
H_2O cont. ppm max.		5	5	5
H_2cont. ppm max.		20	20	20
Cl cont. ppm max.		1	1	1

4.2.5 Raw water, fire water, industrial water, cooling water

Parameter		Raw water	Fire water	Industrial water	Cooling water
Supply pressure MPa g	min.	0.25			0.28
	norm.	0.40	0.60	0.6	0.35
	max.	0.54	1.25	0.8	0.50
	design	0.60	1.60	0.8	0.60
Pressure at return MPa g					0.12
temperature ^{o}C	supply	11	18	15	20-26
	design	55	55	55	55
Return temperature ^{o}C					38
Conductivity µS/cm		730	1100	1200	1150
pH		7.8	8.2	7.8-8.2	8.3
Hardness as $CaCO_3$ ppm		310	150		290
Cl content ppm		35	200	250	115

4.2.6 Decarbonized water, demineralized water, boiler water, potable water

Parameter		Decarbonized water	Demi water	Boiler water	Potable water
Supply pressure MPa g	min.	0,40	0.30	3.0	
	norm.		0.45	3.5	0.22
	max.	0,50		3.9	
	design	0,60	0.60	4.0	0.60
Supply temperature °C	norm.	<30	30	130	12
	design	55	55	145	55
Conductivity µS/cm			2.5	2.5	700
pH		9.5-11.0	8.2	8.9-9.2	7.7-8.3
Hardness	Nval/l		0	0	1.2
SiO_2	ppb		< 20	< 20	30
Oxigen	ppm			0.02	
Iron	ppb	100	20	20	
Copper	ppm		0.01	0.01	
SO_4	ppm				15-20
NO_3	ppm				0.1 - 0.5
NO_2	ppm				0.01 - 0.07

4.2.7 Fuel gas

Refinery fuel gas is a mixture of hydrogen and hydrocarbons from methane to pentane. During the plant start-up it is a mixture of propane and butane. Average gas parameters are as follows:

Parameter		Value
Pressure MPa g	min.	0.30
	norm.	0.35
	max.	0.50
	design	0.52
Temperature °C	min.	
	norm.	75
	max.	90
	design	120

Average, representative composition of fuel gas:

Hydrogen 39 % vol.

Methane 12 % vol.

Ethane 16 % vol.

Propane 14 % vol.

Butanes 18 % vol.

Pentanes 1% vol.

Hydrogen sulfide 50 ppm

Mixture density in normal conditions approx. 1.1 kg/Nm^3

Net calorific value 49 - 50 GJ/Mg

4.2.8 Fuel oil

Density at temp. 20^oC	920-980 kg/ m^3
Viscosity max at temp. 100 ^oC	150 cSt at 100 ^oC
Working temperature	160 - 180º C
Design temperature	200º C
Pressure norm.	1.0 MPa g
max.	1.4 MPa g
design	1,5 MPa g
Net calorific value	42 GJ/Mg

5 Relevant documents

Instrumentation Standards:

- 3410 Pressure measurement instruments
- 3420 Flow measurement instruments
- 3430 Temperature measurement instruments
- 3010 Instrumentation general requirements

6 Record of changes

No.	Date	Description	Introduced by
1		This specification entirely replaces the former LOTOS Group S.A. standard No. PR 07 110with the same title.	T. Wróbel
2	16-03-2007 (rev.2)	Instrument air parameters correction	T.Wróbel
-	31-08-2015	Page layout corrections, no contents changes.	T. Wróbel