APPENDIX A DATA SHEETS

The pipe data sheets listed below are in accordance with [36] for the proposed structure.

Some particularities of the pipe design might be changed due to future updates during project phase.

For some analysis, the resulting values are addressed to external documents as per reference list of each structure.

List of External Data Providers

Note Nr	Name
1	Design Premise (15762-DOC-ENG-100)
2	BFLEX
3	ABC Crossana
4	Thermal model
5	FEA Collapse
6	Pipeflex
7	Installation Feasibility (15762-DOC-MNL-100)
8	Fatigue Report
9	Lateral Buckling
10	FEA Crushing
11	LWS (Local Wire Stress)
12	Global analysis report
13	I-ET-3000.00-1519-291-PAZ-001 rev. 0

1 - GENERAL DATA		
Manufacturer identification		15762-PID-401_SF-04 rev. 03
Pipe family as per table 1 of API RP 17B 3rd edition		III
Flexible pipe structure identification code		15762-PID-401_SF-04 rev. 03
Application		ID 4" service flowline
Internal diameter	mm	101.60
Internal diameter	inch	4.00
Outside diameter	mm	165.64
Service (sweet or sour)		Sour
Maximum design pressure (diff)	MPa	20.7
Minimum design pressure (abs)	MPa	0.10
Design maximum temperature	°C	60
Design minimum temperature	°C	4
Maximum pressure differential	MPa	10.48
Maximum specified water depth	m	1065
Hydrostatic pressure test (FAT)	MPa	26.9

2 - STRUCTURE COMPOSITION DATA - PART 1						
Layer No	Layer Description	Type	Generic Specification Code	Commercial Name	σu [MPa]	Elongation at Break (%)
1	Carcass	Interlocked Spiral	Duplex AISI 2101	Duplex 2101	700	30
2	Low Strength Tape	Tape	Polymer fiber	Diolen	-	-
3	Low Strength Tape	Tape	Polymer fiber	Diolen	-	-
4	Internal Pressure Sheath	Extruded Layer	HDPE Neutral	HDPE Neutral	25	500
5	Pressure Armour	Interlocked Spiral	Carbon Steel	Sour 800 grade	970	5
5	Pressure Armour	Interlocked Spiral	Carbon Steel	Sour 800 grade	970	5
6	Low Strength Tape	Tape	Polymer fiber	Diolen	-	-
7	Tensile Armour	Helical Wires		Sour 1000 grade	1111	5
8	Low Strength Tape	Tape	Polymer fiber	Diolen	-	-
9	Tensile Armour	Helical Wires		Sour 1000 grade	1111	5
10	Low Strength Tape	Tape	Polymer fiber	Diolen	-	-
11	Low Strength Tape	Tape	Polymer fiber	Diolen	-	-
12	Low Strength Tape	Tape	Polymer fiber	Diolen	-	-
13	Outer Sheath	Extruded Layer	HDPE Yellow	HDPE Yellow	25	500

2 - STRUCTURE COMPOSITION DATA - PART 2							
Layer No	Commercial Name	Wire Width X Thickness (mm x mm)	Mass (kg/m)	No. elements	Lay Angle (Deg)	ID (mm)	Thickness (mm)
1	Duplex 2101	50.0x1.0	8.06	1	87.23	101.60	6.00
2	Diolen	100.0x0.2	0.11	2	-73.28	113.60	0.39
3	Diolen	100.0x0.2	0.11	2	-73.40	114.38	0.39
4	HDPE Neutral	-	2.36	-	-	115.15	6.50
5	Sour 800 grade	10.0x2.2	-	2	87.01	128.15	-

5	Sour 800 grade	10.0x2.2	12.37	2	87.10	-	4.40
6	Diolen	100.0x0.2	0.09	2	-69.64	136.95	0.27
7	Sour 1000 grade	7.5x3.0	9.41	48	25.56	137.49	3.00
8	Diolen	100.0x0.2	0.10	2	-71.94	143.49	0.29
9	Sour 1000 grade	7.5x3.0	9.77	50	-25.22	144.06	3.00
10	Diolen	100.0x0.2	0.11	2	73.65	150.06	0.30
11	Diolen	100.0x0.2	0.11	2	-73.71	150.66	0.30
12	Diolen	100.0x0.2	0.15	2	-77.51	151.26	0.39
13	HDPE Yellow	-	3.21	-	-	152.04	6.80

3A- TECHNICAL DATA

Item	Description	Unit	Value
1	Internal diameter	inch	4.00
2	Outside diameter	mm	165.64
3	External volume per unitary length	dm^3/m	21.55
4	Internal volume per unitary length	dm^3/m	9.10
5	Free volume in armour annulus	dm^3/m	0.53
6	Weight in air empty	N/m (kgf/m)	451 (45.97)
7	Weight in air full of sea water	N/m (kgf/m)	542.5 (55.3)
8	Weight in sea water empty	N/m (kgf/m)	234.3 (23.9)
9	Weight in sea water full of sea water	N/m (kgf/m)	325.9 (33.2)
10	Specific gravity in sea water empty	kg/m^3	1109.00
11	Specific gravity in air empty	kg/m^3	2134.00
12	Calculated burst pressure	MPa	69.40
13	Calculated hydrostatic collapse resistance [Ref. 6.2.3 of I-ET-3000.00.6500-291-PAZ-038 Rev.0]	MPa	16.6 @ 1652.7m
14	Calculated hydrostatic collapse resistance considering the effects of crushing loads [Ref. 9.4.5 (h) of I-ET-3000.00.6500-291-PAZ-038 Rev.0]	MPa	16.6 @ 1652.7m
15	Damaging pull in straight line	kN	1831.10

16	Maximum working tension (allowable effective tension for normal operation at start of life)	kN	935.70
17	Minimum bending radius for storage at 20°C	m	1.15
18	Minimum bending radius for laying at 20°C	m	2.43
19	Minimum bending radius for operation at 20°C	m	2.43
20	Natural bending radius for laying at the temperature of the maximum specified water depth and atmospheric pressure (inside and outside)	m	4.07
21	Natural bending radius at maximum inner operating temperature, the temperature of maximum outside water depth, maximum inner operating pressure, and pressure equivalent to maximum outside water depth	m	3.75
22	Axial stiffness (EA) at 20°C and atmospheric pressure (inside and outside)	kN	331736.20
23	Axial stiffness to compression at 20°C and with atmospheric pressure (inside and outside)	kN	57900 @ 1065m
24	Bending stiffness (EI) at 20°C and atmospheric pressure (inside and outside)	$kN.m^2$	Moment curvature load case 1 and 8
25	Bending stiffness (EI) at the temperature of the maximum specified water depth and atmospheric pressure (inside and outside)	$kN.m^2$	Moment curvature load case 2 and 9
26	Bending stiffness (EI) at the temperature of the maximum specified water depth (inside and outside), atmospheric pressure inside and pressure equivalent of the maximum specified water depth outside	$kN.m^2$	Moment curvature load case 3 and 10
27	Bending stiffness (EI) at the temperature of the maximum specified water depth (inside and outside) and pressure equivalent of the maximum specified water depth	$kN.m^2$	Moment curvature load case 4 and 11
28	Bending stiffness (EI) at the temperature of the maximum specified water depth (inside and outside), maximum operating pressure inside and pressure equivalent of the maximum specified water depth outside	$kN.m^2$	Moment curvature load case 5 and 12
29	Bending stiffness (EI) at operating maximum temperature inside, 20°C outside, maximum operating pressure inside, and atmospheric pressure outside	$kN.m^2$	Moment curvature load case 6 and 13
30	Bending stiffness (EI) at operating maximum temperature inside, the temperature of the maximum specified water depth outside, maximum operating pressure inside and the pressure equivalent to the maximum specified water depth outside	$kN.m^2$	Moment curvature load case 7 and 14
31	Limp torsional stiffness (GJ) at 20°C and at the atmospheric pressure inside and outside	Nm^2/rad	-

32	Limp torsional stiffness (GJ) at the temperature of the maximum specified water depth and at the atmospheric pressure inside and outside	Nm^2/rad	-
33	Stiff torsional stiffness (GJ) at 20°C and at the atmospheric pressure inside and outside	Nm^2/rad	396000
34	Stiff torsional stiffness (GJ) at the temperature of the maximum specified water depth and at the atmospheric pressure inside and outside	Nm^2/rad	-
35	Thermal exchange coefficient at the design maximum temperature inside, at the temperature of the maximum specified water depth outside, and with intact outer sheath	W/mK	6.38
36	Thermal exchange coefficient at the design maximum temperature inside, at the temperature of the maximum specified water depth outside, and with damaged outer sheath [Ref 6.4.3.3 of I-ET-3000.00.6500-291-PAZ-038 Rev.0]	W/mK	6.38
37	Equivalent thermal conductivity of flexible pipe layers	W/mK	7.24
38	Equivalent heat capacity of flexible pipe layers	J/(kg.K)	669.28
39	Equivalent volumic mass of flexible pipe layers	kg/m^3	2133.5
40	Spooling tension	kN	-
41	Erosional velocity	m/s	-
42	Dimensions (width/thickness) of pressure armor wire	mm	10x2.2 10x2.2
43	Dimensions (width/thickness) of tensile armor wire	mm	3x7.5
44	Dimensions of carcass strip/wire	mm	1.0x50-Std
45	Friction coefficient between flexible pipe outer sheath and tensioner pad, µ1 as per item 11.4.1.2 of API RP 17B 3rd Edition	µ	0.33 / 0.41 [1]
46	Friction coefficient between flexible pipe outer sheath and underlying armor layer, µ2 as per item 11.4.1.2 of API RP 17B 3rd Edition	µ	0.15 / 0.12 [2]
47	Friction coefficient for tensile armour wire fatigue stress calculation (steel/steel)		0.07
48	Friction coefficient for tensile armour wire fatigue stress calculation (steel/polymer)		0.15 / 0.12 [2]
49	Permissible Tension in straight line without internal pressure [Ref 9.4.5(a) of I-ET-3000.00.6500-291-PAZ-038 Rev.0] (Utilisation as per installation case)	kN	1248.24
50	Permissible Tension at the operation MBR without internal pressure [Ref 9.4.5(a) of I-ET-3000.00.6500-291-PAZ-038 Rev.0] (Utilisation as per installation case)	kN	1061.10

51	Permissible Axial Compression at 20°C inside, at the temperature of the maximum specified water depth outside, atmospheric pressure inside and the pressure equivalent to the maximum specified water depth outside	kN	-50 @ 1065m
52	Maximum fatigue accumulated damage, for the tensile armours, for the specified service life	%	*
53	Maximum fatigue accumulated damage for the pressure armours, for the specified service life	%	*
54	Maximum accumulated wearing for the tensile armours, for the specified service life (% of nominal thickness)	%	*
55	Maximum accumulated wearing for the pressure armours, for the specified service life (% of nominal thickness)	%	*
56	Maximum allowable temperature for the internal pressure sheath to continuously operate along the specified service life considering the specified internal fluid	°C	60
57	Maximum allowable time for the internal pressure sheath to continuously operate under the design maximum temperature and the specified internal fluid	h	219000.00
58	Maximum allowable time for the internal pressure sheath to continuously operate under 3 temperature steps of the specified internal fluid from the operating temperature to the design maximum temperature	(h/h/h)	219000 / 219000 / 219000
59	Permissible crushing load, for each tensioner pad, for the calculated maximum laying tension and maximum specified water depth, with the pipe full of water, for the specified installation vessel	kN/m	*
60	Permissible crushing load, for clamp device, for the calculated maximum laying tension and maximum specified water depth, with the pipe full of water	kN/m	*
61	Permissible laying tension, when flexible pipe is passing through wheel, for specified installation vessel	kN	*
62	Laying tension [Ref Item 3.71 of I-ET-3000.00.6500-291-PAZ-038 Rev.0] for the maximum specified water depth, with the pipe full of water, for the specified installation vessel	kN	*
63	Design tension [Ref Item 3.62 of I-ET-3000.00.6500-291-PAZ-038 Rev.0] obtained from the global analysis for the maximum specified water depth	kN	*
64	Maximum and minimum riser top angle in the bend stiffener region in relation to the neutral position of the catenary obtained from the global analysis for the maximum specified water depth and considering all the design load cases and combinations	° (max/min)	*

65	Minimum bending radius obtained from the global analysis for the maximum specified water depth and considering all the design load cases and combinations	m	*
66	Minimum allowable bending radius for prevention buckling of tensile armour and hydrostatic collapse during installation of the pipe for the intact annulus and empty bore conditions in the Maximum Specified Water Depth	m	1.55
67	Minimum allowable bending radius for prevention buckling of tensile armour and hydrostatic collapse during installation of the pipe for the flooded annulus (annulus not intact) and empty bore conditions in the Maximum Specified Water Depth	m	2.43
68	Minimum allowable bending radius for prevention buckling of tensile armour during installation of the pipe for the intact annulus and flooded bore conditions in the Maximum Specified Water Depth	m	1.55
69	Minimum allowable bending radius for prevention buckling of tensile armour during installation of the pipe for the flooded annulus (annulus not intact) and flooded bore conditions in the Maximum Specified Water Depth	m	1.43
70	Minimum allowable bending radius for prevention buckling of tensile armour and hydrostatic collapse during operation of the pipe for the intact annulus and empty bore conditions in the Maximum Specified Water Depth	m	1.55
71	Minimum allowable bending radius for prevention buckling of tensile armour and hydrostatic collapse during operation of the pipe for the flooded annulus (annulus not intact) and empty bore conditions in the Maximum Specified Water Depth	m	2.43
72	Minimum allowable bending radius for prevention buckling of tensile armour during operation of the pipe for the intact annulus and flooded bore conditions in the Maximum Specified Water Depth	m	1.55
73	Minimum allowable bending radius for prevention buckling of tensile armour during operation of the pipe for the flooded annulus (annulus not intact) and flooded bore conditions in the Maximum Specified Water Depth	m	1.43

Note 1) Dry / Flooded

Note 2) Contact presure < 12MPa / Contact pressure > 12MPa