
ANEJO Nº 5

ESTUDIO SIMULACIÓN GOLPE DE ARIETE

Ampliación del depósito y
bombeo de Montes de Cierzo, en
Tudela (Navarra)

Junta Municipal de Aguas de Tudela
Oficina Técnica

ANEJO Nº 5: ESTUDIO SIMULACIÓN GOLPE DE ARIETE

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1. ESTUDIO SIMULACIÓN GOLPE DE ARIETE



Estudio de simulación

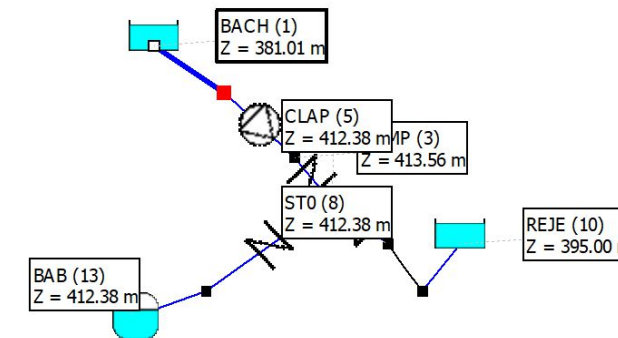
Aguas de Tudela

- Cliente: Aguas de Tudela
- Proyecto: ----
- Caso estudiado: Golpe de ariete por paro accidental de bombas a caudal total de 108.5 l/s en conducción de 300 mm de FD.
- Solución adoptada:
 - Calderín antiarriete volumen : **2000 litros.**
 - Modelo : **Hydrochoc**
 - Orientación : vertical
 - Presión de diseño : 10 bar
 - Presión de prueba : 15 bar
 - Boca de conexión : DN150 PN10

Creation date : 27/02/2018



Version : 431



Model description

Network

BACH: Tank
ZGround: 341.01 m
Z0: 381.01 m
BACH - POMP: Centrifugal pump
Q rated: 100 L/s
H rated: 35.00 m
N rated: 1450.0 rpm
R rated: 1
no. of stages: 1
no. of inlets: 1
TDH points
TDH: Model Ns
motor: standard
operation: disjonction_t=1s
Pd²: 0 kg.m²
coefficient: 2
C (double-parabola model, made dimensionless by /Hnom): 2.00968
B (double-parabola model, made dimensionless by *Qnom /Hnom): -0.02
Q1 (double-parabola model, made dimensionless by /Qnom): 1.4
POMP: Simple node
ZGround: 341.01 m
POMP - CLAP: Singular head loss
Alpha 1 (POMP to CLAP): 100 m/(m³/s)²
Alpha 2 (CLAP to POMP): 1e+020 m/(m³/s)²
CLAP: Simple node
ZGround: 341.01 m
CLAP - ST0: Singular head loss
Alpha 1 (CLAP to ST0): 0.000000 m/(m³/s)²
Alpha 2 (ST0 to CLAP): 0.000000 m/(m³/s)²
ST0: Simple node
ZGround: 341.01 m
ST0 - REJE: Pipe
Length: 2611.00 m
Pipe no. 1

ZGround: Perfil_Tudela
REJE: Tank
ZGround: 395.00 m
Z0: 395.00 m
CLAP - BAB: Singular head loss
Alpha 1 (CLAP to BAB): 0.000000 m/(m³/s)²
Alpha 2 (BAB to CLAP): 0.000000 m/(m³/s)²
BAB: Air vessel
ZGround: 342.41 m
Zbase: 343.41 m
capacity: 2.000 m³
Vinitial gas volume trapped:: 2.000 m³
Pinitial pressure: 1.5 bar
gamma: 1.200000
geometry : Vertical cylinder (D: 1000.0 mm)
k (during filling): 4.200000
k (during emptying): 3.000000
Output diameter: 150.0 mm

Pipes input

Pipe no. 1
phi = 300.0 mm
k = 0.1 mm
c = 1200.00 m/s
Minimum allowable pressure = -0.001 bar
Maximum allowable pressure = 10.000 bar

Numerical parameters

Calculation time 200.00 s
Time step 0.05000 s
Print frequency 1

Physical constants

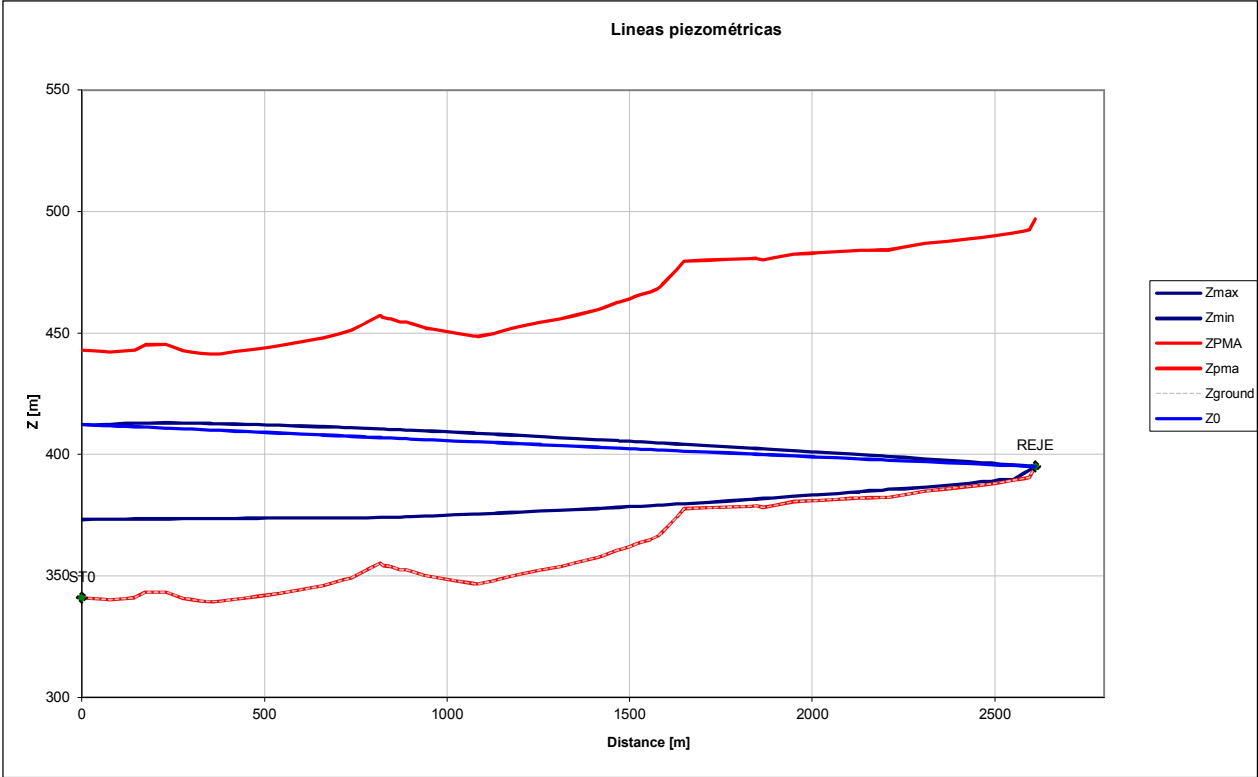
Mass density 1000.00 kg/m³
Atmospheric pressure 10.33 m
Gravity 9.81 m/s²
Kinematic viscosity 1.000e-006 m²/s
Vapour pressure 0.23 m

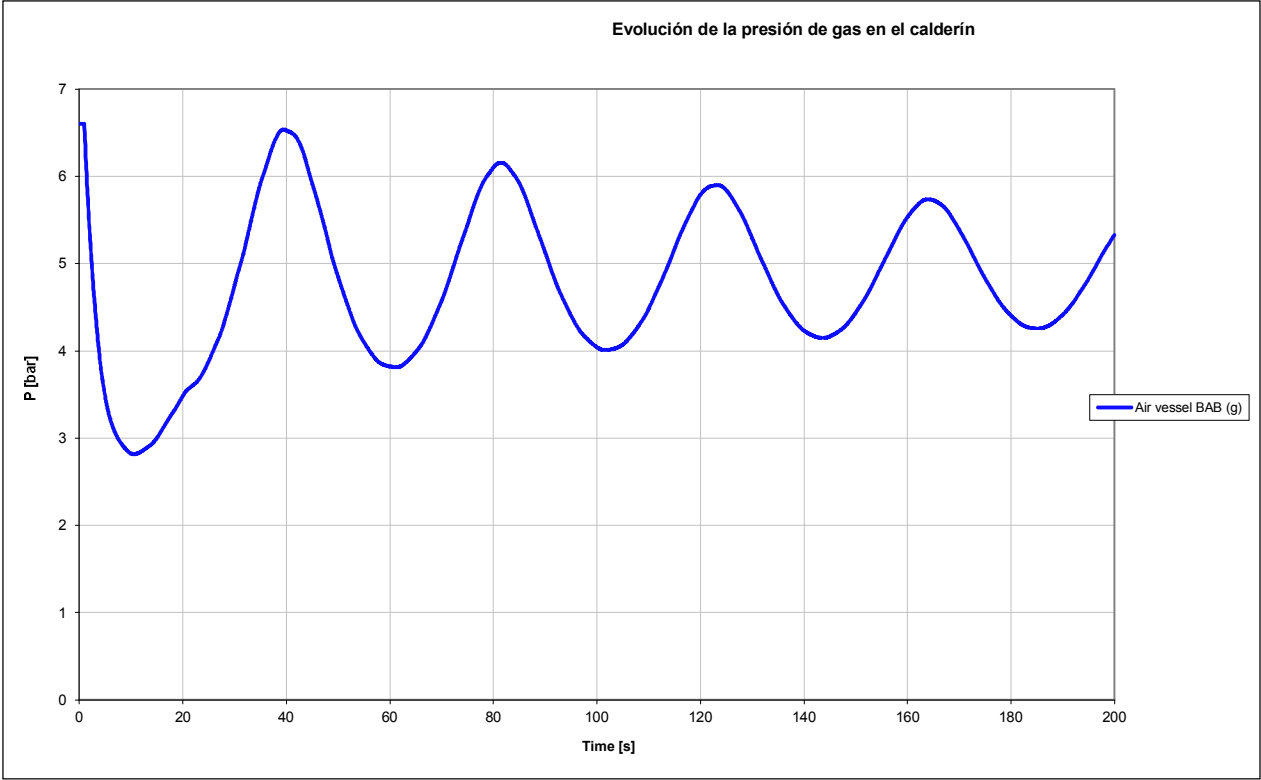
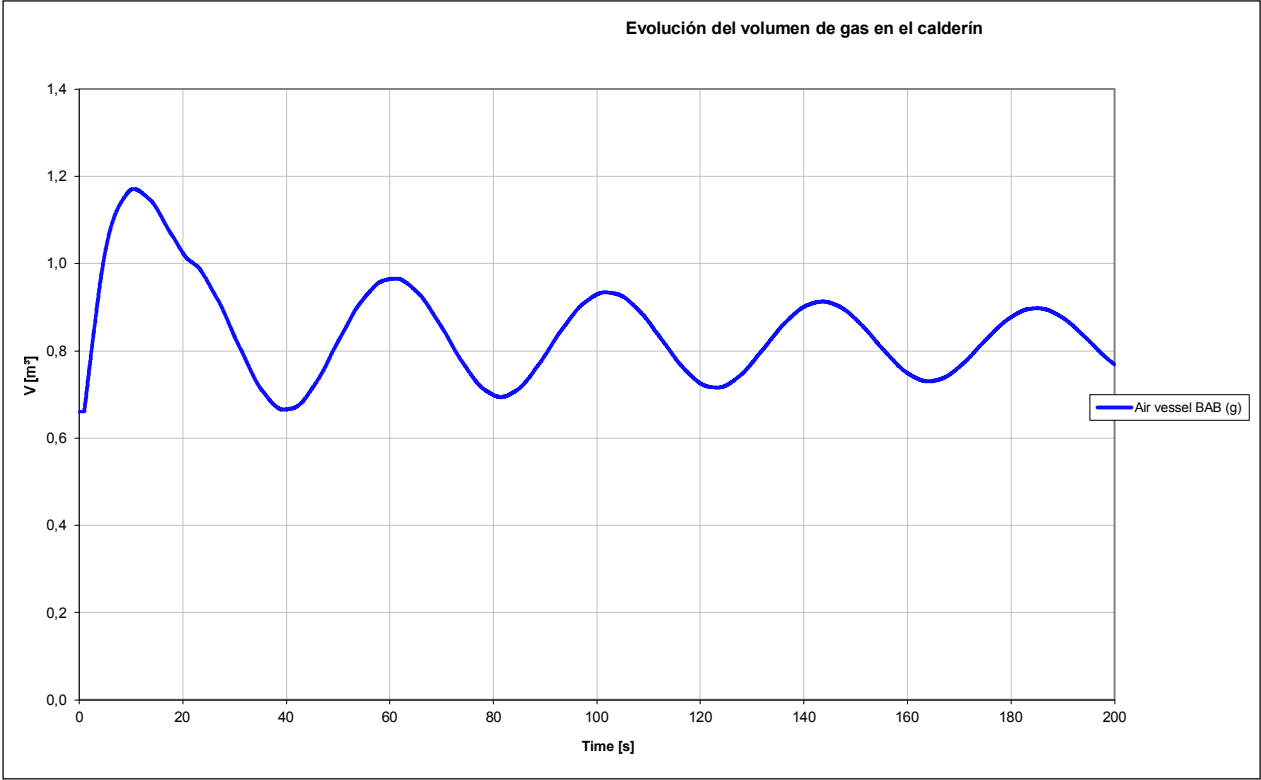
Laws

Operations disjonction_t=1s
time [s] Y/Ynom. []

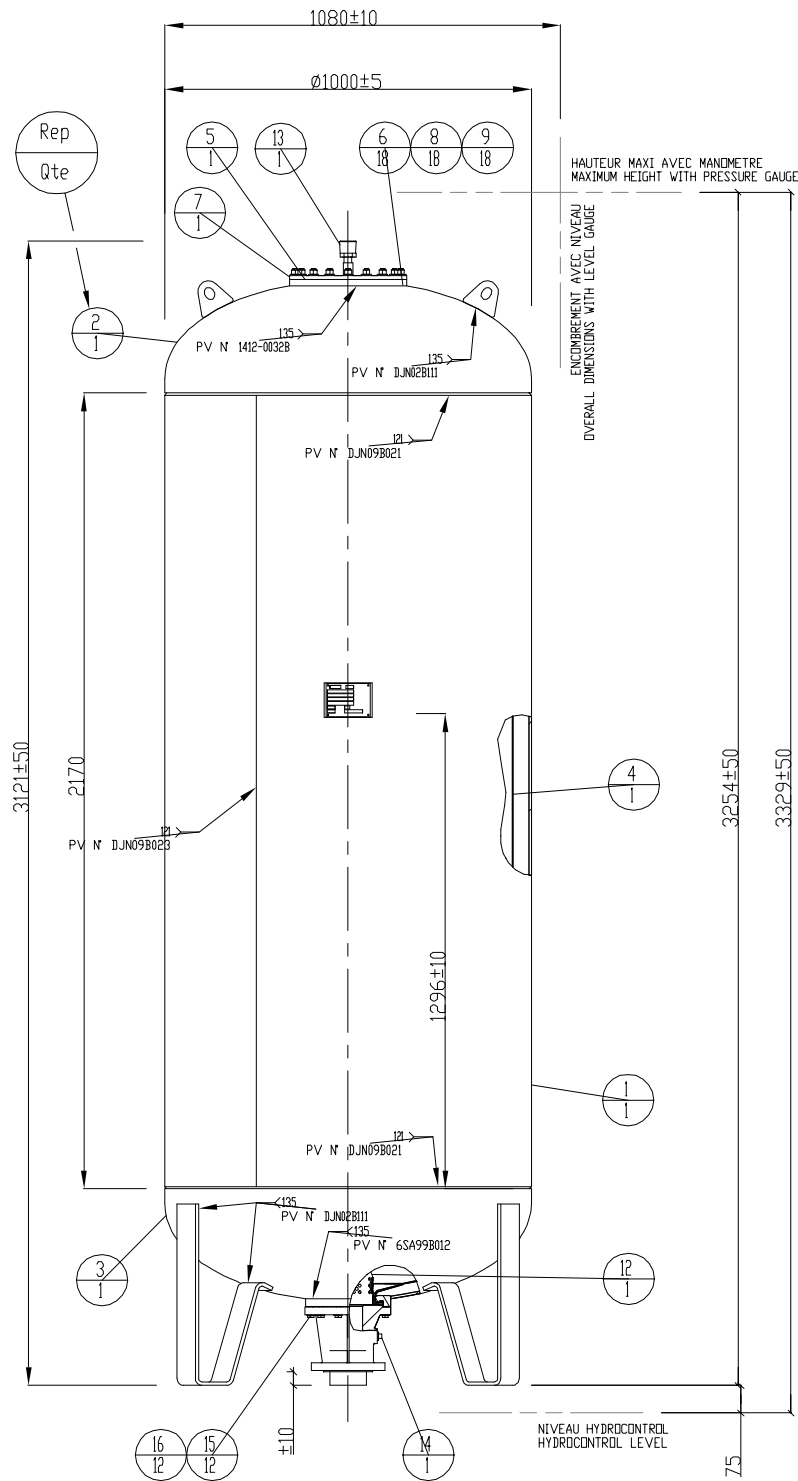
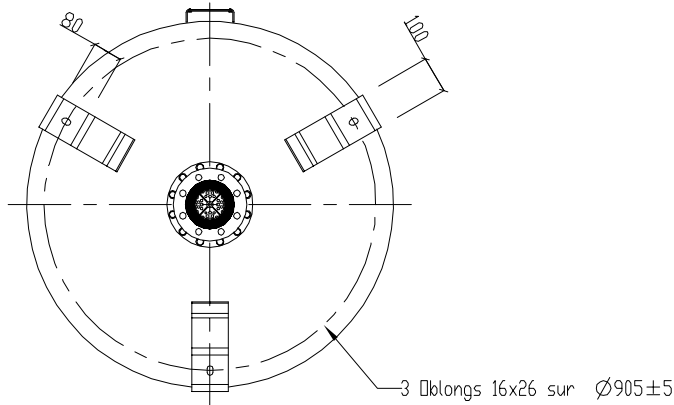
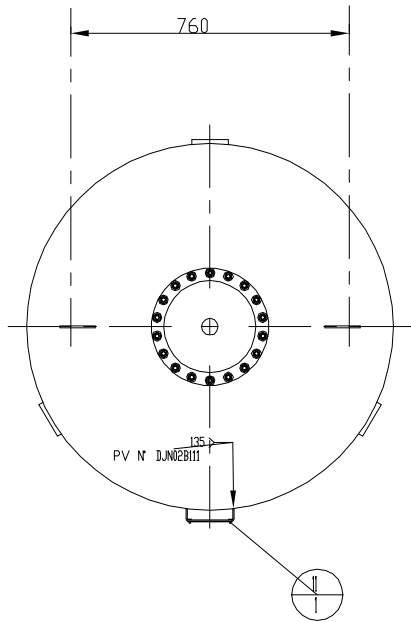
1	1
1	0
Characteristics of motors	
standard	
N/Nnom. []	C/Cn. []
0	2
0.8	2
1	1
1.03	0
Pipe profiles	
Perfil_Tudela	
KP [m]	Z [m]
0.001	341.01
32.27	340.59
76.27	340.22
96.9	340.46
144.46	341.04
172.98	343.18
229.26	343.42
278.3	340.76
325.96	339.66
351.89	339.39
377.33	339.5
451.49	341.02
507.3	342.06
569.77	343.55
649.78	345.61
701.36	347.67
736.75	349.19
774.04	351.94
816.71	355.26
824.6	354.29
845.23	353.9
871.28	352.53
887.8	352.53
939.69	350.14
991.04	348.81
1072.98	346.81
1084.65	346.7
1129.05	347.98
1176.38	349.93
1258.17	352.5
1311.65	353.89
1422.71	358.08
1468.7	360.67
1500.09	362.02
1516.02	363.07
1557.54	365.03
1577.28	366.36
1585.47	367.33
1629.05	374.17
1649.69	377.68

1709.63	378
1846.85	378.84
1865.74	378.17
1949.59	380.62
2000.73	380.93
2104.21	381.92
2156.35	382.18
2208.6	382.23
2310.54	384.95
2464.68	387.39
2514.78	388.43
2580.03	390.1
2594.16	390.52
2611	395



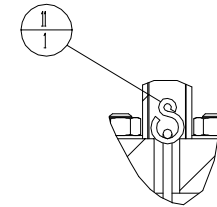


2. PLANO DETALLE CALDERÍN ANTIARIETE



ASSEMBLAGE PAR SOUDURE
CONFORME A LA DIRECTIVE 97/23/CE
ET AU DECRET 99.1046 DU 13 DECEMBRE 1999

JOINING BY WELDING
ACCORDING TO 97/23/CE DIRECTIVE
AND DECEMBER 1999 13TH DECREE 99.1046



ACCROCHAGE DE LA VESSIE
HANGING DETAILS OF THE BLADDER
ECHELLE / SCALE 0,500

Calcul suivant : CODAP 95 Calculation conform to : CODAP 95	
Catégorie de construction : C Construction category:	Pression de service : 10,00 bar Working pressure:
Catégorie de risque : IV Risk category:	Température de service : 0/90 °C Working temperature:
Coefficient : 0,70 Coefficient:	Pression d'épreuve : 15,00 bar Test pressure:
Pression de calcul : 10,00 bar Calculation pressure:	Épaisseur min de la virole : 5,20 mm Shell min thickness:
Température de calcul : 90 °C Calculation temperature:	Épaisseur min des fonds : 4,30 mm Caps min thickness:
Contrainte de calcul : 136,7 daN/mm ² Calculation strength:	Épaisseur de corrosion : 0,00 mm Corrosion thickness:
Épaisseur nominale de la virole : 6,00 mm Shell nominal thickness:	Épaisseur nominale des fonds : 6,00 mm Caps nominal thickness:

FRENCH STANDARDS		EUROPEAN STANDARDS		MATERIAL CERTIFICATE
NORMES FRANÇAISES		NORMES EUROPEENNES		Type certificat matériaux
A42CP	NFA 36.205	P265GH	NF EN 10028-2	NF EN 10204 / 3.1
XC18S	NFA 35.501			
I242	NFA 35.501	S235 JR	NF EN 10025-2	NF EN 10204 / 3.1
I242	NFA 35.501			
TUE250b	NFA 49.201	P265GH	NF EN 10216-2	
BF42	NFE 29.204	P265GH	NF EN 1759-1	
Z3 DN 19-09	NFA 36.209	14306	NF EN 10028-7	
Z3 DN 17-11-02	NFA 36.209	14404	NF EN 10028-7	
NES		DC 04	NF EN 10130	NF EN 10204 / 3.1

16	12	VVHMZ100402	VIS H M10X40 Z	CLASSE 8.8	ZINGUE
15	12	VRMXZ100000	SCREW H M10X40	ACIER	ZINGUE
14	1	GBDUB000005	RONDELLE M10 Z		
13	1	RH001M05000	BOUCHON M TH 1/2" GAZ	XC18	/
12	1	GCREP000001	PLUG 1/2" BSP M	ACIER	/
11	1	RH001M07000	ENSEMBLE DE GONFLAGE	PLASTIQUE	/
10	1	DPYR1000001	INFLATING SYSTEM	ALUMINIUM	/
9	18	VEDHZ120007	CREPINE	1.4404	/
8	18	VRMXZ120000	STRAINER	CLASSE 8	ZINGUE
7	1	RV015M03000	PLAQUE CE EQUIPEE	ACIER	ZINGUE
6	18	VGOUZ120452	MANUFACTURER PLATE	S/ENS	BDPCD000005
5	1	JTXM0000001	ESSE D'ACCROCHAGE	CLASSE 8.8	ZINGUE
4	1	RV042M04000	CATCHING ESSE	NITRILE	/
3	1	RV041M02002	ECROU H M12 Z	BUTYL	
2	1	RV020M02001	NUT H M12	S/ENS	BDSOD000012
1	1	DFRRD000005	RONDELLE M12 Z	S/ENS	BDVID000001
Rep. Item	Qte Qty	Numero Number	Designation Description	Matiere Material	Observations Remarks

SORTIE / OUTLET				
DN SORTIE OUTLET ND	C mm	REF. DE LA SORTIE OUTLET REFERENCE	REF. NIVEAU A BILLES LEVEL GAUGE REFERENCE	PERCEGE DE LA BRIDE DRILLING OF THE FLANGE
50	36	R7000M00001	R9044M00001	4 X 18 X 125
80	40	R7001M00001	R9045M00001	8 X 18 X 160
100	49	R7002M00001	R9045M00001	8 X 18 X 180
125	49	R7003M00001	R9046M00001	8 X 18 X 210
150	45	R7004M00001	R9046M00001	8 X 22 X 240

CLAPET ANTI-RETQUR / NON RETURN VALVE						
DN SORTIE OUTLET ND	D mm	E mm	REF. DU CLAPET AR NON RETURN VALVE REF.	REF. NIVEAU A BILLES LEVEL GAUGE REFERENCE	PERCEGE DE LA BRIDE DRILLING OF THE FLANGE	REF. REHAUSSES RAISERS REFERENCE
50	203	476	R8301M00000	R9046M00001	4 X 18 X 125	R84047M00000
80		480	R8302M00000		8 X 18 X 160	
100		460	R8303M00000		8 X 18 X 180	
125		450	R8304M00000		8 X 18 X 210	
150		457	R8305M00000		8 X 22 X 240	

NIVEAU HYROCONTROL / HYDROCONTROL LEVEL TYPE	
OPTIONS	REFERENCE DU NIVEAU LEVEL GAUGE REFERENCE
SANS ALARME WITHOUT WARNING	R9109M00001
4 ALARMES 4 WARNINGS	R9112M00001
SORTIE 4/20mA 4/20mA OUTPUT	R9118M00001
4 ALARMES + SORTIE 4/20mA 4 WARNINGS + 4/20 mA OUTPUT	R9124M00001

